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Efficiency Wages with Motivated Agents

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Efficiency Wages with Motivated Agents

Abstract

Many organizations nowadays combine profits with a social mission. This paper reveals a new hidden benefit of the mission: its role in facilitating the emergence of efficiency wages. We show that in a standard gift-exchange principals highly underestimate agents' reciprocity and, thereby, offer wages that are much lower than the profit-maximizing level. This bias has a high social cost: if principals had correct beliefs and thus offered the profit-maximizing wage, efficiency would increase by 86 percent. However, the presence of a social mission (in the form of a positive externality generated by the agent's effort), by increasing principals' trust, acts as a debiasing mechanism and, thereby, increases efficiency by 50 percent. These results contribute to our understanding of behavior in mission-oriented organizations, to the debate about the relevance of reciprocity in the workplace and open new questions about belief formation in prosocial contexts.

JEL-Codes: D230, M520.

Keywords: mission motivation, reciprocity, gift exchange, beliefs, efficiency wages.

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1. Introduction

Recent empirical evidence shows that workers' motivation is driven by different nonfinancial motives and that HRM in organizations is increasingly focusing on various nonmonetary factors in addition to the simple paycheck (Cassar and Meier, 2018). For instance, according to the Net Impact 2012 report, 72 percent and 53 percent of surveyed students and workers, say, respectively, that "A job where I can make an impact" is very important or essential to their happiness. Similarly, according to the PWC 19th annual global CEO survey in 2016, 59 percent of chief executive officers think that "top talent *today* prefers to work for organizations with social values which are aligned to their own" and 67 percent of them think this will hold true for the top talent in 5 years from the time of the survey, namely, in 2021. The report also reveals that CEOs are adjusting their behavior accordingly (p.23): "49 percent of CEOs are changing their focus on the leadership pipeline."

The 2018 report of the Deloitte Global Human Capital Trends summarizes the overall trend very well: "Based on this year's global survey of more than 11,000 business and HR leaders (...) we believe that a fundamental change is underway. Organizations are no longer assessed based only on traditional metrics such as financial performance (...) organizations today are increasingly judged on the basis of their relationships with their workers, their customers, and their communities, as well as their impact on society at large—transforming them from business enterprises into social enterprises." It is important to point out that this trend does not necessarily mean that organizations are no longer trying to maximize profits, but that they may use a different strategy to achieve the same purpose; a strategy that takes into account the social side of the working environment, such as the relationship between the employer and the workers and the relationship between the organization and the rest of the world, i.e., the organization's social mission.

To better understand the implications of this trend for incentive theory and HRM, we need to develop a richer framework of work motivation that allows to nest different nonfinancial motives and their potential interaction. This paper makes one of the first steps in this direction by studying contracting in a setting where agents can be motivated both by the social mission of their job and by social preferences towards the principal. In particular, we are interested in investigating, theoretically and experimentally, how an organization's social mission may affect the emergence of a specific type of efficiency wages, namely, those wages that are set above the competitive level with the aim of motivating effort *by appealing to workers' sense of fairness and reciprocity*.¹ We chose to focus on the social mission and efficiency wages because

¹There are, of course, also other microfoundations for why managers may want to pay efficiency wages. The

they appeal to two fundamental-but clearly distinct-aspects of workers’ intrinsic motivation: the mission relates to the social impact that a company has on third-parties and may motivate workers who care about the social cause underlying the mission (e.g., Murdock, 2002; Benabou and Tirole, 2003; Besley and Ghatak, 2005; Delfgaauw and Dur, 2007, 2008; Ashraf et al., 2014; Prendergast, 2008; Besley and Ghatak, 2018; Cassar and Armouti-Hansen, 2019), while efficiency wages relate to the relationship between the employer and employees, who can be motivated to exert effort by reciprocity and fairness concerns (e.g., Fehr et al., 1993, 1998; Levine, 1998; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Charness and Rabin, 2002; Brown et al., 2004; Fehr and Falk, 1999a; Gneezy and List, 2006).

Our theoretical model draws from the general framework of work motivation recently proposed by Cassar and Meier (2018). The model’s generality allows us to nest the two nonmonetary motives under investigation: mission motivation and social preferences towards the principal. With this model, we analyze a one-shot principal-agent game where a profit-maximizing principal offers the (motivated) agent a fixed wage contract for a job, which in addition to generating revenues, has a positive externality on society. The agent decides whether or not to accept the contract, and conditional on accepting, decides how much effort to exert. Hence, in this setting, the agent can be induced to exert effort by his motivation to contribute to the social mission of his job and/or by exerting social preferences towards the principals, such as the willingness to reciprocate a high wage.

We derive the theoretical conditions under which the social mission fosters, weakens or leaves unaltered the relationship between wage and effort, and thus, under which it facilitates or hampers the emergence of efficiency wages. We also provide theoretical examples of behavioral foundations identified by previous literature that could lead to such positive or negative interactions. Our theoretical findings suggest that, under mild assumptions, the effect of the mission on the effort-wage function depends on whether wage and mission interact in generating workers’ intrinsic motivation. More specifically, if the mission and wages are additively separable in the agents’ utility function, then the presence of the mission does not affect the slope of the agent’s effort choice and the optimal wage offer stays the same. On the other hand, if (i) the wage affects the agent’s mission motivation (e.g., in image-seeking theory) and/or (ii) the mission affects the agent’s social preferences toward the principal (e.g., if fairness perceptions are influenced by the broader environment), then the slope of the agent’s optimal effort choice may naturally change, and with it the optimal wage offer. Specifically, if the interaction is of

most notable one is the payment of efficiency wages to increase the cost of job loss and thus to make the threat of firing in case of shirking more effective (Shapiro and Stiglitz, 1984). For the sake of exposition, throughout the paper we will refer to “efficiency wages” more generally but it must be clear that we refer to efficiency wages that are microfounded on social preferences.

positive (negative) sign, then the profit-maximizing wage offer increases (decreases).

Next, we design a laboratory experiment with the following two aims. First, we want to shed light on the shape of workers' preferences for social mission and wages by eliciting the effort-wage function at the individual level. Second, we want to test the predictions of our model in terms of principals' wage offers. In order to implement a stylized version of our contractual setting in the laboratory, we use a principal-agent gift-exchange game in which the agent's effort generates a positive externality in the form of a donation to the agent's favorite charity. Then we compare the subjects' behavior in this modified version of the gift-exchange game (henceforth, mission treatment) to the behavior of other subjects in a standard general gift-exchange game without donation, and thus without mission (henceforth, GE treatment). In particular, in each treatment we use the strategy method to elicit agents' effort level for each possible wage offer, which allows us to construct an optimal effort function for each agent.²

Our experimental findings show that the social mission decreases the agents' minimum acceptable wage offer and shifts the optimal effort choice function upwards without affecting its slope. Hence, from the point of view of the agents' preferences, mission and efficiency wages are independent in motivating effort. Thus, according to our theoretical predictions, if principals are profit maximizers, we should not observe any difference in wage offers between the mission and GE treatment. Surprisingly, however, we observe principals in the mission treatment offering a significantly higher wage than the principals in the GE treatment. After ruling out several other explanations (including the one that principals are not profit-maximizers and have their own mission preferences) we show that the effect is clearly driven by principals' distorted beliefs about the agents' effort function in the GE treatment. More specifically, in the GE treatment principals highly underestimate agents' social preferences (i.e., the slope of the effort-wage function) and, in turn, offer a wage that is significantly lower than the profit-maximizing wage. Interestingly, this is not the case for the principals in the mission treatment: they correctly predict the slope of the effort-wage function and they offer a wage that is not significantly different from the profit-maximizing wage. In other words, we show that in both treatments principals act as profit-maximizers based on their beliefs. However, given that in the GE treatment principals beliefs are pessimistically biased, they end up offering wages that are too low.

In a next step we try to understand why the presence of a social mission helps reduce the

²Note that both in the theory and in the experiment, the mission is exogenous, so the best interpretation of our analysis is one which compares the behavior of employees (i.e., the agents who choose how much to work) and managers (i.e., the principals who choose how much to pay) in established standard organizations, with the behavior of employees and managers in established mission-oriented organizations. Hence, differently from Cassar and Armouti-Hansen (2019) and Besley and Ghatak (2017), in this project we leave aside questions related to the optimal choice of the mission or of the organizational form.

beliefs distortion. Does the mission act as a debiasing mechanism, or is the principal’s more accurate belief in the mission treatment the result of two countervailing biases? It could be that principals are coincidentally better at predicting the agents’ effort choices in the mission treatment because they on the one hand underestimate social preferences and on the other overestimate how wages affect mission motivation, or simply overestimate their interaction. We test this conjecture in a third treatment with “no principals” (henceforth, NO-Principal treatment). This treatment is the same as the mission treatment except that the wage offer to the agent is randomly determined by a computer, and the agent’s effort has no effect on the principal’s payoff – only the charitable institution is affected. The principals are paid a fixed wage and their task is only to guess the agents’ effort levels. In this setting, there is no scope for social preferences toward the principals. We find no evidence that principals significantly overestimate how wages affect agents’ efforts, and thus, their mission motivation.

Having ruled out that the more accurate beliefs observed in the mission treatment are the result of chance, we dig deeper on the potential psychological mechanisms through which the mission may act as a debiasing mechanism. We hypothesize that the presence of the mission increases principals’ level of trust. Trust is indeed found to be an important regulator of social interactions and a key factor in economic exchange (Kosfeld et al., 2005). Our data supports this conjecture in two ways. First, an heterogeneity analysis suggests that the beliefs distortion is entirely driven by principals who we categorized as being “less likely to trust others” based on their donation in a dictator game with charity played at the beginning of the experiment.³ Second, we compare principals’ trust level at the end of the experiment. We elicited trust in each treatment through a survey at the end of the experiment but before the payoffs were revealed. Thus, any observed difference in trust should reflect the effect of undergoing either the GE or mission treatment in our gift-exchange game. We find that trust is significantly higher ($p < 0.01$) in the mission treatment than in the GE treatment.⁴ We conclude that the presence of the social mission is likely to put individuals in an more trusting state of mind.

Finally, we look at the social costs of this distortion and at how the mission affects efficiency, i.e., the level of effort realized within each principal-agent pair. The average realized effort level in the GE treatment is low and in line with the level found for one-shot gift-exchange games (Fehr et al., 1998; Brown et al., 2004; Charness, 2004; Charness et al., 2004).⁵ In this respect

³As we don’t have a direct measure of trust before the experiment we use principals’ altruism as a proxy for trust. Evidence has indeed shown that the two are highly correlated and that both conditions generally characterize a positive disposition toward others Falk et al. (2018).

⁴Note that the treatments were balanced on principals’ altruism at the beginning of the experiment so the observed difference in trust is unlikely to be due to an initial imbalance in the treatments.

⁵More specifically, it is equal to 2.8 in a range between 1 and 10, while in previous studies with the same effort interval it was found to be on average equal to 3.

the principals' distorted beliefs are socially very costly: If principals correctly estimated the role of social preferences for motivating effort, and thus offered the profit-maximizing wage, efficiency would increase by 86 percent. The mission mitigates the negative effect of principals' bias by increasing efficiency by 50 percent.

This paper makes several contributions to the literature. Most broadly, it contributes to the economics literatures that study workers' preferences for monetary and non-monetary job attributes and their implications for performance and contracting (for a recent overview see Cassar and Meier (2018)). This includes literature on prosocial motivation (e.g., Bénabou and Tirole, 2006; Ariely et al., 2009), on fairness and identity (e.g., Akerlof and Kranton, 2008; Fehr et al., 2009), on awards and recognition (e.g., Kosfeld and Neckermann, 2011; Gallus and Frey, 2016) and on autonomy and alternative work-arrangement (e.g., Mas and Pallais, 2017). By being grounded on richer theories of human's motivation than the traditional Homo Oeconomicus view, all these literatures make important contributions to our understanding of behavior in organizations.

However, one limitation of these literatures is that, despite they all aim at providing a more realistic picture of workers' motivation, they often remain disconnected. In other words, while different non-financial motives are likely to coexist in the workplace, economists typically study them in isolation, thereby, overlooking their potential interaction. An early exception is the study by Ichniowski et al. (1997) which has shown in an industrial context that the combination of incentive pay with a flexible job assignment increases productivity, which implies that for one context, at least, the complementarities between monetary and nonmonetary incentives are important. More recently, Bartling et al. (2012) show in an experimental study that such complementarities can endogenously lead to two different types of jobs: "‘bad’ jobs with low discretion, low wages, and little rent-sharing, and ‘good’ jobs with high discretion, high wages, and substantial rent-sharing" (p. 834). Within this experimental setting, low wages cannot be offset by non-moneatry attributes-in this case a contract with full discretion-if they violate fairness norms. Finally, the experimental work by Kosfeld et al. (2017) show that while job purpose and monetary incentives are independent in motivating effort, purpose and recognition interact negatively, which suggests that they might operate through the same channel of image-seeking. We add to this literature in two ways. First, we provide a general theoretical framework that can be used to nest the different models of intrinsic motivation so far studied in isolation. Second, our experimental findings are consistent with workers' preferences being represented by utility functions that are additively separable in the mission and wage, suggesting that these two factors are independent in motivating effort—at least from the point of view of workers' preferences.

Within these broad streams of literatures, we contribute in particular to the expanding literature on performance and contracting in mission-oriented organizations by revealing a new hidden benefit of the social mission. While the focus of many of these studies is on how the social mission allows to economize on monetary incentives (Besley and Ghatak, 2005; Cassar, 2019), we show that when contract are incomplete, the presence of the mission fosters the emergence of efficiency wages. In other words, while monetary incentives and an organization’s social mission can be used as substitutes in incentivizing effort, we show that because of principals’ biased beliefs, efficiency wages and an organization’s social mission are complements in motivating effort. Furthermore, we show that the mechanism underlying this effect is an increase in trust: the mere presence of a social mission increases principals’ trust towards the agents, suggesting that the contribution of a social mission to the creation of more trusting and cooperative environments goes beyond the self-selection effects documented by previous studies (Fehrler and Kosfeld, 2013, 2014; Friebe et al., 2019).

Our results also contribute to the ongoing debate about the relevance of reciprocity in motivating effort provision when contracts are incomplete (e.g., Fehr et al., 1993, 1996, 1997, 1998; Fehr and Gächter, 1998; Fehr and Falk, 1999b; Fehr and Gächter, 2000; Fehr and Falk, 2002; Brown et al., 2004; List, 2009). Our results provide a new explanation for why efficiency levels in a one-shot gift-exchange game are typically lower than in a repeated setting: Contrary to the argument that social preferences play no role and that reputation is all that matters for motivating effort when contracts are incomplete (List, 2009), we show that agents exhibit social preferences which, if they had been predicted correctly by the principals, they would have led to a much higher level of efficiency even in a one-shot setting with no scope for reputation. Hence, our findings provide strong support in favor of the role of social preferences as a motivator for effort, in the laboratory.

Finally, our paper provides some novel insights to the literatures on bounded-rationality and belief formation in prosocial contexts (Fehr et al., 2005) and, in particular, on the determinants of trust (Fehr, 2009; Schwerter and Zimmermann, 2019). To the best of our knowledge, this is one of the very few studies that elicits principals’ beliefs of returned effort in a gift-exchange game, and we are the first to do so in an incentivized manner.⁶ Our results suggest first, that managers are likely to highly underestimate worker’s reciprocity in the work context, and second, that the presence of an organization’s social mission can be useful in increasing managers’ trust towards the employees.

The remainder of the paper is organized as follows. Section 2 presents the theoretical

⁶Brown et al. (2004) also elicits the principals’ beliefs in a repeated gift-exchange game, however, their elicitation was not incentivized and was not based on the strategy method.

analysis and its results. Section 3 describes our experimental design. Section 4 presents the main experimental findings. Section 5 investigates the behavioral mechanisms underlying our findings. Section 6 sheds some light on the role of the mission as a debiasing mechanism. Section 7 provides an efficiency analysis. Section 8 concludes.

2. Theoretical Framework

In this theoretical exposition, we are interested in analysing the effect of an exogenous increase in the pro-sociality of an organization's mission on (i) the agent's optimal effort provision, (ii) the minimum wage offer that the agent would accept (see Section 2.1), and on (iii) the wage offer that would maximize the principal's profits (profit-maximizing wage), in a one-shot principal-agent framework with incomplete contracts (see Section 2.2). Let $m \in \mathbb{R}_+$ be the exogenous social mission⁷, $w \in \mathbb{R}_+$ the wage that the principal can offer to the agent, and let $e \in \mathbb{R}_+$ be the effort choice of the agent. A given contract in this setting is simply given by the wage w , whereas the environment in which an agent may be employed is given by the tuple (w, m) . The positive social external impact from an agent exerting effort e in the environment (w, m) is assumed to be a positive linear mapping of the product me . In other words, the impact is strictly increasing in the sociality of the mission. When offering a contract to the agent, the principal must take into consideration an outside option of the agent in the form of a transfer valued at τ for any agent.

