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Gift-exchange, incentives, self-serving biases, reference-dependent utility, laboratory experiments, labor conflicts

JEL codes:

C92, D23, M54

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Abstract

We extend Akerlof's (1982) gift-exchange model to the case in which reference wages respond to changes in the work environment such as those related to unemployment benefits or workers' productivity levels. Our model shows that these changes spur disagreements between workers and employers regarding the value of the reference wage. These disagreements tend to weaken the gift-exchange relationship thus reducing production levels and wages. We find support for these predictions in a controlled, yet realistic, workplace environment. Our work also sheds light on several stylized facts regarding employment relationships such as the increased intensity of labor conflicts when economic conditions are unstable.

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1. Introduction

The inherent incompleteness of many labor contracts forces employers to rely on non-contractual mechanisms to motivate workers. These alternative mechanisms largely rely on the existence of social motives such as reciprocal concerns (e.g., Charness and Rabin, 2002; Casadesus-Masanell, 2004; Sobel, 2005; Segal and Sobel, 2007; Ramalingam and Rauh, 2010), altruism (see Rotemberg, 1994; Dur and Sol, 2010; Dur and Tichem, 2015), social norms (e.g., Danilov and Sliwka, 2017) or social pressure (Kandel and Lazear, 1992, Mas and Moretti, 2009, Corgnet, Hernán-González and Rassenti, 2015a). A recurrent example in the economics literature is the gift-exchange mechanism according to which workers tend to exert more effort whenever wages exceed what they consider to be fair (Akerlof, 1982). Gift-exchange has proven to have far-reaching implications in the economics literature. For example, gift-exchange incentives are crucial to our understanding of critical features of labor markets such as downward wage rigidity (Bewley, 2009), cyclical unemployment (Akerlof and Yellen, 1990) or the widespread use of implicit incentives (Fehr, Klein and Schmidt, 2007).

The empirical evidence on gift-exchange is vast and includes laboratory (Fehr, Kirchsteiger, and Riedl, 1993, 1998; Charness, 2004; Charness and Kuhn, 2007; Hennig-Schmidt et al., 2010) as well as field experiments (Gneezy and List, 2006; Falk, 2007; Kube, Puppe and Marechal, 2012; Cohn, Fehr and Goette, 2015). The magnitude of gift-exchange has been shown to crucially hinge on the individual characteristics of workers (Englmaier, Strasser and Winter, 2014; Cohn, Fehr and Goette, 2015) as well as on specific features of the work relationship. In particular, gift-exchange has been shown to depend on the length of the employer-worker interaction (Gneezy and List, 2006), the timing of wage increases (Sliwka and Werner, 2017), the amount of information on employers' profits (Hennig-Schmidt et al., 2010) or co-workers' wages (e.g., Gächter and Thöni, 2010).

The reason why the magnitude of gift-exchange varies substantially across contexts might be due to the sensitivity of workers' reference wages to specific features of the work environment. For example, Falk, Fehr, and Zehnder (2006) showed that minimum wages might impact workers' reference wages even after they have been removed. These findings might explain why employers are reluctant to cut wages right after minimum wage laws have been relaxed (e.g., Freeman, Wayne, and Ichniowski, 1981; Katz and Krueger, 1991, 1992). In a related study, Brandts and Charness (2004) reported that the introduction of minimum wages reduced workers' effort even though they did not affect the magnitude

of gift-exchange.² The works of Brandts and Charness (2004) and Falk, Fehr, and Zehnder (2006) inspired our current study as they provide primary evidence that, beyond specific terms of the compensation contract, critical elements of the work environment can affect effort provision in a gift-exchange setting. However, little is known about the underlying mechanisms driving these effects.

We started our reflection by extending the gift-exchange model of Akerlof (1982) to allow for reference wages to adjust to changes in the work environment. The main insight of our model is that economic stability favors gift-exchange. In the absence of changes in the work environment, previous wages act as a natural candidate for a worker's reference wage thus limiting potential disagreements between employers and workers (see Akerlof, 1982; Falk, Fehr and Zehnder, 2006; Hart and Moore 2008; Fehr, Hart and Zehnder, 2009; 2011). By contrast, unstable work conditions tend to weaken gift-exchange because they increase the set of possible values for the reference wage. For example, two competing reference wages exist after a sudden change in workers' levels of productivity. The reference wage could either be set at previous levels or adjust for the changes in productivity levels. In sum, changes in the work environment tend to multiply the number of possible candidates for the reference wage. As a result, employers risk picking a wage that is at odds with workers' actual reference wages.

Because employers have a strong incentive to learn workers' actual reference wages, we might think that any inefficiency triggered by unstable economic conditions would be short-lived. However, this might not be the case when we consider workers' and employers' self-serving biases (see Messick and Sentis 1979; Babcock and Loewenstein 1997; Konow 2000). People who suffer from self-serving biases tend to form beliefs selectively by looking for pieces of information that support their view of the world and by discarding contradicting evidence (Sanitioso, Kunda and Fong, 1990, p. 229). For example, Babcock, Wang, and Loewenstein (1996) provided evidence for the role of self-serving biases in public school teacher contract negotiations in Pennsylvania. During these negotiations, the "comparable" districts picked by unions paid teachers significantly more than those picked by school boards. Moreover, they showed that strike activity was positively related to the difference in salaries between the union and board lists of comparable school districts. In our context, self-serving workers would think they deserve a raise when their productivity levels go up while thinking previous wages should apply when productivity levels go down. Self-serving employers would apply the opposite logic. These

² Bottino et al. (2016) study a similar environment but where the minimum wage is set at the competitive level. The authors find that in this case, even though wage offers decline, effort levels do not.

systematic biases tend to exacerbate the discrepancy in employers' and workers' views regarding the reference wage thus opening the door to labor conflicts.