Let $U(w, m, e; \theta)$ be the agent's utility function. We assume that, by entering a contract, the agent derives an extrinsic benefit depending on the wage received and the effort exerted as well as an potential intrinsic benefit depending on the mission in addition to the wage and effort. We assume that these two terms are additively separable such that his utility may be specified as:

$$U(w, m, e; \theta) = w - c(e) + M(w, m, e; \theta) \quad (1)$$

where the two first terms are the standard way of representing the extrinsic benefit, with $c(e)$ being an increasing and convex function capturing the disutility of exerting effort⁸. The last term, $M(w, m, e; \theta) \geq 0$, is the intrinsic benefit of an agent endowed with θ working in the present environment (w, m) and exerting effort e . The magnitude in which the intrinsic benefits impacts the agent's utility is governed by θ which is distributed according to F_θ , which has well-defined first two moments. As in Cassar and Meier (2018), we interpret θ as being a vector of parameters indicating the weights assigned to different intrinsic benefits.

⁷That is, if $m' > m''$ then m' is more pro-social than m'' .

⁸Formally, $c'(e) > 0$ for $e > 0$, $c'(0) = 0$ and $c''(e) > 0, c'''(e) \geq 0$ for all e

Thus, any heterogeneity in the utility of agents stems from this vector of parameters. Mission motivation and/or social preferences towards the principal stem from the function M . Social preferences toward the principal may consists of distributional concerns (as in Fehr and Schmidt, 1999; Charness and Rabin, 2002) as well as reciprocity (as in Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2005) where the agent cares more about the principal if he judges an action taken by her as kind. Additionally, mission motivation may, in addition to pure altruism, contain impure motives such as warm glow (as in Andreoni, 1989, 1990). The meaning of - and the assumptions imposed on - the (cross-) partial derivatives of M are as follows:

- The marginal intrinsic utility of increasing the mission is captured by the sign and magnitude of the partial derivative M_m and mission motivation is captured by the sign and magnitude of the cross derivative M_{em} , both assumed to be non-negative for all w, m, e, θ and positive in expectation for all w, m, e . Thus, we assume that the average worker (i) benefits from being employed in a pro-social environment and (ii) attains a higher benefit by exerting effort in a pro-social environment.
- The marginal intrinsic utility of exerting effort is given by M_e , which is assumed to be (i) non-negative for all w, m, e, θ , (ii) positive in expectation for all m, e and $w > 0$, (iii) weakly decreasing for all w, m, e, θ and (iv) strictly decreasing in expectation for all w, m, e . That is, in expectation, the intrinsic utility is increasing in effort with diminishing returns. Furthermore, as a technicality, we assume that $M_{eee} \leq 0$ and $M_{eem} = 0$ for all w, m, e, θ .
- The marginal intrinsic utility of increasing the wage is captured by the sign and magnitude of the partial derivative M_w , and reciprocity is captured by the sign and magnitude of the cross derivative M_{ew} , both assumed to be non-negative for all w, m, e, θ and positive in expectation for all w, m, e . That is, in expectation, increasing the wage increases the marginal intrinsic utility of exerting effort with a diminishing effect. Thus, agents are, on average, reciprocal. Furthermore, as a technicality, we assume that $M_{eew}, M_{eww} \leq 0$ for all w, m, e, θ .
- The potential additional (de)motivation arising from the interaction between reciprocity and mission motivation is captured by the sign and magnitude of M_{ewm} . As the subsequent analysis will show, this will be the term of main interest.

The principal is assumed to be a risk neutral expected profit maximizer. Thus, she offers the wage w which maximizes her expected profits given by $re - w$ with $r > 0$. In the analysis,

we assume that the principal cannot observe the agent's type vector θ but that the distribution F_θ and the functional form of M are common knowledge⁹.

2.1. Optimal effort and lowest acceptable wage

Upon receiving the wage offer w in an environment with a mission m , the agent chooses effort such that

$$e^* = \arg \max_{e \in \mathbb{R}_+} \{w - c(e) + M(w, m, e; \theta)\} \quad (2)$$

Since the agent's objective function is strictly concave in effort, it follows that the optimal effort level e^* solves

$$M_e(w, m, e^*; \theta) - c'(e^*) = 0 \quad (3)$$

Thus, at the interior optimum, the agent equalizes his marginal intrinsic benefit with his marginal cost of exerting effort. Naturally, an agent with no intrinsic motivation will choose to exert no effort. However, if he is intrinsically motivated, the interior solution in (3) must hold for some $e^* > 0$ since $c(\cdot)$ is increasing and strictly convex with $c'(0) = 0$, whereas $M(\cdot)$ is increasing and concave in e . Naturally, the utility derived from this optimal effort choice in the given work environment must be higher than his evaluation of the outside option for the agent to accept the contract in the first place. If this is the case, it immediately follows from (3) that an exogenous increase in the prosociality of the mission leads to a weak increase in the agent's effort choice for any given wage. To see this, note that from the implied function theorem, the change in optimal effort following a marginal increase in the mission is given by

$$e_m^* = \frac{M_{em}(w, m, e^*; \theta)}{c''(e^*) - M_{ee}(w, m, e^*; \theta)} \quad (4)$$

As the denominator is positive for any θ and M_{em} , the mission motivation, is positive in expectation and unsupported below 0, it follows that (i) the optimal effort weakly increases in the mission for any agent and any wage and (ii) the expected optimal effort strictly increases in the mission for any wage.

Prediction 1 *For any given wage w , the expected optimal effort choice of agents increases in the social mission. That is, $E[e_m^*] > 0$.*

Next we turn to the lowest acceptable wage offer. Recall that the agent has an outside option valued at τ . Thus, the principal must offer a wage w which together with the exogenous

⁹Note that our setup excludes behavioral motives such as reciprocal altruism as in Levine (1998) in which the agent cares more about the principal if he thinks she is a prosocial type. This is because we consider a profit-maximizing principal, which, by definition, is not endowed with any prosociality.

mission m and the agent's optimal effort choice e^* gives the agent a utility of at least τ , i.e. $U(w, m, e^*; \theta) \geq \tau$. Let the wage offer which binds the constraint for a given agent be given by \underline{w} . That is, $\underline{w} = \tau - M(\underline{w}, m, e^*; \theta) + c(e^*)$ is the minimum acceptable wage offer¹⁰. Taking the derivative of \underline{w} with regard to m reveals how this wage level moves as the mission increases:

$$\underline{w}_m = -\frac{M_m(\underline{w}, m, e^*; \theta) + M_e(\underline{w}, m, e^*; \theta)e_m^* - c'(e^*)e_m^*}{1 + M_w(\underline{w}, m, e^*; \theta)} = -\frac{M_m(\underline{w}, m, e^*; \theta)}{1 + M_w(\underline{w}, m, e^*; \theta)} \quad (5)$$

where the second equality sign follows from the optimal effort characterization in (3). From our assumptions that M_m and M_w are positive in expectation and unsupported below 0, it follows that, (i) the lowest acceptable wage weakly decreases in the mission for any agent and (ii) in expectation, this lowest acceptable wage strictly decreases as the mission increases. That is, as the mission becomes more social, the interval of wages acceptable to the agent becomes larger.

Prediction 2 *The expected lowest acceptable wage to the agents decreases in the mission. That is, $E[\underline{w}_m] < 0$.*

2.2. The principal's wage offer

Now we consider the principal and her optimal wage offer. To ease the exposition, suppose for now that the principal can observe the agent's type vector θ . As mentioned, when choosing her optimal wage offer, the principal must take into consideration the agent's participation constraint, given by τ . After substituting in the agent's incentive compatibility constraint given in (3), the principal's maximization problem becomes:

$$\max_w \{re^* - w\} \quad \text{s.t. } U(w, m, e^*) \geq \tau \quad (6)$$

where the inequality constraint in (6) is the agent's participation constraint stemming from the outside option. Notice that due to this acceptable wage interval derived from the agent's participation constraint, together with strict concavity of the principal's objective function¹¹, the optimal wage w^* can be characterized by:

$$\begin{cases} w^* = 0 & \text{if } re^* - w < 0, \forall w \geq \underline{w} \\ w^* = \underline{w} & \text{if } \exists w \geq \underline{w} \text{ s.t. } re^* - w \geq 0 \text{ and } re_w^* - 1 < 0, \forall w \geq \underline{w} \\ re_w^* - 1 = 0 & \text{otherwise} \end{cases} \quad (7)$$

That is, if there does not exist a wage equal to or larger than \underline{w} from which the principal will earn a positive expected profit, the optimal wage is naturally zero. Furthermore, if the

¹⁰As w is unbounded from above and $M \geq 0$ by assumption, such a wage must exist.

¹¹Specifically, the principal's objective function is strictly concave iff $e_{ww}^* < 0$, which can be shown to follow from the assumptions $c''' \geq 0$, $M_{eee} \leq 0$ and $M_{eev} \leq 0$. As this holds for any θ , it also holds in expectation.

principal's objective function reaches its maximum at a wage lower than the lowest acceptable one but it is still possible to derive positive profits above this point, then it is optimal to offer the lowest acceptable wage. This follows because the objective function is strictly concave and thus it must be decreasing on the acceptable wage interval such that the principal derives higher profits from the lowest acceptable wage than any higher wage offer. As a consequence, notice that, if an interior solution exists the principal will choose a wage which equalizes here marginal revenue and marginal costs. To see how the optimal wage changes as the mission increases, we apply the implicit function theorem to the interior solution in (7) which gives us

$$w_m^* = -\frac{e_{wm}^*}{e_{ww}^*} \quad (8)$$

and since $e_{ww}^* < 0$, we have $\text{sgn}(w_m^*) = \text{sgn}(e_{wm}^*)$. In other words, if an increase in the mission leads to a steeper effort-wage slope, the optimal wage increases and vice versa. That is, in determining the optimal wage, a potential upwards or downwards shift of the whole expected effort-wage slope due to an increase in mission is irrelevant. Rather, it is the slope itself which determines the profit-maximizing wage. Taking the derivative of e_m^* defined in (4) with regard to the wage, it follows that e_{wm}^* is positive if and only if

$$\frac{M_{ewm}(w^*, m, e^*; \theta)}{M_{em}(w^*, m, e^*; \theta)} > \frac{c'''(e^*)e_w^* - M_{eee}(w^*, m, e^*)e_w^* - M_{eew}(w^*, m, e^*; \theta)}{c''(e^*) - M_{ee}(w^*, m, e^*; \theta)} \quad (9)$$

That is, if the relative increase in the agent's mission motivation is large enough to compensate for the term of the right hand side, which depend on the relative increase in convexity of his cost function and concavity of his intrinsic marginal utility with regard to effort following a marginal increase in the wage, the effort-wage slope will increase and, thus, the profit-maximizing wage offer. Notice that the right-hand side of (9) is positive. Hence, even if the wage increases the agent's mission motivation, it might not be enough for him to increase his effort choice. In turn it follows that there exists a non-negative threshold λ which $M_{emw}(w, m, e^*; \theta)$ must surpass for the effort-wage slope and profit-maximizing wage offer to increase. Naturally, the threshold is endogenous as it depends on $M(\cdot)$ itself as well as the optimal effort and wage. However, we will show later that the threshold can be made exogenous with a few simplifying assumptions.

Until now, we have assumed that the principal is able to observe the agent's type vector θ . If the principal cannot observe θ , but only F_θ , then the principal chooses the wage which maximizes her expected profit, given by $rE[e^*] - w$ subject to the constraint that the agent's expected utility is larger than the outside option. In turn, the profit-maximizing wage in the interior, if it exists, is such that her expected marginal revenue, $rE[e_w^*]$, equals her marginal costs, 1. It thus follows that the profit-maximizing wage increases following a marginal increase in the mission if and only if the slope of the expected effort-wage slope increases, i.e. $E[e_{wm}^*] > 0$.

In turn, it follows that the profit-maximizing wage increases with the mission if and only if the expected increase in the agent's mission motivation surpasses the threshold $\bar{\lambda}$ which is equal to the expected threshold $E[\lambda]$ plus a term that is proportionate to the covariance between $\lambda - M_{ewm}(w^*, m, e^*)$ and $1/(c''(e^*) - M_{ee}(w^*, m, e^*))$ ¹². The intuition for this second term is as follows: Suppose the aforementioned covariance is positive. Then, $\lambda - M_{ewm}(w^*, m, e^*)$ is larger (potentially positive) when $c''(e^*) - M_{ee}(w^*, m, e^*)$ is smaller and vice versa. In turn, this implies that the expectation of $M_{ewm}(w^*, m, e^*)$ has to be larger to compensate for this. Our prediction follows:

Prediction 3 *In the interior, the profit-maximizing wage offer, w^* , increases (decreases) if the expected additional motivation from the interaction between wages and mission motivation (or mission and reciprocity), $E[M_{ewm}]$, is above (below) the threshold $\bar{\lambda}$.*

Figure 1 illustrates three examples of the agent's expected optimal effort choice as a function of the wage, and depicting the profit-maximizing wage, before and after an increase in the mission under three scenarios. In Case 1, the slope of expected effort choices remain constant leading to the profit-maximizing wage being identical in both settings. In Case 2, there is an increase in the expected effort slope and, in turn, an increase in the profit-maximizing wage offer. Finally, in Case 3, there is a flattening in the expected effort slope and hence a decrease in the profit-maximizing wage offer. In the following subsection, we provide an explicit functional form of the intrinsic utility function M , capable of explaining each case, and provide behavioral explanation of its meaning. In these examples, we assume that (i) $c'''(e) = 0$ for all e to fit the model with our experiment, and (ii) that $M_{ee}(w, m, e^*) = M_{eee}(w, m, e^*) = 0$ such that the profit-maximizing wage increases (decreases) in the mission if and only if the expected interaction between social preferences toward the principal and mission motivation in the agent's intrinsic utility function is positive (negative).

2.3. Examples

First, let us assume a very simple functional form of the work meaning function:

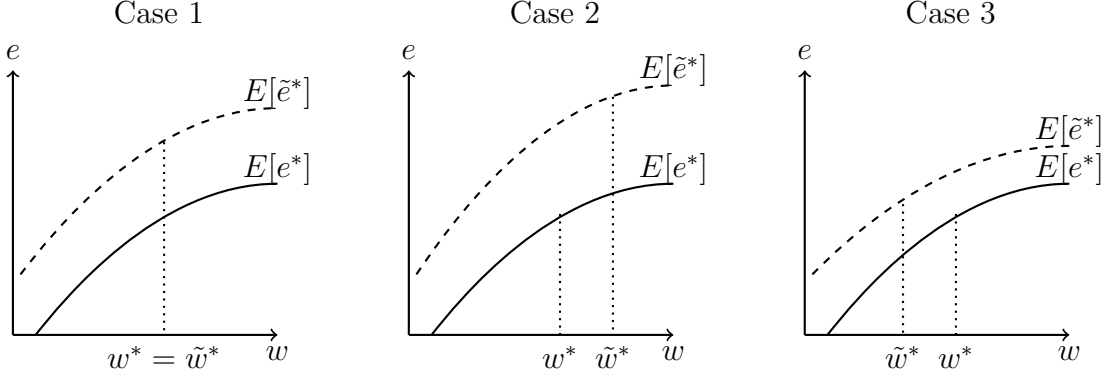
$$M(w, m, e) = (\theta_F f(w) + \theta_G g(m)) e \quad (10)$$

where $f' > 0, f'' \leq 0, g' > 0$, and $g'' \leq 0$ ¹³. f is a simple reciprocity function such that the agent returns higher effort levels in response to higher wage offers with diminishing returns. In

¹²Specifically, $E[e_{wm}^*] = 0 \iff E\left[\frac{M_{ewm}}{c''(e^*) - M_{ee}}\right] = E\left[\frac{\lambda}{c''(e^*) - M_{ee}}\right]$ and so the expected threshold is given by $\bar{\lambda}_1 = E[\lambda] + \frac{Cov[\lambda - M_{ewm}(w^*, m, e^*), \frac{1}{c''(e^*) - M_{ee}(w^*, m, e^*)}]}{E\left[\frac{1}{c''(e^*) - M_{ee}(w^*, m, e^*)}\right]}$

¹³Notice that this functional form satisfies all imposed assumptions.

FIGURE 1: Examples of expected effort wage slopes and optimal wage offers for $E[e_{wm}^*] = 0$ in Case 1, $E[e_{wm}^*] > 0$ in Case 2 and $E[e_{wm}^*] < 0$ in Case 3.



Note: $E[e^*]$: expected slope before an increase of the mission; $E[\tilde{e}^*]$: expected slope after an increase of the mission. w^* : optimal wage before an increase of the mission; \tilde{w}^* : optimal wage after an increase of the mission.

particular, higher wage offers may be received as kinder actions resulting in kinder reactions. g may be interpreted as a mission motivation function, in which the agent is more motivated to exert effort the more social the mission is. Note that $\theta = (\theta_F, \theta_G)$, where θ_F indicates how important reciprocity is to the agent and θ_G indicates how mission driven the agent is. We assume that both parameters are positive in expectation and unsupported below zero. It follows that $M_{emw}(w, m, e^*; \theta) = 0$ for all w, m, e, θ implying that the slope of the agent's expected optimal effort function stays constant, $E[e_{wm}^*] = 0$ and, thus, that the profit-maximizing wage stays the same, $w_m^* = 0$. This follows because an increase in the mission does not alter the agent's reciprocity. Furthermore, notice that (i) $M_m(w, m, e^*; \theta) = \theta_G g'(m) e^* \geq 0$ implying that the minimum acceptable wage weakly decreases and (ii) $M_{em}(w, m, e^*, \theta) = \theta_G g'(m) > 0$ implying that the optimal effort increases for any acceptable wage offer following an increase in the mission. Thus, this functional form of the work meaning function is fully capable of rationalizing Case 1 in Figure 1.

Second, let us now suppose that f is a function of m in addition to w and that g is a function of w in addition to m :

$$M(w, m, e) = (\theta_F f(w, m) + \theta_G g(m, w)) e \quad (11)$$

where $f_w > 0, f_{ww} \leq 0, g_m > 0, g_{mm} \leq 0$. In other words, we impose the same assumptions here as before. In addition, assume that $f_m \geq 0, g_w \geq 0$ and $g_{ww} \leq 0$. Once again, it follows that (i) $M_m(w, m, e^*; \theta) = (\theta_F f_m(w, m) + \theta_G g_m(m, w)) e^* \geq 0$ implying, once again, that the minimum acceptable wage decreases and (ii) $M_{em}(w, m, e^*) = \theta_F f_m(w, m) + \theta_G g_m(m, w) > 0$ indicating that the agent's optimal effort choice increases for any given wage level. Finally, notice that

$$M_{ewm}(w, m, e^*) = \theta_F f_{wm}(w, m) + \theta_G g_{wm}(m, w) \quad (12)$$

Thus, the change in the profit-maximizing wage depends solely on the cross derivatives of f and

g. Naturally, if both cross derivatives are zero then we are back in the preceding scenario and thus in Case 1 in Figure 1. Suppose that is not the case, then we have four potential scenarios: Either they are both positive (negative), which then implies that $M_{emw}(w, m, e^*) > (<)0$ leading to a steeper (flatter) optimal effort function of the agent and a higher (lower) profit-maximizing wage, or one is positive and the other negative such that the sign of $M_{emw}(w, m, e^*)$ will depend on the magnitude of the effects.

The question then arises: Are all cases plausible? We can find reasonable behavioral foundations for all the 4 cases. Consider the reciprocity function f : On the one hand, an increase in the prosociality of the mission can prime the agents towards a more reciprocal “state of mind” because the environment is perceived as being more social. Furthermore, offering a high wage in this environment could be interpreted as a kinder act than in an environment with no mission because it suggests that the principal is not trying to save on wages by exploiting agents’ mission motivation (i.e., she is not trying to capture more of the agent’s surplus by offering a low wage)¹⁴. In this example, the cross derivative would be positive. On the other hand, an increase in the prosociality of the mission can make a given wage offer seem less kind because the agent might expect the principal to be more altruistic herself and thus to increase the wage offer in response to a mission increase. In this example the cross derivative would be negative. Now, consider the altruism function g : On the one hand, it may be that an increase in the wage leads to a higher degree of mission motivation because agents are happy to receive a higher wage and want to give back not only to the principal but also to the charity (e.g., because of indirect reciprocity Engelmann and Fischbacher, 2002). Furthermore, a wage increase makes the agent richer and, thus, he has a more resources to benefit the charity (income effect). This example would result in a positive cross derivative. On the other hand, an increase in the wage may make it more difficult for the agent to signal his altruism to others. Thus, if reputational or image concerns are important enough to the agent (Bénabou and Tirole, 2006) this might lead to a negative cross derivative.

To conclude: Although we are able to make reasonable predictions on (i) change in the minimum acceptable wage offer and (ii) change in the effort exerted for any given wage offer following an increase in the prosociality of the exogenous mission, it is unclear a priori what happens to the slope of the agent’s optimal effort function and thus to the profit-maximizing wage offer following this increase. What we can say is that this will depend on the interaction between the agent’s social preferences toward the principal and his mission motivation.

¹⁴Lower wages have been found to be negatively associated with a firm’s social responsibility reputation (see e.g., Nyborg and Zhang, 2013). Thus a high wage may be interpreted as more kind in a social setting.

3. Experimental design

The objective of the experiment is to complement the theoretical analysis in the previous section with an empirical investigation of the relationship between social mission and efficiency wages. It was designed specifically to test how the social mission affects (i) agents' acceptance rates, (ii) agents' effort provisions, (iii) the principals' profit-maximizing wage and (vi) the overall level of efficiency achieved.

We collected experimental data in six separate sessions. At the beginning of each session, subjects were informed that the experiment comprised two stages, and were told also that their decisions in one stage would be irrelevant for the other stage. Subjects were not given details about the second stage until they had completed the first stage. In the first stage, we elicited subjects' mission motivation and social preferences using a dictator game with a donation to a charity and an ultimatum game, respectively. In the second stage, the main part of the experiment, we implemented a stylized version of our contractual setting using a principal-agent gift-exchange game, with or without a social mission. The social mission was implemented by letting the agent's effort generate a positive externality in the form of a donation to a charity of the agent's choice. In each session, participants completed both stages. Which stage counted towards the payment was determined randomly. The selected stage was the same for all participants in a given session. Individual payoffs and earnings were revealed only after both stages were completed. All the participants were asked to choose their preferred charitable organization from a list of 12 charities (see Supplemental Material). They were informed that all donations they generated in the stage chosen for payment would be paid to the organization of their choice.

3.1. Dictator and ultimatum game

We elicited subjects' social preferences before the main experiment, using a dictator game with a donation to charity, and an ultimatum game. In the dictator game, all subjects were asked to divide 100 points (in multiples of 10) between themselves and their chosen charitable organization. In the ultimatum game, subjects were randomly assigned to the roles of either proposer or responder and were randomly matched in pairs. The proposer received an endowment of 100 points and was asked to propose a split of these points (in multiples of 10) between himself/herself and the responder. Beforehand, the responder was asked to indicate acceptance or not for each possible split. If the proposed allocation was accepted, the players received the corresponding amounts. If the proposal was rejected, neither player of the pair received anything. The resulting individual payoffs were revealed only at the end of the experiment.

3.2. Gift-exchange game and treatment variation

We used the same random assignment of roles in the ultimatum game to divide subjects between principals and agents. In other words, those in the role of the proposers were now principals, while those in the role of the responders were now agents. Principals and agents were then matched randomly in pairs, and depending on the session, were allocated to one of the two treatments: GE treatment or mission treatment. Those in the GE treatment played a standard gift-exchange game where the agent decided whether or not to accept the wage contract offered by the principal, and conditional on acceptance what level of effort to exert. The only difference in the mission treatment was that the agent's effort generated a donation to the charity that was chosen at the beginning of the experiment. The donation was an externality paid by the experimenter.

Timings and payoffs in both treatments were as follows. The principal chose a lump-sum wage offer w . Meanwhile, the agent chose, for each possible wage offer, whether he would accept the contract and, conditional on accepting, a costly level of effort e .¹⁵ As in Fehr et al. (1993), the set of possible wages is given by $w \in \{1, 3, 5, 10, 15, \dots, 65, 75, 85, 95\}$, and the set of possible effort levels is given by $e \in \{1, \dots, 10\}$. In the case of rejection of a given wage offer, we code $e = 0$. Both parties received an initial endowment of 100 points to ensure a non-negative return for all participants. There was an additional 5 point outside option available to the agent, should the contract not be concluded i.e. if the principal offered a wage which the agent did not accept. There was no such outside option for the principal. Thus, in the case that the agent rejected the contract, the monetary payoffs to the principal and agent were respectively 100 and 105 points. If the contract was accepted by the agent, then the principal's and the agent's monetary payoffs from concluding the contract were respectively

$$\begin{aligned}\Pi_{P|e>0} &= 10e - w + 100 \\ \Pi_{A|e>0} &= w - c(e) + 100\end{aligned}\tag{13}$$

where the first term of the principal's monetary payoff constituted her revenue based on the agent's chosen effort level multiplied by 10, and the last term her endowment. If the contract was accepted, the principal was bound to pay the wage to the agent. The agent's monetary payoffs consisted of the wage offered and his endowment minus the cost of the chosen effort level. Table 1 presents the costs of each effort level which are the same as in Fehr et al. (1993) and Brown et al. (2004). Since the marginal cost is increasing in the effort, it corresponds to a large extend the quadratic cost function considered in the examples in section 2.

¹⁵The use of the strategy method allows us to reconstruct an optimal effort function of the wage for each agent, which is essential in order to test how the slope of this function varies across treatments.

TABLE 1: Effort and corresponding costs of effort

e	1	2	3	4	5	6	7	8	9	10
$c(e)$	0	1	2	4	6	8	10	12	15	18

Additionally, in the mission treatment, if the principal-agent pair concluded a contract, the charitable organization received a donation:

$$\Pi_C = 25e \quad (14)$$

Thus, the charitable organization received the agent’s chosen effort level multiplied by 25.

Note, that if both parties were maximizing their monetary payoffs, the payoffs corresponding to the unique Nash equilibrium were (105, 105). This corresponds to the principal offering a wage that matches the outside option i.e. $w = 5$, making the agent indifferent between rejecting the contract and receiving 105, or accepting it and exerting the minimum effort $e = 1$ which comes at a cost of 0. This applies, because the agent’s best response was to reject the contract for any wage offer below the outside option, and to accept the contract by exerting minimum effort level for any wage offer above the outside option. Thus, a wage offer of 5 maximized the principal’s payoff.

3.3. Elicitation of principals’ beliefs

Following the principals’ wage choices, we elicited their beliefs about the agents’ effort responses.¹⁶ Specifically, for each possible wage offer, we asked principals to guess whether the matched agents would accept the contract, and conditional on accepting, what effort level would most likely be chosen. Principals received 0.5 points for correctly guessing (i) each wage that was not accepted, and (ii) each accepted wage and chosen effort by the agent. Thus, we elicited the modal effort choice for each possible wage offer.¹⁷ ¹⁸ After eliciting principals’ beliefs about agents’ effort, we asked principals to guess the wage that, given her beliefs, maximizes profit. In the empirical analysis, we will refer to this variable as the “guessed profit-maximizing wage”. The question we posed was: “Based on your guesses of what wages the worker would accept and how much effort he/she would put, what wage level do you think gives you the highest income?”. The principal received 0.5 points for a correct guess.

¹⁶To avoid priming the subjects, the instructions did not mention that we would elicit principals’ beliefs. The elicitation did not affect the payoffs of the agents.

¹⁷To the best of our knowledge, this is one of the very few studies that elicits principals’ beliefs of returned effort in a gift-exchange game, and we are the first to do so in an incentivized manner. Brown et al. (2004) also elicits the principals’ beliefs in a repeated gift-exchange game, however, their elicitation was not incentivized and was not based on the strategy method.

¹⁸By imposing the assumption that the mode coincides with the mean (e.g., as with a symmetric unimodal distribution), we have elicited the principals’ conditional expectation in a risk-robust manner (Hurley and Shogren, 2005).

3.4. Trust questionnaire

At the end of the experiment but before the payoffs were revealed, we administered a socio-economic questionnaire. Specifically, we elicited a measure of trust by asking: "I assume that people have only the best intentions" (1-10 points). Additionally, we asked a series of socio-economic questions and collected variables on fairness considerations and social preferences. None of these measures was incentivized (see Supplemental Material).¹⁹

3.5. Procedural details

The six laboratory sessions were conducted at the University of Cologne in September, 2016. In total, 190 students participated in this between-subject design experiment and none of whom participated in more than one session. In five of the six sessions 32 subjects participated, whereas 30 subjects participated in the remaining session. Among the 190 subjects, 94 were assigned to the GE treatment and 96 were assigned to the mission treatment. The experiment was programmed in and used z-Tree software (Fischbacher, 1999). Participants in the experiments received points with a conversion rate of 1/12. Average earnings were 13.72 euro with a standard deviation of 2.14 and a minimum earning of 5.66 euro.

4. Results

4.1. Agents' acceptance rates and effort choices

We start by looking at the agents' wage acceptance rates across treatments. According to our theoretical model, the average minimum acceptable wage should decrease in the mission treatment compared to the GE treatment. Figure A.1 summarizes the percentage of agents accepting the offer for each possible wage across the two treatments. We found no significant treatment differences in acceptance rates for the vast majority of wages above the agents' outside option, of 5. Additionally, the acceptance rate increased with the wage. However, at wage offers below the outside option of 5 we found significant treatment differences. Below wage offers of 5, approximately 4 percent of the agents in the GE treatment accepted a wage offer (for both wages equal to 1 and 3) compared to approximately 17 and 19 percent in the mission treatment (respectively for wages equal to 1 and 3). This difference was significant for both wage levels using the two-sample Wilcoxon rank-sum test ($p = 0.07$).²⁰ Thus, consistent with the theory, the presence of the social mission reduced the agent's average minimum acceptable

¹⁹We used a shortened version of the Global Preference Survey. See also (Falk et al., 2018).

²⁰For the rest of the analysis, we continue to use the Wilcoxon rank-sum test, unless otherwise specified.

wage.

The regressions in Table 2 provides further evidence of a lower average minimum acceptable wage in the mission treatment. The OLS regression (Column 1) and the logit regression (Column 2) show the probability of accepting a wage below 5 for “mission treatment” - a dummy which is 0 for the GE treatment and 1 for the mission treatment.

TABLE 2: Overview of Regressions

	Acceptance (1)	Acceptance (2)	Effort (3)	Effort (4)	Wage offer (5)
Mission treatment	0.145** (0.064)	1.647** (0.816)	0.749** (0.302)	1.431** (0.626)	10.196** (3.952)
Wage			0.913*** (0.007)	0.145*** (0.011)	
Mission treatment*Wage			-0.004 (0.009)	-0.013 (0.016)	
Constant	0.043 (0.030)	-3.114*** (0.726)	0.242* (0.142)	-2.552*** (0.413)	25.574*** (2.443)
R ²	0.051		0.466		0.067
Pseudo R ²		0.077		0.141	
Observations	95	95	1710	1710	95

Note: Ordinary least- squares (OLS) regressions in columns (1) and (5). Logit regression in column (2). Random-effects regressions with clustered standard errors at the individual level in column (3) and tobit regression column (4). All regressions are estimated with robust standard errors. Significance levels: *p<0.1; **p<0.05; ***p<0.01

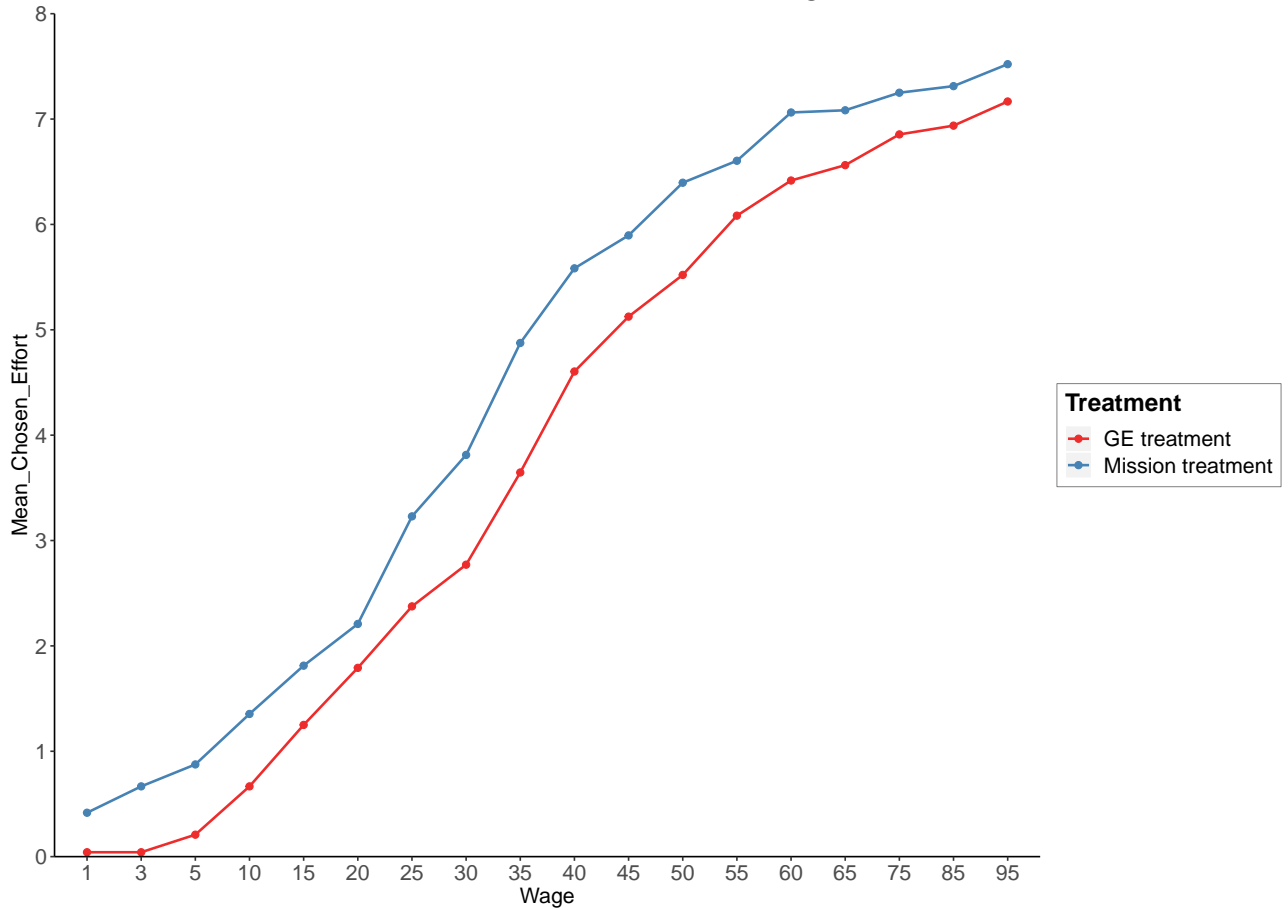
The OLS regression shows there was an average 4.3 percent probability of acceptance in the GE treatment, and a 18.8 percent probability of acceptance in the mission treatment with a statistically significant difference. The logit regression shows a similar pattern. In summary, we find compelling evidence that the presence of a social mission lead more agents to accept a contract with which they were loosing money, as compared to the outside option. Hence, we conclude:

Result 1 *In line with Prediction 2, the average minimum acceptable wage offer is smaller in the mission treatment compared to the GE treatment.*

After investigating agents’ acceptance rates we characterized their effort choices. Figure 2 shows the mean effort choice for each potential wage offer in both treatments. Since we observed the chosen effort levels for all agents at every wage level, this graph provides an approximation of the agents’ optimal effort function in each treatment. It shows that the social mission shifted the agents’ optimal effort function upwards. For each possible wage offer, the average effort was higher in the mission treatment than in the GE treatment (the difference is significant for most wages below 55).