In addition to changing economic conditions, our model also accounts for the effect of unemployment benefits on workers' reference wages (see Akerlof, 1982). When unemployment benefits increase, workers' reference wages tend to be higher thus lowering the perceived magnitude of employers' gifts for a given wage. In that case, it might become too expensive for employers to induce workers' effort in a gift-exchange relationship. We thus predict an adverse effect of unemployment benefits on gift-exchange. Generous unemployment benefits might thus demotivate workers not only because of their negative effect on monetary incentives (e.g., Katz and Meyer, 1990; Hunt, 1995) but also because of their negative effect on workers' reciprocal motives (Fehr, Gächter and Kirchsteiger, 1997).

Our conjectures are then tested in a controlled yet rich environment that combines the tight experimental control of lab experiments with important features of the field such as access to on-the-job leisure alternatives (Corgnet, Hernán-González, and Rassenti, 2015a, 2015b). Subjects are assigned to one of three possible roles at the beginning of each of six periods: the employer, the employed worker (worker, henceforth) or the unemployed worker. If employed, a worker receives a fixed wage selected by the employer at the beginning of the two rounds of each period. Given the offered wage, the worker decides how much to work on a tedious task (adding numbers in a table) or shirk (browsing the web). Each piece of work (a correctly completed table) is worth 60¢ in the first round of each period. In the second round, a productivity shock applies at random, and the value of each piece of work is either 20¢ (*negative conditions*), 60¢ (*stable conditions* or '*status-quo*') or 100¢ (*positive conditions*). In our setup, the employer also completes the real-effort task so as to earn the cash which is used to pay the worker. If unemployed in a given period, a subject receives unemployment benefits for each of the two rounds and is only able to browse the web during that time. Unemployment benefits are either low (40¢ in the *low benefits* treatment) or high (80¢ in the *high benefits* treatment).

In line with our model predictions, we find that high unemployment benefits significantly abate gift-exchange thus leading to a sharp decrease in workers' production levels compared to the case of low benefits. In our setup, the decrease in production in the *high benefits* treatment cannot be explained by weaker explicit incentives because employers do not have the possibility of firing workers at the end of the first round.

We also report supportive evidence for our conjecture that changing economic conditions will weaken gift-exchange. In line with our model with self-serving biases, employers select wages according to previous wages (Round 1) (219.9¢) after a positive shock in Round 2 (224.3¢) while slashing wages after a negative shock (124.6¢). Workers react negatively by reducing their effort on the task compared to when no changes in productivity levels occur in which case wages are roughly kept at Round 1 levels (211.1¢). It follows that gift-exchange is more pronounced when productivity levels are stable across rounds compared to cases in which they vary.

Our experimental findings provide causal evidence for the main implications of our theoretical model. Therefore, our extension of Akerlof’s (1982) framework seems to capture relevant behavioral mechanisms underlying gift-exchange. Our contribution is a necessary step for any behavioral research for which, unlike the canonical rational-choice framework, modeling alternatives are potentially countless. We thus see our laboratory experiments as a necessary checkpoint before our hypothesized mechanisms are tested in the field. In Section 5, we discuss how the behavioral mechanisms we have uncovered can account for empirical regularities on wage setting and labor conflicts.

2. Theoretical Framework

2.1. A gift-exchange model with dissonance costs

We consider a model with one employer and one worker. The employer offers a fixed compensation, w , to the worker who then decides on a level of effort, e . The employer’s monetary profits are given by $qe - w$, where q represents the revenue generated per unit of worker’s effort. Following the partial gift-exchange idea introduced by Akerlof (1982), we consider the following *reference effort function*, which captures the motivational effect of paying higher wages than the reference point:

$$e_R := \begin{cases} (w - w_R)^{1/2} & \text{if } w > w_R \\ 0 & \text{otherwise} \end{cases} \quad [1]$$

Where w is the actual wage paid to the worker and w_R is the worker’s *reference wage*.³ In Akerlof (1982), workers would not pick the level of effort that maximizes their utility but instead mechanically select the reference level of effort (e_R). We extend the work of Akerlof by allowing workers to adjust their level of effort around the reference point. To that end, workers maximize a utility function in which they face a cost for picking a level of effort which differs from the reference level. We can interpret this

³ Akerlof (1982) refers to the *reference effort function* as the “norm of gift-exchange” while sometimes referring to the *reference wage* as the worker’s idea of a “fair wage”. We decided to use a more neutral terminology.

cost as a “*dissonance cost*” which, according to Festinger (1957), arises when people experience a discrepancy between their action (in our case the chosen level of effort of the worker) and their beliefs (the reference level of effort). People try to minimize this dissonance by either changing their beliefs or their actions. In our setup, this means that workers can alleviate dissonance costs by either changing their beliefs regarding what should be the reference wage or by adjusting their level of effort. For now, we consider the case in which workers can reduce dissonance costs by adjusting effort. In Section 2.3 we describe a model where workers can also adjust the reference wage.

In our model, the utility function of a worker can be written as follows:

$$U(w, e) := w - C(e) - D(e, e_R)$$

Where $C(e)$ is the cost of effort and $D(e, e_R)$ is the dissonance cost. For the sake of illustration, we consider the following quadratic specifications for the cost of effort function $C(e) := \beta \frac{e^2}{2}$ where $\beta > 0$ captures the marginal cost of effort, and for the dissonance cost function $D(e, e_R) := \alpha \frac{(e_R - e)^2}{2}$ where the parameter $\alpha > 0$ captures the marginal cost of deviating from the reference level of effort. Because reference wages are assumed to be exogenous, dissonance costs solely depend on effort choices.

Workers choose the level of effort that maximizes their utility given actual and reference wages. Therefore:

$$e^*(w) := \operatorname{argmax}_e U(w, e) = \frac{\alpha}{\alpha + \beta} e_R \quad [2]$$

In line with gift-exchange, workers provide higher levels of effort when they receive higher wages if these wages are above the reference level (see [1]). Moreover, lower cost of effort (i.e., lower β) and higher dissonance costs (i.e., higher α) increase the effort provided by the worker for a given wage. If $\alpha \rightarrow \infty$ then $e^*(w) = e_R$ so that our model collapses to Akerlof’s (1982) basic framework.

Given that profits are equal to $\pi(w) := qe^*(w) - w$, a profit-maximizing employer will offer the following wage to the worker:

$$w^* := \operatorname{argmax}_w \pi(w) = w_R + \left(\frac{q}{2} \frac{\alpha}{\alpha + \beta} \right)^2 \quad [3]$$

The last part of this expression can be interpreted as the *gift* that the employer pays to the worker, which is the salary paid in excess of the worker’s reference wage. This gift increases with q because the potential gains from gift-exchange are larger in that case. It follows that motivating higher effort is more profitable when workers’ productivity levels (economic conditions) are high. The gift also decreases with the cost of effort, β , and increases with α because workers are more responsive to employers’ gifts

when it is more costly to ignore the reference level of effort. The model of Akerlof (1982) for which $\alpha \rightarrow \infty$ thus constitutes an upper bound for the magnitude of gift-exchange.

Finally, a higher reference wage (w_R) decreases the profitability of paying higher wages. Therefore, the employer will be reluctant to engage in gift-exchange with the worker if the reference wage is too high. Indeed, if we substitute w^* and $e^*(w)$ in the profits function, we get that $\pi(w^*) = \left(\frac{q}{2} \frac{\alpha}{1+\alpha}\right)^2 - w_R$, which becomes negative when w_R is high enough.

We summarize our gift-exchange model results in the following proposition. Details of the proofs are available in Appendix A.

Proposition 1 (Gift-exchange)

If $w_R < \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2$, the optimal wage and effort levels are given by:

$$w^* = w_R + \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2 ; \quad e^* := e^*(w^*) = \frac{q}{2} \left(\frac{\alpha}{\alpha+\beta}\right)^2$$

If $w_R \geq \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2$, then $w^* = e^* = 0$.

2.2. Variable reference wages

We consider an extension of the simple gift-exchange model where the reference wage might vary in response to changes in the work environment. In particular, we focus on two key dimensions that can affect a worker's reference wage: economic conditions and unemployment benefits. In Akerlof's (1982) model (p. 561), the reference wage is defined as follows:

$$w_{S,R} = r_S^{1-u} b^u \quad [4]$$

Where r_S is the *status-quo* wage and b is the payment obtained when not working, i.e., unemployment benefits. The weights for the geometric average are determined by the unemployment rate (u).

We extend Akerlof's specification to the case in which the reference wage can be affected by economic conditions, captured by workers' productivity levels q_i which represent the revenue generated per unit of effort under condition i where $i \in \{L, S, H\}$ (i.e., low, status-quo and high), with $0 < q_L < q_S < q_H$. We define the reference wage when affected by current economic conditions as the following geometric average:

$$w_{i,R} = r_i^{1-u} b^u \quad [5]$$

Where r_i captures the extent to which reference wages are affected by economic conditions i . We consider $r_i \in \{r_L, r_S, r_H\}$ with $r_L < r_S < r_H$.⁴

In our model, a worker's reference wage is either affected by the new economic conditions (in which case it is determined by [5]) or not (in which case it is determined by [4]). Employers do not know whether a worker's reference wage is determined by [4] or [5] but they know, as is commonplace in models with asymmetric information, the likelihood $p \in [0,1]$ with which the new economic conditions affect a worker's reference wage. It follows that with probability $(1 - p)$ the reference wage of the worker is the status-quo (see [4]).

In Proposition 1, we show that it is more costly for the employer to motivate effort when the reference wage increases. It follows from Proposition 1 that if $w_{i,R} < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ for any $i \in \{L, S, H\}$ then $w_H^* > w_S^* > w_L^*$ and hence $e_H^* > e_S^* > e_L^*$, where $e_i^* (w_i^*)$ stands for the optimal level of effort (wage) when economic conditions q_i apply. Therefore, better economic conditions are associated with both higher wages and higher effort as long as the worker's reference wages are not too high. In that case, wages and effort levels are not driven by the existence of a gift-exchange relationship because gift-exchange is always observed regardless of productivity shocks. In the more interesting case in which $w_{i,R} < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ for $i \in \{L, S\}$ and $w_{H,R} > \left(\frac{q_H}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ the wage offered by the employer under high economic conditions would only induce gift-exchange when workers do not adjust their reference wage to the new economic conditions thus picking the status-quo reference wage instead ($w_{S,R}$). These findings are captured in Proposition 2.⁵ Details of the proofs are available in Appendix A.

Proposition 2 (Variable reference wages) Let us assume that $w_{i,R} < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ for $i \in \{L, S\}$ and $w_{H,R} > \left(\frac{q_H}{2} \frac{\alpha}{\alpha+\beta}\right)^2$.

If $1 - p < \frac{q_S}{q_H}$, then:

$$\begin{aligned} e_S^* &> \max\{e_L^*, e_H^*\} \\ w_S^* &> \max\{w_L^*, w_H^*\} \end{aligned}$$

⁴ Kahneman et al., (1986) provide additional support for our model by finding that even though the “current wage of an employee serves as a reference for evaluating the fairness of future adjustments of that employee's wage”, the “entitlement of an employee to a reference wage” can change when new conditions arise (p. 730).

⁵ Proposition 2 does not predict employers' profits because the net effect of changing economic conditions is unclear in that case. On the one hand, high economic conditions automatically increase the value of what is produced thus mechanically increasing the employer's profit for given levels of effort and wages. On the other hand, high economic conditions, by increasing the worker's reference point, might prevent gift-exchange thus lowering the employer's profits.

If $1 - p \geq \frac{q_S}{q_H}$, then:

$$e_H^* > e_S^* > e_L^*$$

$$w_H^* > w_S^* > w_L^*$$

The first part of Proposition 2 shows that under stable conditions, effort and wages tend to be higher than under unstable economic conditions. That is, by eliminating the asymmetry of information over reference wages, stable economic conditions favor gift-exchange. Gift-exchange is most effective when employers know the reference wage of workers. When the reference wage varies and employers do not know for sure which one applies then they risk choosing wages which are lower than the worker's reference wage thus generating a negative response from workers who feel entitled to a higher wage. Conversely, employers also risk choosing wages which are higher than what is necessary to trigger a gift-exchange relationship.