We investigated whether the presence of a mission also affected the slope of the agents' optimal effort function. We tested for treatment differences investigating the change in effort with increasing wage. For example, we started by testing whether the change in effort level following an increase in the wage from 1 to 3 was different across treatments, and conducted the same analysis for all the remaining wage differentials. We found no significant differences over most of the wage intervals, except at wages 3, 45 and 55. As expected, and based on our previous results, in the mission treatment agents exerted more effort than in the GE treatment in response to an increase in the wage from 1 to 3 ($p = 0.08$). This is because wages 1 and 3 were below the outside option and very few agents were motivated to accept such offers in the GE treatment. However, in the case of middle level wages such as 45 and 55, the agents' effort responses to an increase in the wage was significantly lower in the mission treatment compared to the GE treatment, suggesting that at these points the agents' reaction was flatter in the mission treatment than in the GE treatment ($p = 0.02$ for both wage levels).

FIGURE 2: Mean chosen effort for each wage across treatments



We complemented our non-parametric analysis by running an OLS regression of the agents' effort choices on the wage level, with a treatment dummy and the wage-treatment interaction

(see Column 3 in Table 2). The coefficient of the mission treatment variable was positive and significant, confirming that the mission shifted the agent’s optimal effort function upwards. We found no significant change in the slope. We obtained similar results from the Tobit regression (see Column 4 Table 2) which controls for the fact that the chosen effort must be with the interval 0 and 10.²¹ These results suggest that the mission shifted the agent’s effort function upwards without affecting its slope. We conclude:

Result 2 *In line with prediction 1, effort provision is larger for any given wage in the mission treatment compared to the GE treatment. Furthermore, we find no difference in the slope of the optimal effort function in the mission treatment compared to the GE treatment. Hence, mission and wages are independent in motivating agents’ effort.*

4.2. Principals’ behavior

Next, we look at the behavior of the principals. Note that Result 2 suggests that we are in Case 1 of our model, that is, the agents’ utility function is additively separable in mission and wage. Our theory predicts that in this case the optimal wage is independent of the mission. Hence, in our experiment we should observe no significant differences in the wage offers across treatments.

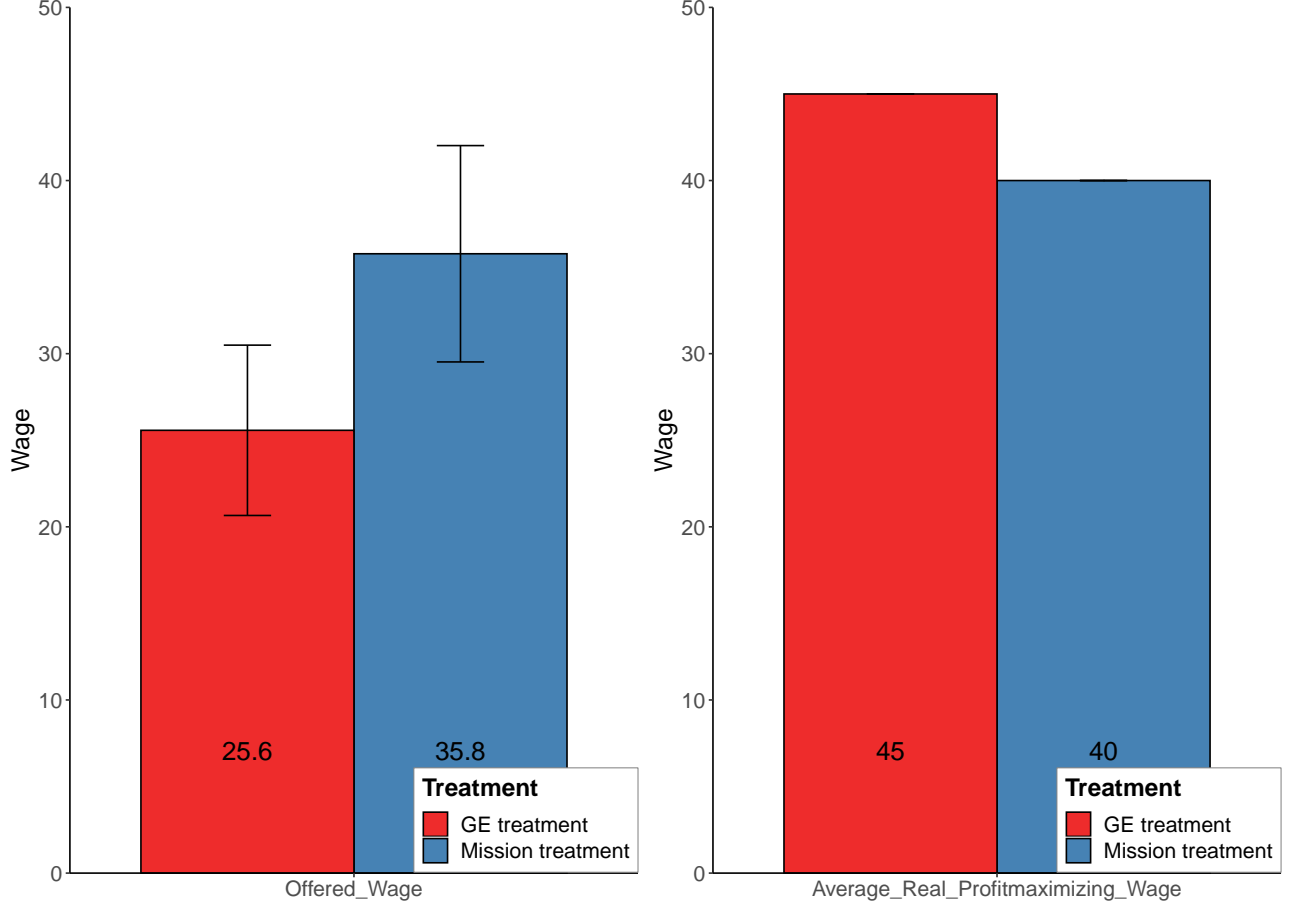
The left-hand side of Figure 3 compares the average offered wage across treatments. As can be seen, contrary to our predictions, in the GE treatment principals offered on average a wage of 26 points, while in the mission treatment the average offered wage was about 36 points, hence 10 points higher. The difference is statistically significant ($p = 0.01$). The OLS regression in Column 5 of Table 2 provides similar results. Thus, we conclude:

Result 3 *Contrary to our predictions, principals in the GE treatment offer significantly lower wages than principals in the mission treatment.*

The next question arises: who is getting it wrong? Are the principals in the GE treatment or in the mission treatment (or both) sacrificing profits? Surprised by Result 3, we investigate the potential mechanism(s) underlying principals’ behavior. We discuss and test three possible behavioral channels for this result in Section 5 below.

²¹Note that if we only focus on the effort choices conditionally on accepting the contract the results become stronger, and the negative interaction term also become significant. However, given that this regression does not control for selection into the contract, we chose to exclude it from the analysis.

FIGURE 3: Profit-maximizing wages and offered wages across treatments



5. Principals' behavioral channels

There are three potential channels for the principals' behavior: (i) it may be that principals were motivated by the mission themselves and that the presence of a social mission induced altruistic principals to offer a higher wage in the mission treatment in order to boost the agent's effort and thus increase the size of the donation, (ii) principals were risk averse and the conditional variance of the expected effort level in the GE treatment (i.e. the variance of the subjective random variable "expected effort") was higher in the GE treatment, leading them to maximize a lower certainty equivalent compared to the mission treatment, or (iii) that principals acted as profit-maximizers based on biased beliefs about the agents' effort response. These potential explanations are not mutually exclusive, and our results might be due to the combination of some or all of them. We subsequently show that the latter is the only possible explanation.

5.1. Mission motivation and profit-maximizing wage

If principals' mission motivation is the main mechanism underlying Result 3, we should observe principals maximizing profits in the GE treatment, while sacrificing profits in the mission treatment. To test this hypothesis, we calculate the profit-maximizing wage in each treatment and compare it to the wage offered by principals in that same treatment. We can do so because thanks to the strategy method, we elicited the optimal effort function of each agent.²²

The right side of Figure 3 shows the results. We find that consistent with our theoretical predictions based on Result 2, the profit-maximizing wage is very similar across treatments, namely, 45 in the GE treatment and 40 in the mission treatment. This also clearly shows that principals' mission motivation cannot be the explanation for Result 3: in the mission treatment, the average offered wage is actually 4 points *lower* than the profit-maximizing wage and this small difference is not statistically significant ($p = 0.11$). On the contrary, in the GE treatment the average offered wage is 20 points lower than the profit-maximizing wage and the difference is highly significant ($p < 0.01$). In other words, while principals in the mission treatment are maximizing-profit, principals in the GE treatment are not. Thus, we can exclude principals' charitable motivation in the mission treatment being the driver of our results – or at least the only driver.²³

5.2. Risk-aversion

A second possible explanation for Result 3, is that principals were risk averse and that the conditional variance of the principals' expected level of effort in the GE treatment was higher compared to the mission treatment. As principals only indicated the expected effort level for each possible wage offer (and not the distribution), we cannot directly test this. However, if we assume that the variance in expected effort levels across principals is a proxy for the variance of effort levels for any given principal, the question becomes possible to investigate. To test this hypothesis, we characterized principals' beliefs, and in particular, whether the variance in the expected effort levels for each wage level was systematically higher in the GE treatment than in the mission treatment. Figure A.2 shows the variance in the expected effort for each wage and each treatment. The variance in the expected effort was higher in the mission treatment for all wages between 1 and 50. The variance in the GE treatment was higher only for wages

²²For each wage level, we take the mean of the observed effort level in each treatment. This allows us to construct two expected optimal effort functions, one for each treatment. The profit-maximizing wage is then the wage in the 2-tuple (wage, expected effort) that gives the highest profit in each treatment.

²³In fact we cannot yet rule out that principals in the mission treatment have distorted beliefs about agents' effort in a way that they think that they are offering a wage higher than profit-maximizing while in fact they are not. As it will be shown in subsection 5.3, this is not the case.

above 50. This observation, combined with the fact that the average profit-maximizing wage in the GE and in the mission treatments were both below 50, would suggest that the principals' risk-aversion was not what was driving our result.

Additionally, and perhaps even more convincingly, we compare the wage offered by the principals to what they believed was the profit-maximizing wage, which we elicited at the end of the experiment in an incentivized manner and denoted as the principal's "guessed profit-maximizing wage". If principals were risk-averse and were maximizing their certainty equivalent, they should have offered a wage that was significantly lower than what they believed to be the profit-maximizing wage. However, Figure A.3 shows that this did not hold for either treatment. Principals offered wages that were slightly higher than the guessed profit-maximizing wage. Taken together, these findings reject principals risk aversion as explanation for choice behavior.

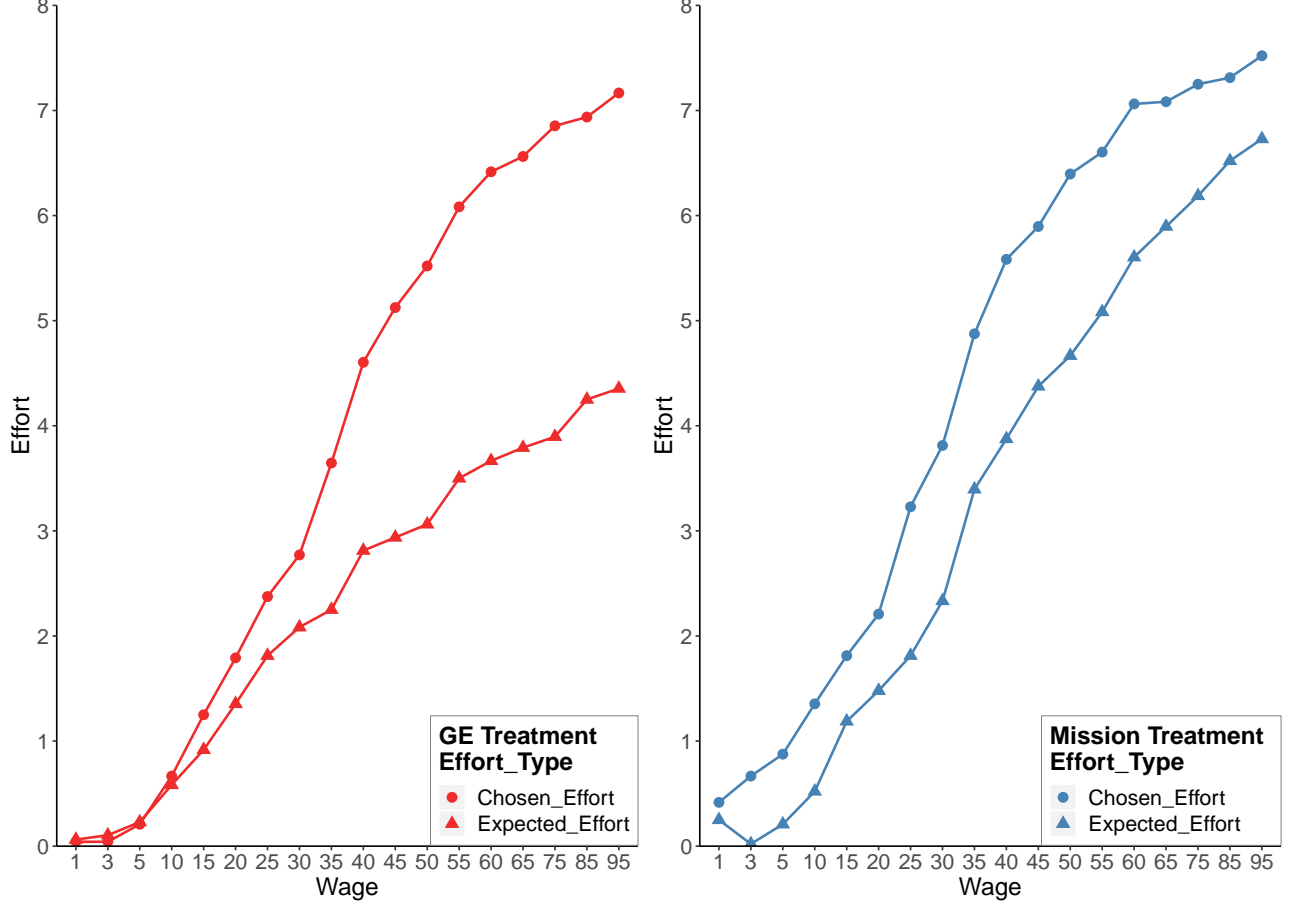
5.3. Biased beliefs

Finally, we investigate the third possible explanation which is that principals were profit-maximizers with biased beliefs about the agents' optimal effort response. Figure 4 compares the difference between the average effort chosen by the agent and the average effort expected by the principal for each treatment and wage. We see that in both treatments and for most wage levels, principals underestimated agents' effort: The expected effort was always equal to or lower than the chosen effort.