The second part of Proposition 2 puts forward that a necessary condition for the negative effect of unstable economic conditions on gift-exchange is that workers are not willing to follow the status-quo too often when economic conditions change (i.e., $1 - p < \frac{q_S}{q_H}$). In the extreme case in which workers never adjust their reference point to new conditions, high productivity levels (q_H) would always be favorable to gift-exchange. This is the case because asymmetric information cannot play a role if employers are certain that all workers will adopt the status-quo regardless of economic conditions.

We finish this section by studying the relationship between unemployment benefits and gift-exchange. Given that $w_{i,R} = r_i^{1-u} b^u$ for $i \in \{L, S, H\}$, it is clear that an increase in unemployment benefits (b) will increase a worker's reference wage under all economic conditions. From Proposition 1 we also know that a higher reference wage will lead to a higher wage and to lower profits while keeping a worker's effort unchanged provided that the condition for gift-exchange $\left(w_{i,R} = r_i^{1-u} b^u < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2\right)$ is satisfied. We summarize these results in the following corollary.

Corollary 1 (Variable reference wages and unemployment benefits)

If $b^u < \frac{1}{r_i^{1-u}} \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ then $\frac{\partial w_i^*}{\partial b} > 0$; $\frac{\partial e_i^*}{\partial b} = 0$; $\frac{\partial \pi(w_i^*)}{\partial b} < 0$

If $b^u \geq \frac{1}{r_i^{1-u}} \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ then $w_i^* = e_i^* = \pi(w_i^*) = 0$

A key assumption in our model thus far is that workers might forego the status-quo and adjust their reference wage to new economic conditions ($p > 0$). In the next section we argue that the decision to adjust the reference wage to productivity levels might reflect self-serving motives.

2.3. Self-serving biases

We build a model in which gift-exchange is likely to fail under changing conditions because workers and employers systematically disagree on what the reference wage is. In this model, both parties suffer from self-serving biases which are defined as the tendency to process information in a way that is consistent with a person's desired conclusions (Klayman and Ha, 1987). As Babcock and Loewenstein (1997) put forth, "self-serving assessments of fairness are likely to occur in morally ambiguous settings in which there are competing 'focal points'—that is, settlements that could plausibly be viewed as fair." (p. 111).⁶

Because wages generate revenues for workers but are costly to employers, self-serving biases will tend to exacerbate the divergence in views between the two parties regarding the reference wage. We incorporate self-serving biases by assuming that the worker systematically chooses the highest wage among the possible reference wages stated in [4] or [5]. That is, workers' reference wages are determined by the status-quo wage ($w_{S,R}$) when economic conditions are low and by $w_{H,R}$ when economic conditions are high. Self-serving employers exhibit the exact opposite pattern thus picking the lowest wage in the set of possible reference wages as their belief of workers' reference point ($\hat{w}_{i,R}$). Table 1 summarizes workers' reference wages and employer's beliefs across economic conditions in that case.⁷

TABLE 1.- Workers' reference wages and employers' beliefs with self-serving biases

Economic conditions	Worker's reference wage ($w_{i,R}$)	Employer's beliefs about worker's reference wage ($\hat{w}_{i,R}$)
Low ($q = q_L$)	$w_{S,R}$	$w_{L,R}$
Status-quo ($q = q_S$)	$w_{S,R}$	$w_{S,R}$
High ($q = q_H$)	$w_{H,R}$	$w_{S,R}$

According to Table 1, self-serving workers and employers disagree about the reference wage whenever there is an alternative justification to the status-quo, which occurs under high and low

⁶ The same idea has been emphasized by other authors looking at workers and employers' standards of fairness. For example, Kahneman et al., (1986) emphasize that: "Disagreements about fairness are most likely to arise when alternative reference transactions can be invoked each leading to a different assessment of the participants' outcomes." (p.730)

⁷ In Appendix C, we extend our self-serving biases model to the case in which workers' reference wage and employers' beliefs in Table 1 are formed endogenously based on Konow's (2000) model of "self-serving self-deception"

economic conditions.⁸ In that case, employers believe that they are treating workers better than how they actually feel treated.

We define $\Delta_i := w_{i,R} - \widehat{w}_{i,R} > 0$ as the *disagreement* between the worker and the employer over the reference wage. According to Table 1, we have that $\Delta_S = 0$ under stable conditions whereas $\Delta_i > 0$ if economic conditions are either high or low. We can apply Proposition 1 and substitute the optimal wage offered by the employer ($w_i^* = \widehat{w}_{i,R} + \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$) in the optimal effort function in order to obtain the worker's optimal effort level as a function of the disagreement over the reference wage:

$$e_i^* := e^*(w_i^*) = \begin{cases} \frac{\alpha}{\alpha+\beta} \left(\left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta} \right)^2 - \Delta_i \right)^{\frac{1}{2}} & \text{if } \Delta_i < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta} \right)^2 \\ 0 & \text{otherwise} \end{cases} \quad [6]$$

Therefore, disagreement (Δ_i) makes gift-exchange less effective because wages motivate workers less than what the employer expects. In the next proposition we show that if the disagreement over the reference wage is high enough, status-quo is most favorable to gift-exchange.

Proposition 3 (self-serving biases) Let us assume that $w_{i,R} < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ and $\Delta_i < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ for all $i \in \{L, S, H\}$.