However, as our theory clearly shows, what matters for determining the profit-maximizing wage is not the absolute value of the exerted effort but the slope of the optimal effort function. The left-hand panel of Figure 4 clearly shows that in the GE treatment, the difference between the real and expected effort increased significantly with the wage. Principals were good at predicting the effort for low wage levels but increasingly underestimated the effort response to an increase in the wage—to the point that at a wage of 95 the expected effort was approximately 60 percent lower than the real effort. In other words, principals underestimated the role of wages in motivating effort, i.e., agents' reciprocity. This implies that in the GE treatment the principal's expected optimal effort function was flatter than the real average optimal effort function. This result is also confirmed by rank-sum tests which compare the variations in the chosen effort to the variations in the expected effort following an increase in the wage: Significant differences in the slope emerge at wage levels equal to 15, 35, 40, 45, 50 and 60.

We obtain similar findings from the regression analysis. Columns 1 and 2 in Table A.1 present the respective chosen effort and expected effort regressions on wage levels in the GE treatment. The wage coefficient in column 1 is almost twice as large as the wage coefficient

FIGURE 4: Mean chosen and expected effort for each wage across treatments



in column 2, suggesting that the linear approximation of the agents' optimal effort function is almost twice as steep as the principals' average expected effort function. Thus, it is not surprising that principals in the GE treatment offered a wage that was too low compared to the profit-maximizing wage.

Additionally we calculate for each principal-agent pair the profit-maximizing wage based on the principal's elicited beliefs (henceforth, "beliefs based profit-maximizing wage")²⁴ which are depicted in Figure A.3. It shows that in the GE treatment the beliefs based profit-maximizing wage was neither significantly different from the offered wage (Wilcoxon signed-rank test $p = 0.73$), nor from the guessed profit-maximizing wage (Wilcoxon signed-rank test $p = 0.45$). This suggests that in the GE treatment principals consciously maximized profits based on their beliefs but these beliefs were wrong.

²⁴Note that while the guessed profit-maximizing wage is the optimal wage guessed by the principal, the beliefs based profit-maximizing wage is the wage that gives the highest profit given the principal's expressed beliefs about acceptance rate and effort response. While the guessed profit maximizing wage is reported directly, the believed profit maximizing wage is calculated based on principals' report of expected returned effort for each wage level.

Remarkably, we did not find the same belief distortion in the mission treatment. The right hand panel in Figure 4 clearly shows that in the mission treatment the difference between the real and the expected effort is not strictly increasing with the wage. Rank-sum tests comparing the changes in chosen effort to the changes in expected effort following an increase in the wage, revealed a significant difference only at wages 3, 25, 65 and 85. Furthermore, among these four wage levels, the difference was positive for the first two and negative for the last two.

The regression analysis provided similar findings. OLS regressions in Columns 3 and 4 of Table A.1 present, respectively, regressions for the chosen effort and the expected effort on the wage level in the mission treatment. In contrast to the GE treatment, the coefficient of the wage in column 3 is almost the same (approx. 0.006 points difference) as the coefficient of the wage in column 4, suggesting that the linear approximation of the agents' optimal effort function was as steep as the principals' expected effort function. Hence, we conclude:

Result 4 *In both treatments, principals acted on average as profit-maximizers based on their effort-beliefs. The reason why the offered wage was lower in the GE treatment than in the mission treatment is that principals in the GE treatment have biased beliefs. This bias is such that they highly underestimated the role of wages in motivating effort provision.*

In the final part of the paper, we try to shed light on why principals are better in predicting agents' marginal effort in the mission treatment.

6. Social mission as debiasing mechanism

We can think of two main explanations for why principals were better able to estimate the effort returned in the mission treatment: (i) the social mission induced overly optimistic beliefs or (ii) the social mission corrected principals' pessimistic beliefs. In the former case, principals' might underestimated agents' social preferences towards them but overestimated how wages affected mission motivation which, quite coincidentally, resulted in more correct beliefs in the mission treatment. In the latter case, the social mission might have put principals in a state of mind in which they could better estimate agents' social preferences towards them. We are able to exclude that the social mission induced principals' overly optimistic beliefs and show evidence for explanation (ii), that the social mission put principals in a state of mind which corrected principals' pessimistic beliefs.

6.1. The social mission induces overly optimistic beliefs

To test explanation (i) we ran an additional treatment (NO-Principal treatment). In this treatment we essentially removed the social preferences link between principals and agents. The treatment was almost identical to the mission treatment with the following modifications: Before making any effort choices, agents were informed that the wage offer they received was generated randomly by a “computer” (i.e. $wage \sim U(1, 3, \dots, 95)$) and not by the matched principals. Again, agents reported effort choices using the strategy method. Furthermore, the agents’ effort choices impacted only their income and the charity’s payoff but not the income of the principal, which was fixed. The role of those subjects selected to be principals in this treatment was merely to estimate the effort choice for each possible wage of the agent to which they were matched. This task was incentivized in the same manner as the other treatments.

Figure A.4 depicts the mean chosen effort of the agents and the mean expected effort of the principals for each possible wage level in the NO-Principal treatment. As in the other treatments, principals underestimated the agents’ effort for each possible wage. If principals would have overestimated how wages affect mission motivation, then the principals’ expected effort function should have been significantly steeper than the agents’ optimal effort function. As in the other treatments, we tested for potential statistical differences between variations in the chosen effort and variations in the expected effort following an increase in the wage. The rank-sum tests were insignificant for all wage levels. Lastly, we regressed the chosen effort and expected effort on the wage levels in the NO-Principal treatment, as shown in Columns 1 and 2 in Table A.2. The coefficient of the wage in column 1 is almost identical (approx. 0.008 points difference) to the coefficient of the wage in column 2, suggesting that the linear approximation of the agents’ optimal effort function is as steep as the principals’ expected effort function. Hence, we can rule out that principals overestimate how wages affect mission motivation.

6.2. The social mission corrects pessimistic beliefs

By ruling out explanation (i), we are left only with explanation (ii), namely that the presence of the social mission corrected principals’ distorted beliefs. How can the social mission have such an effect? Our conjecture is that the presence of the social mission increased the principals’ trust towards the agents. In fact, principals in the GE were found to underestimate agents’ effort response to an increase in wage, which is similar to say that they were not trusting that the agents would reciprocate a high wage. We test this conjecture through two approaches. First, we conduct an heterogeneity analysis to test if the bias in the GE treatment was in fact driven by principals who we define as being “less likely to trust others” based on their behavior in Stage 1 of the experiment (so before they knew and played the GE treatments). Second, we

compare principals' level of trust elicited at the end of the experiment across treatments.

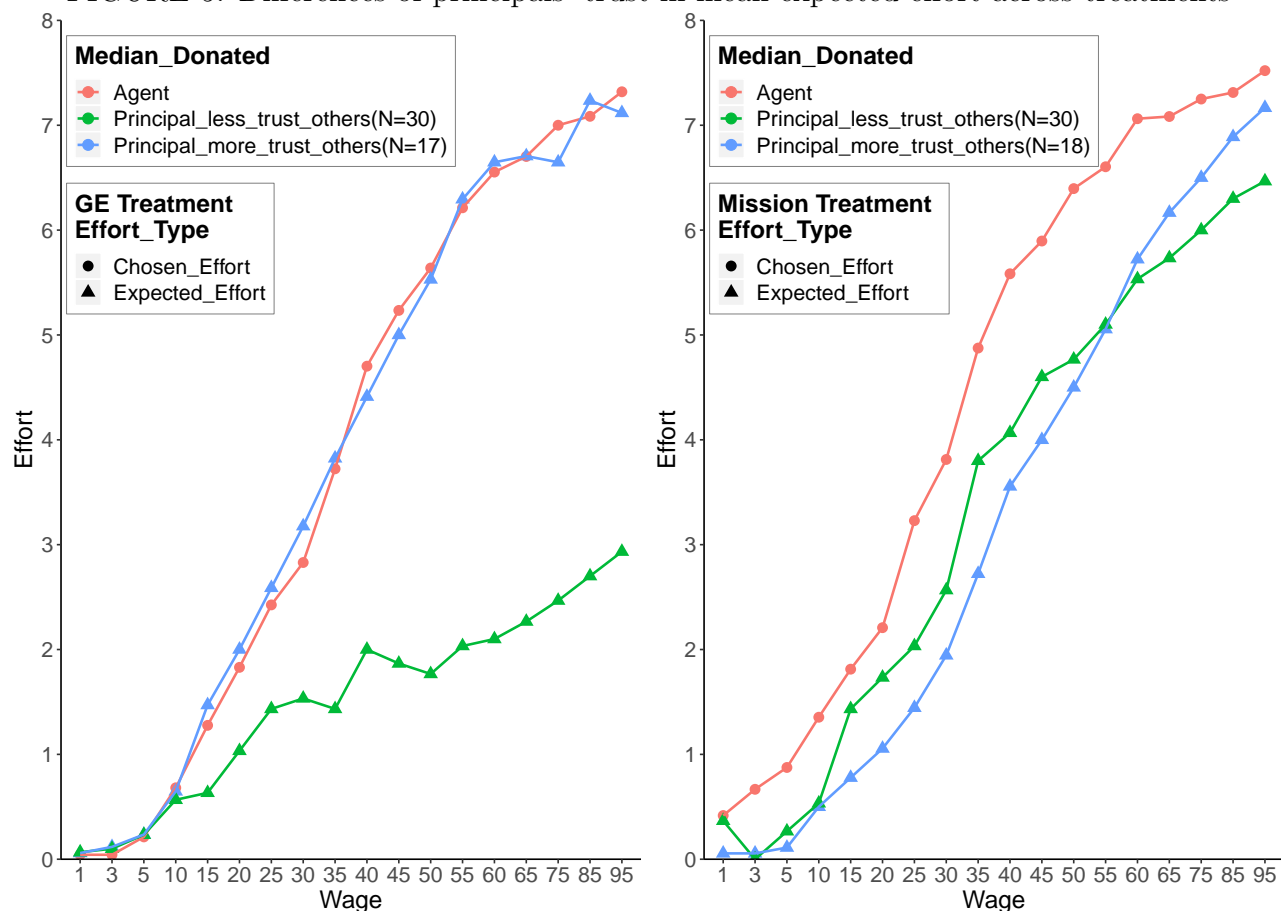
For the first approach, we categorize principals as being more or less likely to trust others based on the number of points they allocated to the charity in the dictator game played in Stage 1 of the experiment.²⁵ More specifically, we categorized principals as being “more likely to trust others” if their level of donation was above the median, and as “less likely to trust others” if their donation was below the median. Within each treatment, we then compare the agent's mean chosen effort and the principal's mean expected effort for the two types of principals. Figure 5 illustrates the results. It emerges pretty clearly that the distortion in beliefs was fully driven by the principals who are less likely to trust others: in the GE treatment, their expected effort function is much flatter than the real effort function, while there is almost no difference between the agents' effort function and the expected effort function of the principals who are more likely to trust others. On the contrary, in the mission treatment, the expected effort function of the principals who are less likely to trust others is very similar to both the agents' effort function and to the expected effort function of the principals who are more likely to trust others. This evidence strongly suggests that the presence of the social mission had a corrective effect on the beliefs of the principals who are less likely to trust others.

This result is further corroborated when we test our conjecture through the second approach. As we describe in the design section, at the end of our experiment *but before the payoffs were revealed*, we elicited subjects' trust towards others using a survey question as in (Falk et al., 2018). Thus, any observed difference in the principals' level of trust across treatments should be the result of undergoing either the GE or mission treatment in our gift-exchange game. Note that the two treatments only differ in the presence of the mission and are otherwise identical. Figure A.5 depicts the distribution of principals' trust across treatments. We find that principals in the mission treatment report a higher trust levels than principals in the GE treatment and the difference is highly significant (two-sample Kolmogorov-Smirnov test $p < 0.01$). To rule out that this effect is due to an unlucky initial unbalance across treatments, we also compare the distribution of points allocated by the principals to the charity in the dictator game played at the beginning of the experiment (i.e., our definition of being more or less likely to trust others) across treatments. The results are depicted in Figure A.6 and as expected, there was no significant difference across treatments (two-sample Kolmogorov-Smirnov test $p > 0.1$). Hence, we conclude:

Result 5 *The social mission acted as debiasing mechanism by increasing principals' trust.*

²⁵Unfortunately we did not have a direct measure of trust before the gift-exchange game as, in fact, we did not anticipate these results. However, previous research has shown a strong positive correlation between altruism and trust, suggesting that both conditions characterize the positive disposition toward others. Also, note that the choice of donating to a charity presumes some trust towards the charity (Falk et al., 2018).

FIGURE 5: Differences of principals' trust in mean expected effort across treatments



7. Efficiency

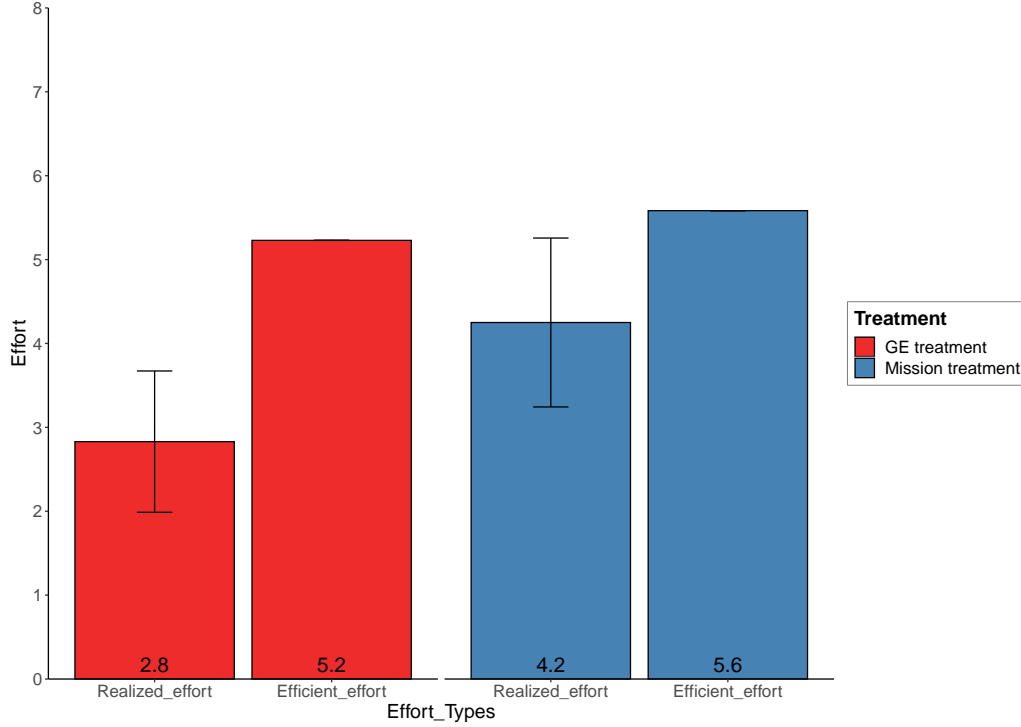
Finally, we compare the efficiency level achieved in each treatment and, thereby, investigate whether the social mission increases efficiency in contracting. Furthermore, we want to quantify the social cost of the distortion in the principals' beliefs by comparing the level of efficiency actually achieved with the level of efficiency that could have been achieved if the principals had correct beliefs. In other words, how much efficiency is lost because of principals' biased beliefs? And how much can the mission help?

We measured the efficiency “realized” as the total surplus generated by the contract for the two parties involved.²⁶ The total surplus was given by the effort realized, namely, the effort chosen by the agent for the wage actually offered by the principal. On the other we define as the “efficient effort level” the average effort that would have been achieved if the principals would have offered the profit-maximizing wage in each treatment. Figure 6 depicts the average

²⁶We ignore the charity's payoff because this would obviously lead to a higher surplus in the mission treatment.

realized effort and the efficient effort level in each treatment.