If $\Delta_H > \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_H^2 - q_S^2)$, then:

$$\begin{aligned} e_S^* &> \max\{e_L^*, e_H^*\} \\ w_H^* &> w_S^* > w_L^* \end{aligned}$$

If $\Delta_H \leq \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_H^2 - q_S^2)$, then:

$$\begin{aligned} e_H^* &> e_S^* > e_L^* \\ w_H^* &> w_S^* > w_L^* \end{aligned}$$

There are two important differences between this proposition and Proposition 2 which was derived in the absence of self-serving biases. First, in the presence of self-serving biases, the result that status-quo favors gift-exchange can hold even in the case in which gift-exchange exists under high economic conditions (i.e., $w_{H,R} < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$). Second, Proposition 2 shows that effort under stable conditions is

⁸ In actual work settings, there exist a wealth of possible alternatives that are not taken into account in our model (see Section 6 for further discussions). Our argument is that the set of available reference points tends to be smaller when economic conditions are stable.

only higher than under unstable conditions because of higher wages. However, Proposition 3 shows that effort can be higher under stable conditions than under high economic conditions even when wages are actually lower. This is because high economic conditions generate two opposing effects. On the one hand, a higher productivity level has a positive effect on worker's effort because it increases the gift offered by the employer. On the other hand, in the presence of self-serving biases, the employer's belief about the gift ($w_H^* - \widehat{w}_{H,R}$) differs from the worker's perception of the gift ($w_H^* - w_{H,R}$). This difference is the disagreement between workers and employers regarding the reference wage ($\Delta_H := w_{H,R} - \widehat{w}_{H,R}$), which has a negative effect on worker's effort (see [6]). When this disagreement is sufficiently high (i.e., when $\Delta_H > \left(\frac{1}{2} \frac{\alpha}{\alpha + \beta}\right)^2 (q_H^2 - q_S^2)$), the negative effect dominates the positive effect and hence worker's effort will be lower under high economic conditions than under stable conditions which is the case in which there is no disagreement ($\Delta_S = 0$).

In Appendix B we report additional results of the self-serving model which follow from Proposition 3. In Corollary B1, we show that when stable conditions are most favorable to gift exchange the decrease in wages under low economic conditions surpasses the increase in wages under high economic conditions (i.e., $w_H^* - w_S^* < w_S^* - w_L^*$). Moreover, in Corollary B2 we show that the positive effect of stable conditions on work effort increases with unemployment benefits (i.e., $\frac{\partial(e_S^* - e_L^*)}{\partial b} > 0$). Finally, we show how the self-serving bias model and the asymmetric-information model of Section 2.2 can be seen as special cases of a more general model.

2.4. Testable predictions

In this section we use our model results to provide testable hypotheses. The first two hypotheses follow directly from Akerlof (1982) whereas Hypothesis 3 is derived from the model with variable reference wages and asymmetric information (Section 2.2) and from the model with self-serving biases (Section 2.3). Hypotheses 4 and 5 are specific to the model with self-serving biases.

In Proposition 1, we showed that gift-exchange arises as long as the worker's reference wage is not too high. That is, we should expect workers to exert higher effort when the employer provides higher wages.

Hypothesis 1 (Gift-exchange). We expect a positive relationship between wages and workers' effort.

In Proposition 1 we also showed that if the worker's reference wage is too high, the employer will not find gift-exchange to be profitable. Given our assumption that reference wages increase with

unemployment benefits, we expect gift-exchange to disappear if unemployment benefits are above a certain threshold (see Corollary 1).

Hypothesis 2 (Gift-exchange and unemployment benefits). We expect gift-exchange to be less pronounced and thus employers' profits to be lower when unemployment benefits are high.

In Proposition 2 we showed that status-quo is more favorable to gift-exchange than unstable conditions. We found a similar result when workers and employers suffered from self-serving biases (Proposition 3).

Hypothesis 3 (Gift-exchange and economic conditions). We expect status-quo in economic conditions to be most favorable to gift-exchange. Status-quo will lead to higher wages and effort levels than unstable conditions.

In the gift-exchange model with self-serving biases, we showed that wages increase with economic conditions (see Proposition 3). Moreover, employers tend to cut wages to reflect new productivity levels when economic conditions worsen while being reluctant to increase wages when economic conditions improve (see Corollary B1 in Appendix B).

Hypothesis 4 (Self-serving biases and wage setting). We expect the decrease in wages (compared to status-quo) under low economic conditions to be larger than the increase in wages (compared to status-quo) under high economic conditions.

Finally, our model with self-serving biases implies that unemployment benefits tend to amplify the negative effect of the disagreement between workers and employers over the reference wage when economic conditions are unstable (see Corollary B2 in Appendix B). We state this finding in Hypothesis 5.

Hypothesis 5 (Unemployment benefits and economic conditions). We expect the positive effect of stable conditions on gift-exchange to be magnified when unemployment benefits are high.

We design a controlled laboratory workplace environment to test these hypotheses. The choice of a laboratory setup was made intentionally so as to discard a series of relevant confounds such as the presence of implicit incentives (Becker and Stigler, 1974; Klein and Leffler, 1981; Shapiro and Stiglitz, 1984; MacLeod and Malcomson, 1989), the existence of a specific corporate culture (Hermalin, 2013),

the presence of hierarchies (Williamson, 1967; Radner, 1992; Qian, 1994), workers' monitoring (Alchian and Demsetz, 1972) and the delegation of authority (Aghion and Tirole, 1997; Van den Steen 2009). We do not mean to downplay the importance of each of these important features of the workplace. Instead, we believe they deserve to be studied separately both theoretically and empirically so as to evaluate the potential impact of each of these factors on the gift-exchange relationship.

3. Experimental Design

3.1. Virtual workplace with real effort and real leisure

We develop a framework in which subjects can undertake a real-effort task while having access to a real-leisure alternative (browsing the internet) at any point in time during the experiment thus allowing for on-the-job shirking (Corngnet, Hernán-González and Schniter, 2015).

3.1.1. The work task

We consider a real-effort summation task that is particularly long, laborious and effortful (e.g., Niederle and Vesterlund, 2007; Eriksson et al., 2009; Dohmen and Falk, 2011). Subjects would sum up matrices of 36 numbers comprised between 0 and 3 for two hours, divided into 7-minute rounds. Each table completed correctly generated a monetary value while there were no penalties for incorrect answers. We define *production* as the monetary amount generated by a subject's answers on the work task.

Subjects were not allowed to use a pen, scratch paper or calculator. This rule amplified the level of effort subjects had to exert in order to complete tables correctly. An example of the work task is shown in Figure D1 in Appendix D.

3.1.2. Internet browsing

At any point during the experiment, subjects could switch from the work task to the leisure activity that consisted of browsing the internet. Each activity was undertaken separately, in a different screen, so that subjects could not sum tables while being on the internet. Subjects were informed that their use of the internet was strictly confidential. Subjects were free to consult their email or visit any web page.⁹ The internet browser was embedded in the software so that the experimenter could keep a record of the exact amount of time subjects spent on each activity.¹⁰

⁹ Subjects were expected to follow the norms set by the university regarding the use of internet on campus.

¹⁰ The lab policy is to forbid cell phone use inside the lab. This ensures that embedded internet browsing is an accurate measure of on-the-job leisure.

3.1.3. Organizational roles and timing

Each experimental session consisted of 12 subjects which were divided into four groups of three. At the beginning of the experiment, subjects were randomly assigned to one of three possible roles: B (worker), C (employer) or E (unemployed). A subject who was assigned the role of employer (C) would keep this role for the entire duration of the experiment. Subjects which were not assigned the employer's role (C) were randomly matched to the other two roles (B or E) at the beginning of each period.¹¹ In addition, the three members of a triplet were randomly matched each period.

Each period consisted of two rounds of 7 minutes each. At the beginning of Round 1, the employer chose the fixed wage of the worker. Given that employers were not endowed with any experimenter money, they paid the worker's wage using the money which was generated by both the employer and the worker when completing the task during the round. Workers and employers could dedicate their time to either completing the work task or browsing the web. Each table completed correctly generated a sum of money for the employer (20¢, 60¢ or 100¢ depending on economic conditions). Unemployed subjects received a fixed compensation paid by the experimenter and could only browse the internet during the round.

3.1.4. Treatments

In Round 1, each table completed correctly generated an income of 60¢ for the employer. At the beginning of Round 2, the economic conditions regarding the work task could change. There were three equally likely conditions for which the value of a correct table was either low (20¢), stable (60¢) or high (100¢). After subjects learnt the new economic conditions, the round proceeded exactly as in Round 1. Our experimental design thus makes use of three *within-subject* conditions varying the value of a correct table in Round 2. In addition, we conducted two *between-subject* treatments which varied the fixed compensation paid to the unemployed subject. In the *low benefits* treatment, the fixed compensation received by the unemployed subject was equal to 40¢. In the *high benefits* treatment, the unemployed subject received 80¢ per round.

¹¹ In a related experimental design assessing the effect of goal setting, Corgnet, Gómez-Miñambres and Hernán-Gonzalez (2015) reported almost identical results for experimental sessions using random matching of roles each period and for sessions using fixed matching of roles.

3.2. Procedures

Our subject pool consisted of students from a major U.S. University. We conducted a total of 8 sessions with twelve subjects each for a total of 96 subjects (48 per treatment). The experiment was computerized and all of the interaction was anonymous. The instructions were displayed on subjects' computer screens. Subjects had exactly 20 minutes to read the instructions. A 20-minute timer was shown on the laboratory screen. Three minutes before the end of the instructions period, a monitor announced the time remaining and handed out a printed copy of the summary of the instructions. None of the subjects asked for extra time to read the instructions. At the end of the 20-minute instruction phase, the instructions file was closed, and the experiment started. The interaction between the experimenter and the subjects was negligible. The complete set of instructions is available online.¹²

At the end of the experiment and before payments were made, we elicited subjects' social preferences following Bartling et al., (2009) elicitation task and asked them to complete the cognitive reflection test (Frederick, 2005) to obtain a measure of subjects' cognitive skills. These questionnaires lasted ten minutes. Subjects were paid their earnings in cash at the end of the experiment. Individual earnings were computed as the sum of the earnings in the 12 rounds. On average, subjects received a payment of \$28.5 on average for an experimental session which lasted about three hours.

4. Results

4.1. Gift-exchange

In Table D1 in Appendix D, we show descriptive statistics for workers' wage, production and internet use. We find that wages decrease in the second round compared to the first round which is associated with a substantial decrease in production and an increase in internet use. However, we do not find statistically significant differences between the low- and high- benefits treatments regarding the levels of wages, production and internet use of workers.

To test our first hypothesis on gift-exchange, we inquire on the relationship between wages and production levels pooling the data from both treatments. In Figure 1, we illustrate that higher wages tend to lead to higher production levels in line with the gift-exchange hypothesis and in line with previous laboratory findings.¹³ This provides an additional robustness check to the gift-exchange

¹² Here is the link: shorturl.at/dk056.

¹³ It is important to stress that in contrast to the classical abstract-effort gift-exchange introduced by Fehr et al., (1998), where firm profits are defined as $(q - w)e$, in our setup firm profits are given by $qe - w$. Therefore, in our design, wages are truly fixed and thus more in line with Akerlof's (1982) original gift-exchange idea.

relationship in a case in which employers had to earn their revenues before paying their workers' wages. Our setup also differs from previous laboratory studies because workers had access to an alternative leisure activity thus making effort particularly costly (see Kurzban et al., 2013). Figure 1 also shows that the gift-exchange relationship holds regardless of the round.

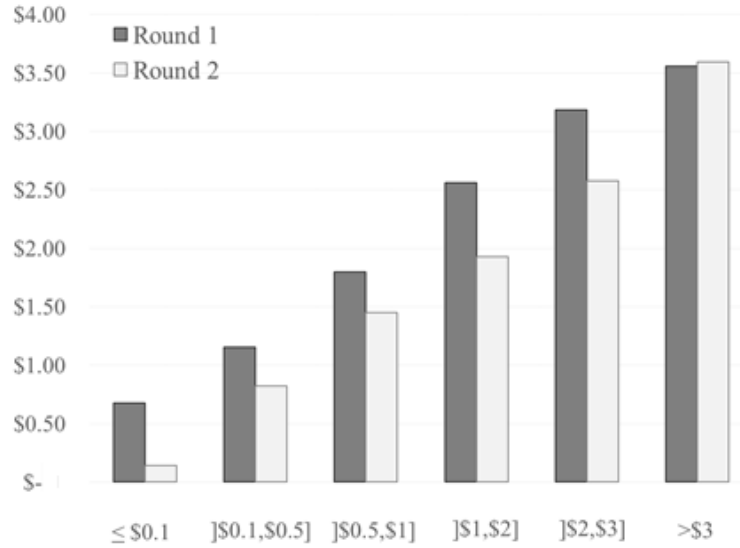


FIGURE 1. Average workers' production (in \$) for each round given wages offered by employers and pooled across the two benefits treatments.