FIGURE 6: Mean realized and efficient effort across treatments



The average effort level realized in the GE treatment was equal to 2.8, which is very much in line with previous work on gift-exchange (Brown et al., 2004; Charness et al., 2004; Fehr et al., 1998; Charness, 2004). However, the efficient effort level that could have been achieved if principals had correct beliefs and thus offered the profit-maximizing wage was equal to 5.2, hence 86 percent higher than the realized effort (Wilcoxon signed rank test $p < 0.01$). This means that the distortion in beliefs led to a 46 percent loss in efficiency. On the other hand, the average realized effort level in the mission treatment was equal to 4.2, thus 50 percent higher than in the GE treatment ($p = 0.04$). The efficient effort level in the mission treatment was 5.6, hence, there is a loss in efficiency in the mission treatment as well (Wilcoxon signed rank test $p < 0.01$). However, this loss is about half the loss in the GE treatment (25 percent rather than 46 percent). We conclude:

Result 6 *The loss in efficiency in the GE treatment due to the principals' biased beliefs is equal to 46 percent. However, the presence of a social mission increases efficiency by approximately 50 percent and almost halves the loss in efficiency in the mission treatment compared to the GE treatment.*

8. Conclusion

In this paper, we provided a first attempt at analyzing, both theoretically and experimentally, the interaction between two non-financial motives that are very common in the workplace and that have received high attention by the economic literature: workers' motivation to reciprocate efficiency wages and workers' motivation to contribute to an organization's social mission. Using the laboratory instead of field data has several advantages. First, it addresses the endogeneity issue head on: our results do capture causal effects of efficiency wages and of the social mission on agents' effort and on the principals' wage offers. We find that the social mission and efficiency wages are independent in motivating agents' effort and that contrary to the resulting theoretical predictions, the social mission increases principals' wage offers. Second, our design allows us to elicit the effort response function of each agent and the belief profile of each principal, which in turn, allows us to gain some deep insights on the principals' optimal behavior and on the presence of potential biases. We show that the treatment difference in wage offers is the result of principals underestimating agents' reciprocity in a standard gift-exchange game and, therefore, of principals offering a wage that is far below the profit-maximizing wage. On the contrary, in the presence of the social mission principals are behaving optimally—in the sense that they are maximizing profits based on their correct beliefs. Third, thanks to the laboratory experiment, we could dig deeper on the underlying psychological mechanism behind our results by eliciting, in an incentivized manner, principals' inclination to trust others. We show that the distortion in beliefs is driven by principals who are less likely to trust others and that the presence of the social mission, by increasing their trust, act as a debiasing mechanism on principals' beliefs. Finally, our design allows us to run some efficiency analysis and to give some insights about the social costs of the beliefs' distortion. We show that because of this bias, efficiency is reduced by 46 percent. However, the presence of a mission increases efficiency by 50 percent.

Studying workers' motivation and wage contracting in the laboratory inevitably also has its downsides. The use of the strategy method and of monetary effort levels certainly make the environment more abstract and artificial. These design features, however, should not fundamentally affect the results (Brandts and Charness, 2011). Furthermore, the laboratory grants exogenous control over key variables, but the same control implies that many features and assumptions that are made in the theory are directly imposed. For example, our experiment treats the social mission as exogenous, while in reality the social mission is chosen by the founder of an organization. Hence, our analysis does not aim to mirror the founder's choice of an organizational form or the choice of the optimal mission, but rather the behavior of workers and managers in well established organizations, with or without a social mission. Relatedly, our

analysis does not take into account workers' self-selection in organizations with a social mission, while in reality the mission plays a major role in attracting a prosocial workforce (Kosfeld and von Siemens, 2009; Fehrler and Kosfeld, 2013; Friebe et al., 2019). Hence, the mission's benefits in terms of debiasing managers and increasing efficiency may be even stronger once we allow self-selection in organizations. These and other extensions to our analysis are left to future research.

A. Appendix

TABLE A.1: Overview of Regressions

	Real effort	Expected effort	Real effort	Expected effort
	(1)	(2)	(3)	(4)
Wage	0.091*** (0.007)	0.051*** (0.007)	0.087*** (0.007)	0.082*** (0.007)
Constant	0.242* (0.142)	0.327*** (0.107)	0.991*** (0.268)	0.108 (0.158)
R ²	0.494	0.247	0.432	0.446
Observations	846	846	864	864

Note:

*p<0.1; **p<0.05; ***p<0.01

Regression columns (1) and (2) display effects in the GE treatment and columns (3) and (4) in the mission treatment. All columns are random-effects regressions with clustered standard errors at the individual level and robust standard errors.

TABLE A.2: Overview of Regressions

	Real effort	Expected effort
	(1)	(2)
Wage	0.034*** (0.004)	0.042*** (0.004)
Constant	2.373*** (0.305)	1.115*** (0.186)
R ²	0.075	0.161
Observations	1725	1746

Note: *p<0.1; **p<0.05; ***p<0.01

Regression columns (1) and (2) display effects in the NO-principal treatment. Columns are random-effects regressions with clustered standard errors at the individual level and robust standard errors.

FIGURE A.1: Acceptance percentage for each wage across treatments

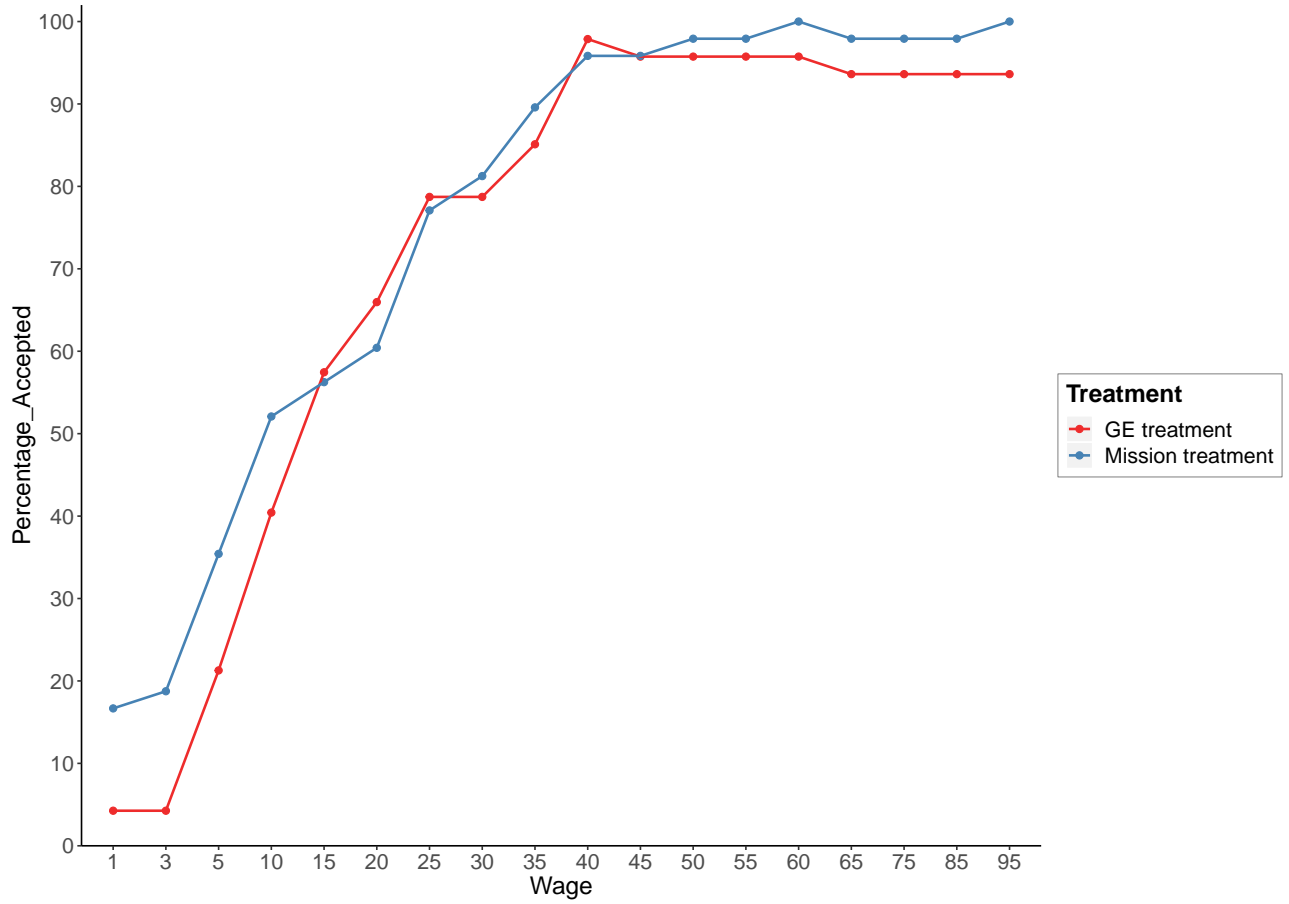


FIGURE A.2: Variance of expected effort for each wage across treatments

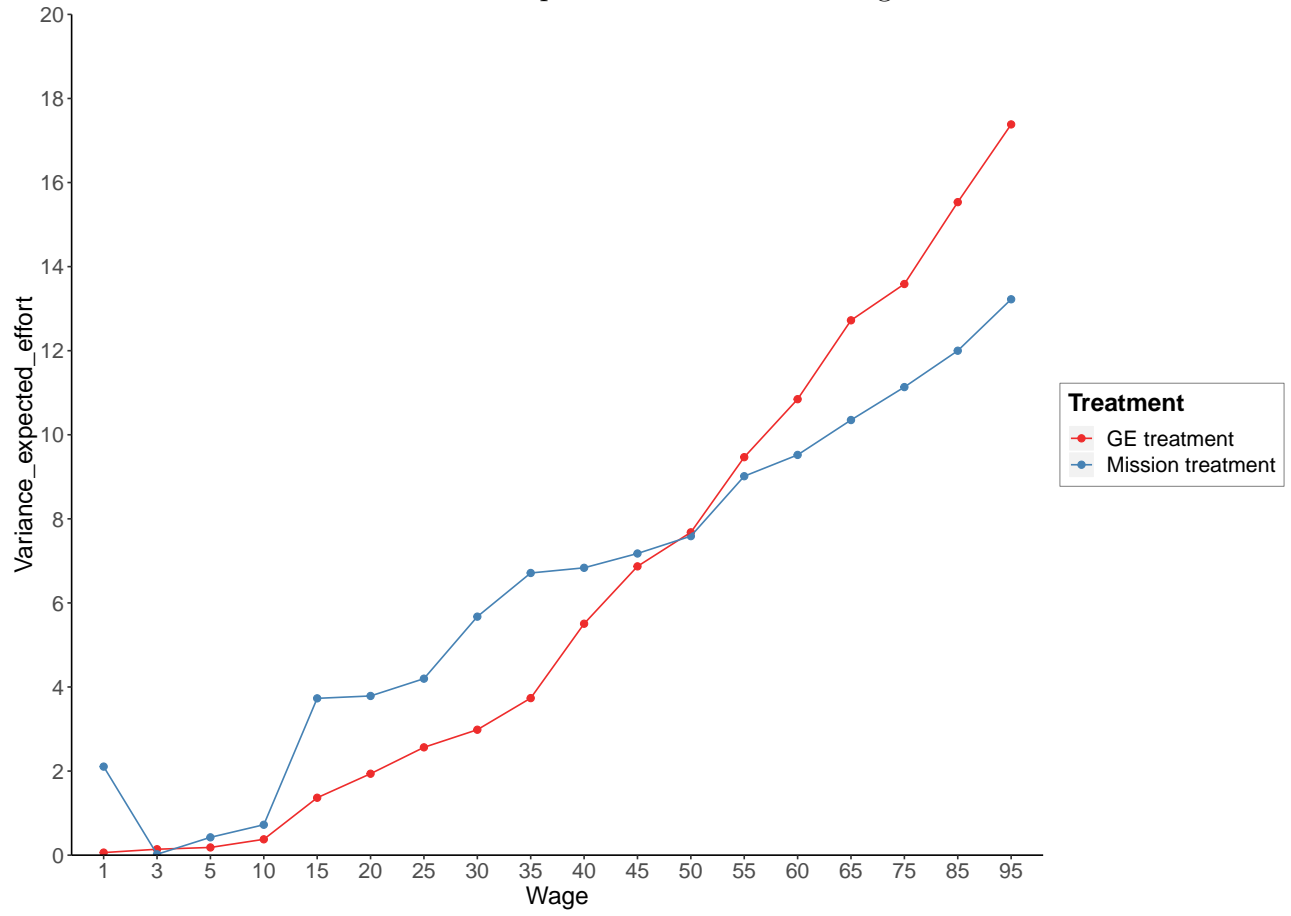


FIGURE A.3: Mean offered wage and mean guessed, believed, and average real profit-maximizing wage across treatments

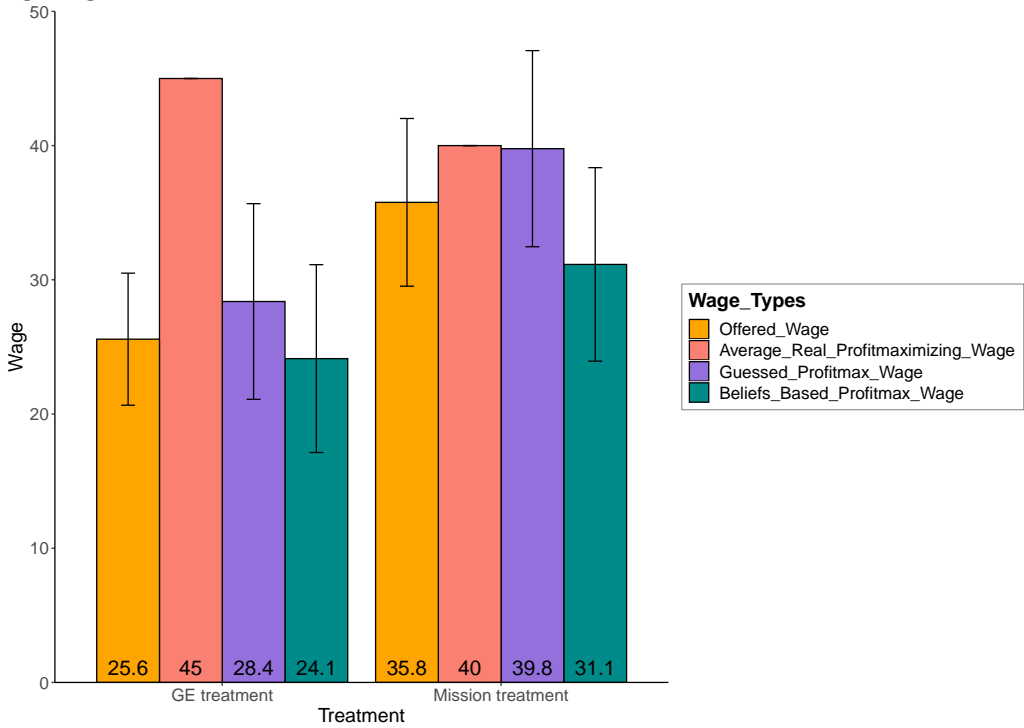


FIGURE A.4: Mean chosen and expected effort for each wage in the NO-Principal treatment

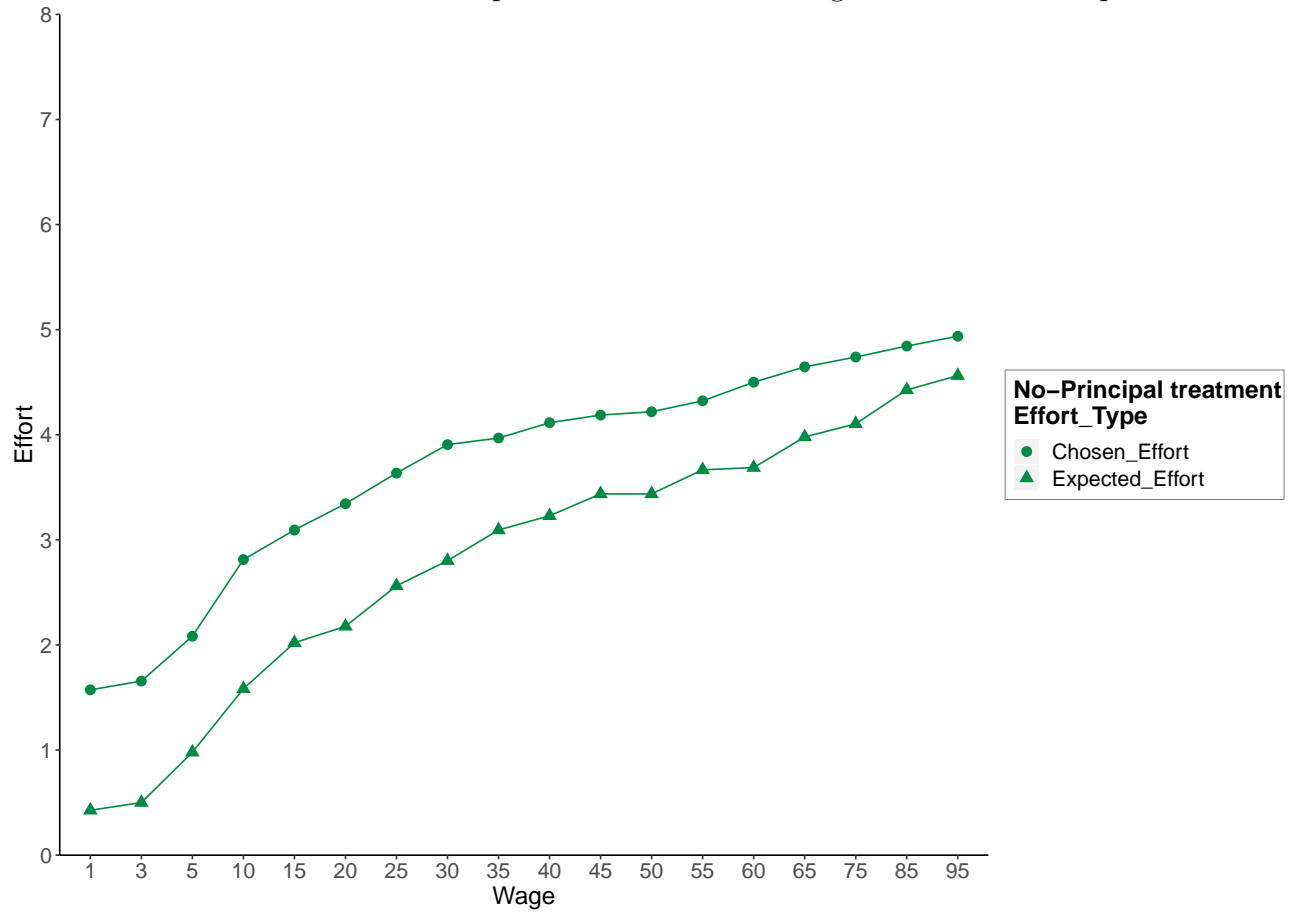


FIGURE A.5: Distribution of principals trust across treatments

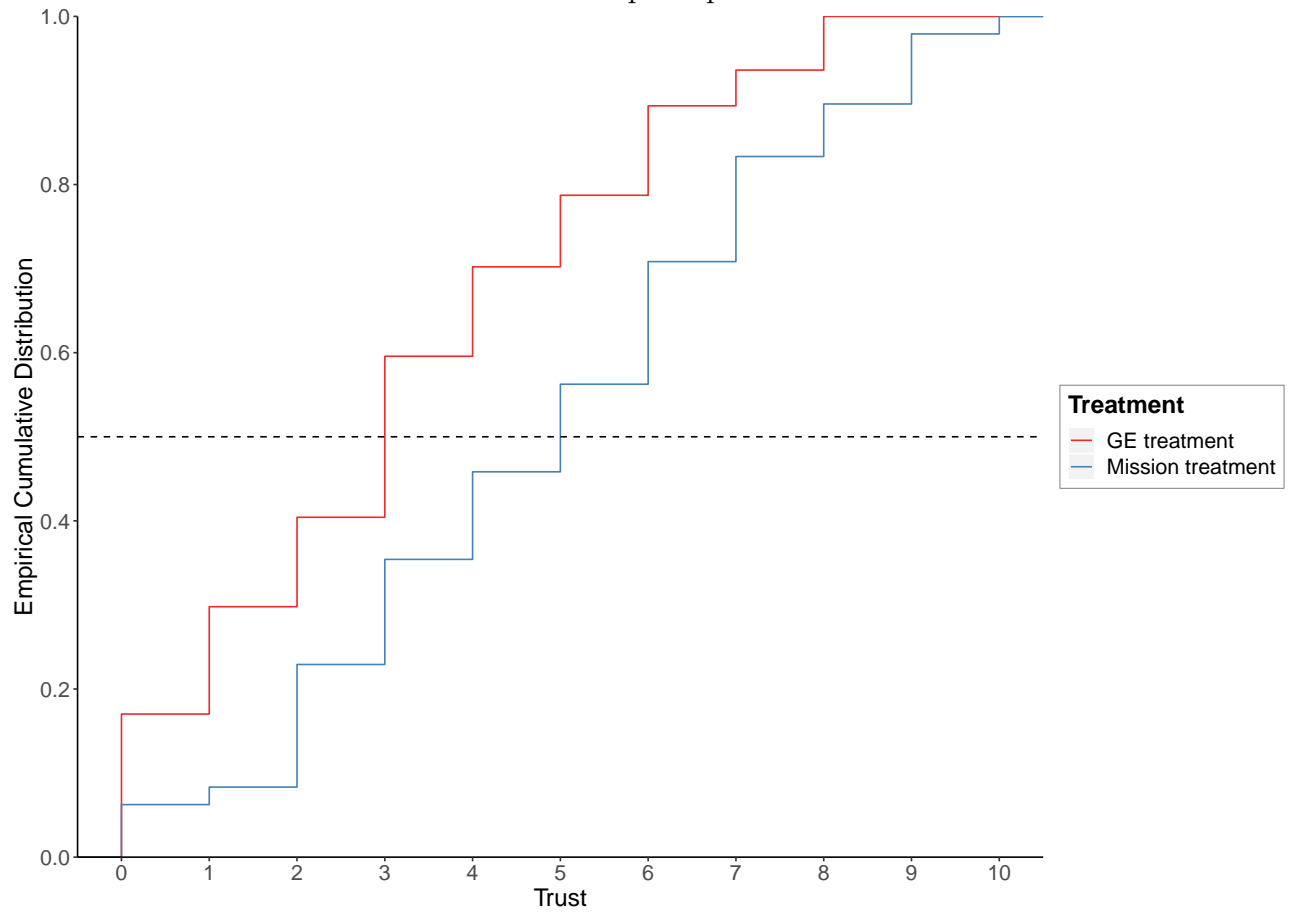
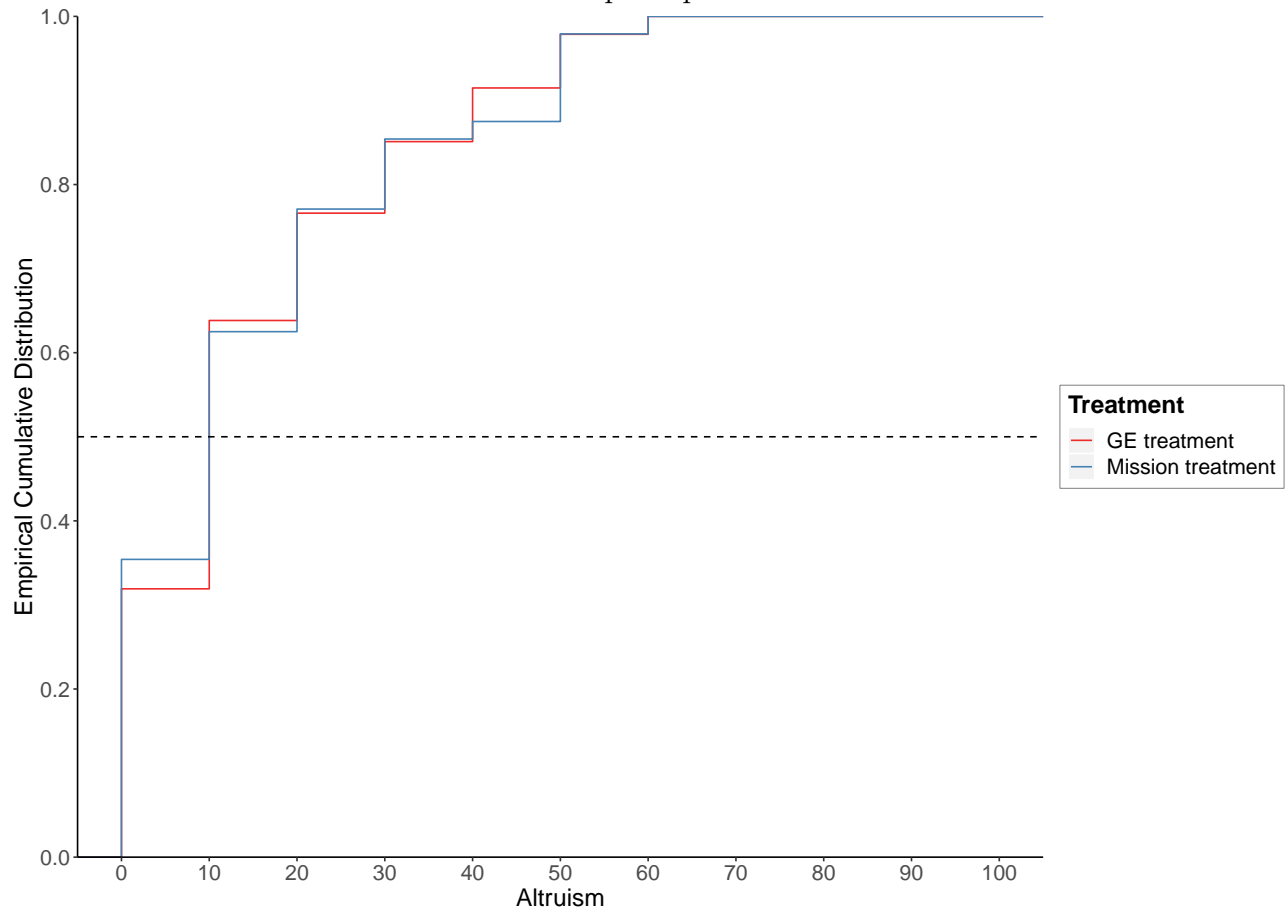


FIGURE A.6: Distribution of principals altruism across treatments



B. Supplemental Material

List of charities/non-profit organizations

Aertze ohne Grenzen

Amnesty International Deutschland

Brot fuer die Welt

Catholic Relief Services

Fluechtlinge Willkommen

German Cancer Research Center

Greenpeace

SOS Kinderdorf

Stiftung MyHandicap

Vier Pfoten

WikiLeaks

Wikipedia (Wikimedia Foundation)

Questionnaire

1. Please indicate what contract (combination of wage and effort) do you think is the most fair taking into account both sides?
2. We now ask for your willingness to act in a certain way. Please indicate from a scale from 0 to 10, where 0 means you are "completely unwilling to do so" and a 10 means you are "very willing to do so".
 - How willing are you to give to good causes without expecting anything in return?
 - How willing are you to punish someone who treats YOU unfairly, even if there may be costs for you?
 - How willing are you to punish someone who treats OTHERS unfairly, even if there may be costs for you?
3. How well do the following statements describe you as a person? Please indicate from a scale from 0 to 10, where 0 means "does not describe me at all" and a 10 means "describes me perfectly".
 - When someone does me a favor I am willing to return it.
 - If I am treated very unjustly, I will take revenge at the first occasion, even if there is a cost to do so.
 - I assume that people have only the best intentions.
4. Please think about what you would do in following situation. You are in an area you are not familiar with, and you realize that you lost your way. You ask a stranger for directions. The stranger offers you to take you to your destination. Helping you costs the stranger about 20 Euro in total. However, the stranger says he or she does not want any money from you. You have 6 presents with you. The cheapest present costs 5 Euro, the most expensive one costs 30 Euro.
 - Do you give one of the presents to the stranger as a "thank you"-gift? If so, which present do you give the stranger?
5. Imagine the following situation: Today you unexpectedly received 1000 Euro. How much of this amount would you donate to a good cause? (Values between 0 and 1000 are allowed)

Instructions GE treatment

General information: Welcome! You will now participate in a scientific experiment, which allows you to earn money. The amount you earn depends on your personal decisions and the decisions of other participants in the experiment. Therefore, it is important that you read the instructions carefully.

Everything that you need to know in order to participate in this experiment is explained below. Should you have any difficulties in understanding these instructions, please raise your hand and wait for one of the experimenters to come to you. Please, note that it is not permitted to communicate with other participants during the experiment. If you intentionally violate this rule you will be asked to leave. In this case, you cannot be reimbursed for your participation.

All participants will receive a show-up fee of 4 Euro. During the course of the experiment you can accumulate points. All the points that you generate are converted into Euro at the end of the experiment and then added to your show-up fee. The exchange rate is:

$$12 \text{ points} = 1 \text{ EURO}$$

Upon completion of the experiment the income you have earned (plus the 4 Euro show-up fee) will be paid to you in cash and in private: no other participant can see how much you have received.

Anonymity: Everything is anonymous. You will never learn the name and identity of the participants you were matched with. They will also never learn your identity. You will not know which choices were made by a specific participant and no other participant will know your choices.

Parts and rounds: The experiment consists of two parts: Part 1 and Part 2. You will now read the instructions for Part 1 directly in the computer. After Part 1 is over, you will receive the instructions for Part 2. **Importantly, either Part 1 or Part 2 will count for payment.** It will be randomly determined whether it is Part 1 or Part 2 that counts. The part that will count for payment will be the same for all participants in the same session. You will learn which part will count only at the end of the experiment. **Note that your choices in Part 1 do not affect Part 2 in any possible way.**

Charity Donation: Some of your decisions in Part 1 and/or Part 2 may involve the accumulation of points for a charity of your choice or for a charity chosen by another participant. Hence, before the experiment starts, some of you will be asked to choose their favorite charity among a list. The list

includes twelve charities that are each active in different fields and can be found below. If you are asked to choose a charity, the chosen charity will be the receiver of all the donations that you generate during the entire experiment. If you are not asked to choose a charity, your decisions may still generate points for the charity chosen by another participant, but you will not know what is the charity that receives the donation until the end of the experiment.

Importantly, as it is the case for the payment of participants, it is either Part 1 or Part 2 that will count for the payment to the charities. The part of the experiment that counts will be the same for both the participants and for the charities. All donations to charities that are generated during this session will be transferred at the end of this study through a bank transfer or credit card payment. You will receive a copy of the transfer receipt of all the donations generated in this session by email. Due to the upcoming holidays' season, please allow approximately one month for us to make the donation.

List of charities/non-profit organizations

Aertze ohne Grenzen

Amnesty International Deutschland

Brot fuer die Welt

Catholic Relief Services

Fluechtlinge Willkommen

German Cancer Research Center

Greenpeace

SOS Kinderdorf

Stiftung MyHandicap

Vier Pfoten

WikiLeaks

Wikipedia (Wikimedia Foundation)

Part 2

Roles and matches: In this part of the experiment there are **two distinct roles: employers and workers**. You will be randomly assigned to one of these two roles and you will be randomly matched with another participant who has a different role than you. You will keep your role and you will be matched with the same participant until the end of the experiment. Your role will appear on the computer screen as soon as the experiment starts.

General description: One employer and one worker are matched. Within this match they can decide to agree upon an employment contract. The employer proposes a wage contract to the worker, whereby the profit of the employer depends on the wage he/she pays to the worker and the effort exerted by the worker. The worker chooses from a list of all possible wages which wages he/she would accept. Only when the wage offered by the employer matches with one of the wages accepted by the worker, a contract is concluded. Upon conclusion of the contract, the income of the worker depends on the effort he/she exerts as well as the wage paid to her/him by the employer. While the employer determines the wage level of the employment contract, the worker can choose the effort level he/she wants to exert.

Importantly, if no contract is concluded (e.g. the employer chooses to offer a wage, which does not match the list of wages the worker specified to accept), both the employer and the worker receive their respective outside option listed in the next pages.

Decisions: **All decisions described below are made only once.** Hence, think carefully about the decisions you make.

Detailed decision task of the employer: The employer makes a contract offer by specifying the wage that he/she would like to pay the worker in order to put effort into the employment contract. The employer can choose one of the following wages:

LIST OF POSSIBLE WAGES

1	3	5	10	15	20	25	30	35	40	45	50	55	60	65	75	85	95
---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Note that when the employer chooses wage, he/she does not know yet what wage levels the worker would accept. Similarly, the employer does not know yet what effort level the worker would exert for that wage level.

Detailed decision task of the worker: First, the worker specifies for each potential wage offer from the employer, which ones he/she would accept. Second, for each of the wages that he/she would accept, the worker chooses how much effort he/she wants to exert. That is, for each possible wage offer the worker decides to accept, he/she decides the level of effort he/she wants to exert. The worker can choose **any integer between 1 and 10 as effort level**. While effort is costly for the worker, it generates a profit for the employer. The costs for each possible choice of effort are given in the table below.

More specifically, when the worker makes his/her effort choices, he/she does not know yet what is the wage offer made by the employer. Therefore, the worker will be asked to decide for an effort level for each potential wage offer the worker would accept from the employer. This means that the worker must make one single effort choice for each of the wage offers that he/she would accept. Out of all the effort choices chosen by the worker, only one will count for the final income: The effort choice that corresponds to the wage chosen by the employer. Note that if the employer offers a wage that is not accepted by the worker, the employment contract is not concluded, and both the employer and the worker receive an outside option.

Effort choice of the worker	1	2	3	4	5	6	7	8	9	10
Cost of effort in points	0	1	2	4	6	8	10	12	15	18

Endowments: Both the employer and the worker receive an endowment of 100 points. This implies that for any combination of wage and effort choices, the income any of the two parties earn in this task is always **positive**.