In Tables 2 and D2 (in Appendix D), we use panel regressions to show that an increase in wages leads to both an increase in workers' production levels and a decrease in shirking behavior (measured as the amount of time spent on the internet instead of working). We also report that workers' production tends to increase less than the increase in wages as the *Wage* coefficient is systematically below one (see Table 3) so that the increase in the value of workers' production corresponds to about half the increase in wages. This result could be a direct consequence of our real-effort, real-leisure design which makes providing effort particularly costly to the worker (see Corgnet, Hernán-González and Schniter, 2015). In our setup, an increase in wages leads to an increase in effort which induces substantial non-monetary costs to the worker.

We should also note that despite a decrease in wages and effort levels over time (see Figure D2 in Appendix D), the wage-effort relationship does not vanish over time as the coefficient $Wage \times Period$ is never significant (see Tables 2 and D2).

TABLE 2.- Gift-exchange: production and wages¹⁴

This table reports the results from linear [tobit] panel regressions with random effects and robust standard errors (reported in parentheses) [with a lower bound at zero] in columns (1) and (2) [(3) and (4)]. The number of observations corresponds to the number of triplets (32) (a triplet is a worker, an employer and an unemployed subject) for both treatments who were matched in each round multiplied by the total number of rounds in the entire duration of the experiment which is equal to twice the number of periods (2×6). The regressor *Period (Round)* is the period (round) number, *Table Value* is the value of completing a table correctly (20¢, 60¢ or 100¢) and *High Benefits Dummy* takes value one if a subject was in the high benefits treatment and value zero otherwise.

	Linear panel regressions		Tobit panel regressions	
Dependent variable:				
Worker's production (in ¢)	(1)	(2)	(3)	(4)
Intercept	255.309*** (50.007)	226.788*** (58.471)	307.382*** (63.280)	332.496*** (71.227)
Wage	0.443*** (0.086)	0.580*** (0.215)	0.636*** (0.073)	0.527*** (0.158)
Wage \times Period		-0.037 (0.048)		0.031 (0.039)
High Benefits Dummy	-31.739 (28.336)	-32.454 (28.072)	-56.852 (39.286)	-56.183 (39.423)
Table Value	1.980*** (0.509)	1.979*** (0.516)	2.133*** (0.576)	2.145*** (0.577)
Period	-49.268*** (6.498)	-41.755*** (9.365)	-79.617*** (8.014)	-86.649*** (12.165)
Round	-46.311*** (17.116)	-46.215*** (17.173)	-84.152*** (24.749)	-84.701 (24.798)
Observations	$n = 384$	$n = 384$	$n = 384$	$n = 384$
Prob > χ^2	<0.001	<0.001	<0.001	<0.001
R ²	0.397	0.400		

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

As additional robustness checks, we show that the wage-effort relationship holds when controlling for individual social preferences and cognitive reflection scores (see Table D3 in Appendix D) and for each round taken separately (see Table D4). We summarize our main finding below.

Result 1. (*Gift-exchange*). We find evidence for a significant and positive relationship between employers' wages and workers' effort.

We now turn to the analysis of unemployment benefits on gift-exchange thus testing Hypothesis 2.

¹⁴ The results reported in Table 2 are robust to controlling for session fixed effects and to estimating standard errors with the wild bootstrap procedure (Cameron and Miller, 2011) which might be preferred to clustering the standard errors at the session level given that we have only four distinct sessions per treatment.

4.2. Gift-exchange and benefits

We analyze wages and production levels in both the low and high benefits treatments, separately. Wages were higher in the high benefits treatment (mean = \$2.200, SD = \$2.042) than in the low benefits treatment (mean = \$1.866, SD = \$1.951) although the difference is not statistically significant (p -value = 0.196).¹⁵ As is illustrated in Figure 2, the positive association between wages and workers' production was weaker for the high benefits treatment compared to the low benefits treatment. More specifically, gift-exchange disappeared in the high benefits treatment in the last two periods as production collapsed, which is not the case in the low benefits treatment. These dynamics are consistent with our theoretical model when the marginal cost of effort (β) increases over time due to workers' fatigue. As β increases above a certain threshold, Corollary 1 predicts that production would go to zero. Interestingly, offered wages did not converge to zero which might indicate that employers exhibited prosocial concerns toward workers (see Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Charness and Rabin, 2002). However, the effectively paid wages actually converged to zero over time in the high benefits treatment. That is, employers lowered their level of production so that they would end up not paying the workers' wage (see Figure D3 in Appendix D). Employers' production per period decreased by 44.1% from an average of \$4.834 in the first four periods to an average of \$2.706 in the last two periods of the experiment. This difference is significant (p -value < 0.001).¹⁶