Payoffs from concluding a contract: **If a contract is concluded**, the income of the **employer** is equal to:

$$10 * \text{effort} - \text{wage} + 100$$

In words, the income of the employer is equal to 10 points multiplied by the effort chosen by the worker for that wage level, minus the wage paid to the worker. Note that the endowment of 100 points is added to this amount.

If a contract is concluded, the income of the **worker** is equal to:

$$\text{Wage} - \text{cost of effort} + 100$$

In words, the income of the worker is determined by the wage chosen by the employer minus the cost of effort, which he/she chooses for that wage level. Note that the endowment of 100 points is added to this.

Payoffs from NOT concluding a contract: If the employer offers a wage that is not in the set of possible wages that the worker would accept, no contract is concluded. Then, both the employer and worker each receive their outside option.

The **outside option of the employer** is equal to: **0 points**

The **outside option of the worker** is equal to: **5 points**

Hence, **if a contract is not concluded:**

- the income of the **employer** is equal to **100 points** (namely his/her endowment),
- the income of the **worker** is equal to **105 points** (namely his/her endowment plus his/her outside option of 5)

So to summarize, the incomes generated in this part of the experiment depend on: 1) the wage offer made by the employer, and 2) whether the worker specified to accept this wage from the list of all possible wages and 3) the level of effort chosen by the worker for that specific wage level.

Example 1: Suppose the following situation occurs: The employer chooses a wage of 25. The worker has selected to accept this wage. Hence, a contract is concluded. For this wage level, the worker has chosen an effort level of 5. The payoffs are as follows:

- *the employer receives a payoff of 125 points ($10 \cdot 5 - 25 + 100$),*
- *the worker receives a payoff of 119 points ($25 - 6 + 100$),*

Example 2: Suppose the following situation occurs: The employer chooses a wage of 25. The worker has not selected to accept this wage and therefore has not specified any effort level. Hence, a contract is not concluded. The payoffs are as follows:

- *the employer receives a payoff of 100 points ($0 + 100$),*
- *the worker receives a payoff of 105 points ($5 + 100$),*

Payment: Both the employers and the worker's **decisions are made only once**. Hence, think carefully about the decision you make. You will be informed about the selections made by your matched participant and your resulting payoff at the end of the experiment, after everyone has made all their

decisions and thus completed the experiment. At the end of these instructions you will find a payoff table, which specifies for each possible combination of wages and effort levels the payoffs for the employer and the worker

Payoff Table

<i>Payoff for wage w and effort choice e (including the endowment)</i>											
Effort Wage	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	
1	101	100	99	97	95	93	91	89	86	83	Worker
	109	119	129	139	149	159	169	179	189	199	Employer
3	103	102	101	99	97	95	93	91	88	85	Worker
	107	117	127	137	147	157	167	177	187	197	Employer
5	105	104	103	101	99	97	95	93	90	87	Worker
	105	115	125	135	145	155	165	175	185	195	Employer
10	110	109	108	106	104	102	100	98	95	92	Worker
	100	110	120	130	140	150	160	170	180	190	Employer
15	115	114	113	111	109	107	105	103	100	97	Worker
	95	105	115	125	135	145	155	165	175	185	Employer
20	120	119	118	116	114	112	110	108	105	102	Worker
	90	100	110	120	130	140	150	160	170	180	Employer
25	125	124	123	121	119	117	115	113	110	107	Worker
	85	95	105	115	125	135	145	155	165	175	Employer
30	130	129	128	126	124	122	120	118	115	112	Worker
	80	90	100	110	120	130	140	150	160	170	Employer
35	135	134	133	131	129	127	125	123	120	117	Worker
	75	85	95	105	115	125	135	145	155	165	Employer
40	140	139	138	136	134	132	130	128	125	122	Worker
	70	80	90	100	110	120	130	140	150	160	Employer
45	145	144	143	141	139	137	135	133	130	127	Worker
	65	75	85	95	105	115	125	135	145	155	Employer
50	150	149	148	146	144	142	140	138	135	132	Worker
	60	70	80	90	100	110	120	130	140	150	Employer
55	155	154	153	151	149	147	145	143	140	137	Worker
	55	65	75	85	95	105	115	125	135	145	Employer
60	160	159	158	156	154	152	150	148	145	142	Worker
	50	60	70	80	90	100	110	120	130	140	Employer
65	165	164	163	161	159	157	155	153	150	147	Worker
	45	55	65	75	85	95	105	115	125	135	Employer
75	175	174	173	171	169	167	165	163	160	157	Worker
	35	45	55	65	75	85	95	105	115	125	Employer
85	185	184	183	181	179	177	175	173	170	167	Worker
	25	35	45	55	65	75	85	95	105	115	Employer
95	195	194	193	191	189	187	185	183	180	177	Worker
	15	25	35	45	55	65	75	85	95	105	Employer

Instructions Mission treatment

General information: Welcome! You will now participate in a scientific experiment, which allows you to earn money. The amount you earn depends on your personal decisions and the decisions of other participants in the experiment. Therefore, it is important that you read the instructions carefully.

Everything that you need to know in order to participate in this experiment is explained below. Should you have any difficulties in understanding these instructions, please raise your hand and wait for one of the experimenters to come to you. Please, note that it is not permitted to communicate with other participants during the experiment. If you intentionally violate this rule you will be asked to leave. In this case, you cannot be reimbursed for your participation.

All participants will receive a show-up fee of 4 Euro. During the course of the experiment you can accumulate points. All the points that you generate are converted into Euro at the end of the experiment and then added to your show-up fee. The exchange rate is:

$$12 \text{ points} = 1 \text{ EURO}$$

Upon completion of the experiment the income you have earned (plus the 4 Euro show-up fee) will be paid to you in cash and in private: no other participant can see how much you have received.

Anonymity: Everything is anonymous. You will never learn the name and identity of the participants you were matched with. They will also never learn your identity. You will not know which choices were made by a specific participant and no other participant will know your choices.

Parts and rounds: The experiment consists of two parts: Part 1 and Part 2. You will now read the instructions for Part 1 directly in the computer. After Part 1 is over, you will receive the instructions for Part 2. **Importantly, either Part 1 or Part 2 will count for payment.** It will be randomly determined whether it is Part 1 or Part 2 that counts. The part that will count for payment will be the same for all participants in the same session. You will learn which part will count only at the end of the experiment. **Note that your choices in Part 1 do not affect Part 2 in any possible way.**

Charity Donation: Some of your decisions in Part 1 and/or Part 2 may involve the accumulation of points for a charity of your choice or for a charity chosen by another participant. Hence, before the experiment starts, some of you will be asked to choose their favorite charity among a list. The list

includes twelve charities that are each active in different fields and can be found below. If you are asked to choose a charity, the chosen charity will be the receiver of all the donations that you generate during the entire experiment. If you are not asked to choose a charity, your decisions may still generate points for the charity chosen by another participant, but you will not know what is the charity that receives the donation until the end of the experiment.

Importantly, as it is the case for the payment of participants, it is either Part 1 or Part 2 that will count for the payment to the charities. The part of the experiment that counts will be the same for both the participants and for the charities. All donations to charities that are generated during this session will be transferred at the end of this study through a bank transfer or credit card payment. You will receive a copy of the transfer receipt of all the donations generated in this session by email. Due to the upcoming holidays' season, please allow approximately one month for us to make the donation.

List of charities/non-profit organizations

Aertze ohne Grenzen

Amnesty International Deutschland

Brot fuer die Welt

Catholic Relief Services

Fluechtlinge Willkommen

German Cancer Research Center

Greenpeace

SOS Kinderdorf

Stiftung MyHandicap

Vier Pfoten

WikiLeaks

Wikipedia (Wikimedia Foundation)

Part 2

Roles and matches: In this part of the experiment there are **two distinct roles: employers and workers**. You will be randomly assigned to one of these two roles and you will be randomly matched with another participant who has a different role than you. You will keep your role and you will be matched with the same participant until the end of the experiment. Your role will appear on the computer screen as soon as the experiment starts.

General description: One employer and one worker are matched. Within this match they can decide to agree upon an employment contract. The employer proposes a wage contract to the worker, whereby the profit of the employer depends on the wage he/she pays to the worker and the effort exerted by the worker. The worker chooses from a list of all possible wages which wages he/she would accept. Only when the wage offered by the employer matches with one of the wages accepted by the worker, a contract is concluded. Upon conclusion of the contract, the income of the worker depends on the effort he/she exerts as well as the wage paid to her/him by the employer. While the employer determines the wage level of the employment contract, the worker can choose the effort level he/she wants to exert. Furthermore, the effort exerted by the worker will also generate a donation to the charity chosen by worker at the beginning of the experiment.

Importantly, if no contract is concluded (e.g. the employer chooses to offer a wage, which does not match the list of wages the worker specified to accept), both the employer and the worker receive their respective outside option listed in the next pages, whereas the charity receives nothing.

Decisions: **All decisions described below are made only once.** Hence, think carefully about the decisions you make.

Detailed decision task of the employer: The employer makes a contract offer by specifying the wage that he/she would like to pay the worker in order to put effort into the employment contract. The employer can choose one of the following wages:

LIST OF POSSIBLE WAGES

1	3	5	10	15	20	25	30	35	40	45	50	55	60	65	75	85	95
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Note that when the employer chooses wage, he/she does not know yet what wage levels the worker would accept. Similarly, the employer does not know yet what effort level the worker would exert for that wage level.

Detailed decision task of the worker: First, the worker specifies for each potential wage offer from the employer, which ones he/she would accept. Second, for each of the wages that he/she would accept, the worker chooses how much effort he/she wants to exert. That is, for each possible wage offer the worker decides to accept, he/she decides the level of effort he/she wants to exert. The worker can choose **any integer between 1 and 10 as effort level**. While effort is costly for the worker, it generates a profit for the employer. Furthermore, **the effort will also generate a donation to the worker's favorite charity**, namely the charity she/he chose at the beginning of the experiment from the list. The costs for each possible choice of effort are given in the table below.

More specifically, when the worker makes his/her effort choices, he/she does not know yet what is the wage offer made by the employer. Therefore, the worker will be asked to decide for an effort level for each potential wage offer the worker would accept from the employer. This means that the worker must make one single effort choice for each of the wage offers that he/she would accept. Out of all the effort choices chosen by the worker, only one will count for the final income: The effort choice that corresponds to the wage chosen by the employer. Note that if the employer offers a wage that is not accepted by the worker, the employment contract is not concluded, and both the employer and the worker receive an outside option.

Effort choice of the worker	1	2	3	4	5	6	7	8	9	10
Cost of effort in points	0	1	2	4	6	8	10	12	15	18

Endowments: Both the employer and the worker receive an endowment of 100 points. This implies that for any combination of wage and effort choices, the income any of the two parties earn in this task is always **positive**.

Payoffs from concluding a contract: **If a contract is concluded**, the income of the **employer** is equal to:

$$10 * \text{effort} - \text{wage} + 100$$

In words, the income of the employer is equal to 10 points multiplied by the effort chosen by the worker for that wage level, minus the wage paid to the worker. Note that the endowment of 100 points is added to this amount.

If a contract is concluded, the income of the **worker** is equal to:

$$\text{Wage} - \text{cost of effort} + 100$$

In words, the income of the worker is determined by the wage chosen by the employer minus the cost of effort, which he/she chooses for that wage level. Note that the endowment of 100 points is added to this.

If a contract is concluded, the effort selected by the worker also generates a donation to **his/her favorite charity from the list**. The donation generated is equal to:

$$25 * \text{effort}$$

In words, the donation is equal to the effort chosen by the worker for the implemented wage, multiplied by 25.

Payoffs from NOT concluding a contract: If the employer offers a wage that is not in the set of possible wages that the worker would accept, no contract is concluded. Then, both the employer and worker each receive their outside option.

The **outside option of the employer** is equal to: **0 points**

The **outside option of the worker** is equal to: **5 points**

Note, furthermore, that if no contract is concluded the charity receives a payoff of 0.

Hence, **if a contract is not concluded**:

- the income of the **employer** is equal to **100 points** (namely his/her endowment),
- the income of the **worker** is equal to **105 points** (namely his/her endowment plus his/her outside option of 5)
- the income of the **charity** is equal to **0 points**.

So to summarize, the incomes and the donations generated in this part of the experiment depend on:

1) the wage offer made by the employer, and 2) whether the worker specified to accept this wage from the list of all possible wages and 3) the level of effort chosen by the worker for that specific wage level.

Example 1: Suppose the following situation occurs: The employer chooses a wage of 25. The worker has selected to accept this wage. Hence, a contract is concluded. For this wage level, the worker has chosen an effort level of 5. The payoffs are as follows:

- the employer receives a payoff of 125 points ($10 * 5 - 25 + 100$),
- the worker receives a payoff of 119 points ($25 - 6 + 100$),

- the charity chosen by the worker receives a payoff of 125 points (25×5)

Example 2: Suppose the following situation occurs: The employer chooses a wage of 25. The worker has not selected to accept this wage and therefore has not specified any effort level. Hence, a contract is not concluded. The payoffs are as follows:

- the employer receives a payoff of 100 points ($0 + 100$),
- the worker receives a payoff of 105 points ($5 + 100$),
- the charity chosen by the worker receives a payoff of 0 points

Payment: Both the employers and the worker's **decisions are made only once**. Hence, think carefully about the decision you make. You will be informed about the decisions made by your matched participant and your resulting payoff at the end of the experiment, after everyone has made all their decisions and thus completed the experiment. At the end of these instructions you will find a payoff table, which specifies for each possible combination of wages and effort levels the payoffs for the employer, the worker, and the charity.

Payoff Table

<i>Payoff for wage w and effort choice e (including the endowment)</i>											
Effort Wage	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	
1	101	100	99	97	95	93	91	89	86	83	Worker Employer Charity
	109	119	129	139	149	159	169	179	189	199	
	25	50	75	100	125	150	175	200	225	250	
3	103	102	101	99	97	95	93	91	88	85	Worker Employer Charity
	107	117	127	137	147	157	167	177	187	197	
	25	50	75	100	125	150	175	200	225	250	
5	105	104	103	101	99	97	95	93	90	87	Worker Employer Charity
	105	115	125	135	145	155	165	175	185	195	
	25	50	75	100	125	150	175	200	225	250	
10	110	109	108	106	104	102	100	98	95	92	Worker Employer Charity
	100	110	120	130	140	150	160	170	180	190	
	25	50	75	100	125	150	175	200	225	250	
15	115	114	113	111	109	107	105	103	100	97	Worker Employer Charity
	95	105	115	125	135	145	155	165	175	185	
	25	50	75	100	125	150	175	200	225	250	
20	120	119	118	116	114	112	110	108	105	102	Worker Employer Charity
	90	100	110	120	130	140	150	160	170	180	
	25	50	75	100	125	150	175	200	225	250	
25	125	124	123	121	119	117	115	113	110	107	Worker Employer Charity
	85	95	105	115	125	135	145	155	165	175	
	25	50	75	100	125	150	175	200	225	250	
30	130	129	128	126	124	122	120	118	115	112	Worker Employer Charity
	80	90	100	110	120	130	140	150	160	170	
	25	50	75	100	125	150	175	200	225	250	
35	135	134	133	131	129	127	125	123	120	117	Worker Employer Charity
	75	85	95	105	115	125	135	145	155	165	
	25	50	75	100	125	150	175	200	225	250	
40	140	139	138	136	134	132	130	128	125	122	Worker Employer Charity
	70	80	90	100	110	120	130	140	150	160	
	25	50	75	100	125	150	175	200	225	250	
45	145	144	143	141	139	137	135	133	130	127	Worker Employer Charity
	65	75	85	95	105	115	125	135	145	155	
	25	50	75	100	125	150	175	200	225	250	
50	150	149	148	146	144	142	140	138	135	132	Worker Employer Charity
	60	70	80	90	100	110	120	130	140	150	
	25	50	75	100	125	150	175	200	225	250	
55	155	154	153	151	149	147	145	143	140	137	Worker Employer Charity
	55	65	75	85	95	105	115	125	135	145	
	25	50	75	100	125	150	175	200	225	250	
60	160	159	158	156	154	152	150	148	145	142	Worker Employer Charity
	50	60	70	80	90	100	110	120	130	140	
	25	50	75	100	125	150	175	200	225	250	
65	165	164	163	161	159	157	155	153	150	147	Worker Employer Charity
	45	55	65	75	85	95	105	115	125	135	
	25	50	75	100	125	150	175	200	225	250	
75	175	174	173	171	169	167	165	163	160	157	Worker Employer Charity
	35	45	55	65	75	85	95	105	115	125	
	25	50	75	100	125	150	175	200	225	250	
85	185	184	183	181	179	177	175	173	170	167	Worker

	25 25	35 50	45 75	55 100	65 125	75 150	85 175	95 200	105 225	115 250	Employer Charity
95	195 15 25	194 25 50	193 35 75	191 45 100	189 55 125	187 65 150	185 75 175	183 85 200	180 95 225	177 105 250	Worker Employer Charity

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