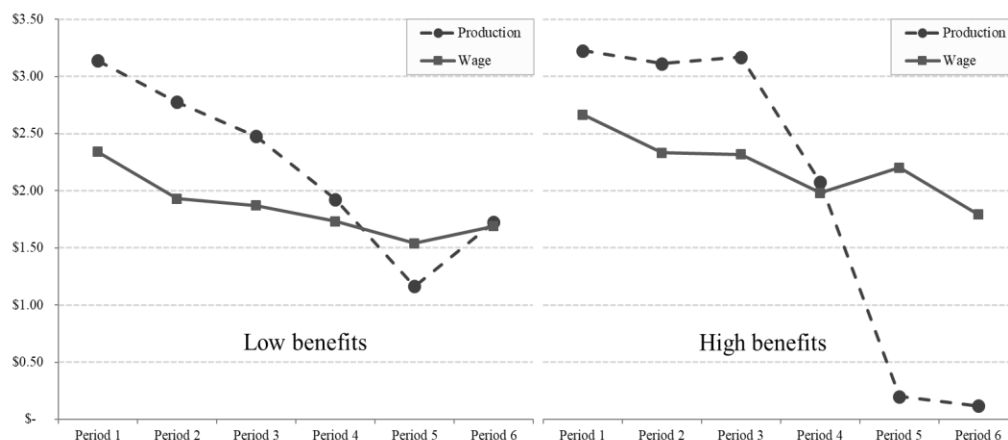


FIGURE 2. Average wages offered by employers and corresponding workers' production (in \$) across treatments. The low benefits treatment is represented on the left-hand panel and the high benefits treatment in on the right.

¹⁵ The p -value is calculated using a linear panel model with robust standard errors using the following regressors: *High Benefits Dummy*, *Table Value*, *Period* and *Round*.

¹⁶ The p -value is calculated using a linear panel model with robust standard errors using the following regressors: *High Benefits Dummy*, *Table Value*, *Period* and *Round*.

In Table 3, we conduct regressions showing that gift-exchange tends to decrease in the presence of high benefits because the interaction term ($Wage \times High\ Benefits\ Dummy$) is negative. However, this interaction term is not significant when considering all periods. It reaches statistical significance in the last two periods of the experiment (see columns (2) and (4) in Table 3) which is consistent with Figure 2.

TABLE 3.- Gift-exchange and benefits¹⁷

This table reports the results of linear [tobit] panel regressions with random effects and robust standard errors (reported in parentheses) [with a lower bound at zero] in columns (1) and (2) [(3) and (4)]. The number of observations corresponds to the number of triplets for both treatments who were matched in each round multiplied by the total number of rounds in the entire duration of the experiment.

Dependent variable: Worker's production (in ¢)	Linear panel regressions		Tobit panel regressions	
	All periods (1)	Last two periods (2)	All periods (3)	Last two periods (4)
Intercept	249.105*** (53.202)	-44.220 (168.682)	313.549*** (65.813)	73.667*** (277.623)
Wage	0.471*** (0.111)	0.678*** (0.152)	0.610*** (0.105)	0.942*** (0.154)
High Benefits Dummy	-23.284 (38.755)	-23.675 (21.290)	-68.068 (51.246)	-170.384** (77.469)
Wage \times High Benefits Dummy	-0.045 (0.164)	-0.630*** (0.157)	0.051 (0.148)	-0.579*** (0.219)
Table Value	1.989*** (0.513)	0.657 (0.494)	2.115*** (0.578)	0.889 (1.119)
Period	-48.959*** (6.574)	13.194 (23.978)	-79.802*** (8.031)	-16.472 (50.415)
Round	-46.522*** (17.305)	-24.998 (17.118)	-83.742*** (24.735)	-102.421** (48.757)
Observations	$n = 384$	$n = 384$	$n = 384$	$n = 384$
Prob $> \chi^2$	<0.001	<0.001	<0.001	<0.001
R ²	0.401	0.525		

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

Overall, wages were 36¢ higher in the high benefits treatment than in the low benefits case which is almost exactly equal to the difference in the payment received by the unemployed subject across treatments (40¢). It turns out that paying workers more was not sufficient to maintain the same level of effort in the high benefits treatment than in the low benefits treatment. Over all periods, production was

¹⁷ The results reported in Table 3 are robust to controlling for session fixed effects and to estimating standard errors with the wild bootstrap procedure (Cameron and Miller, 2011) which might be preferred to clustering the standard errors at the session level given that we have only four distinct sessions per treatment.

on average 9.9% lower in the high benefits treatment compared to the low benefits treatment. This difference is not significant, however (p -value = 0.263).¹⁸ Nevertheless, in the last two periods, workers' production levels were overwhelmingly lower (-89.0%) in the high benefits treatment than in the low benefits treatment (p -value = 0.002). It follows that employers' profits were negatively affected by the presence of high benefits (p -value < 0.001) whereas workers' income was not statistically different between treatments (p -value = 0.997).¹⁹ As a result, the difference in income between workers and employers was reduced in the high benefits treatment compared to the low benefits treatment (p -value = 0.014).

Figure D4 in Appendix D also shows that both employers' profits and workers' income decrease much more rapidly over time in the high benefits treatment than in the low benefits treatment.²⁰

High benefits are not favorable to workers' income because their positive effect on wages is offset by their negative effect on the magnitude of gift-exchange. Because workers did not respond as strongly to an increase in wages when benefits were high as when they were low, employers reacted by slashing wages over time. Importantly, the low level of workers' production in the high benefits treatment implied that employers were not able to pay wages in 25.0% [71.9%] of the cases [in the last two periods] in the high benefits treatment compared to 3.1% [4.7%] in the low benefits treatment (p -values < 0.001).²¹ In sum, employers who paid 36¢ more on average in the high benefits treatment than in low benefits treatment could not compensate for the loss of motivation associated to the weakening of gift-exchange. These results provide support for Hypothesis 2. We summarize our findings regarding gift-exchange across benefits treatments below.

¹⁸ All the p -values in this paragraph are calculated for the *High Benefits Dummy* in a linear panel regression with robust standard errors (as in Table 2) using the following regressors: *High Benefits Dummy*, *Table Value*, *Period* and *Round*.

¹⁹ Note that a worker's income is not exactly equal to a worker's wage as employers might not have enough funds to pay the worker's wage. This occurred in 14.0% of the cases. A worker's income is thus equal to the wage effectively paid by the employer.

²⁰ We conduct a regression of workers' income (employer's profits) on *High Benefits Dummy*, *High Benefits Dummy* \times *Period*, *Period*, *Table Value* and *Round* for each treatment and report a negative and significant interaction effect coefficient (p -value = 0.024 for workers' income and p -value < 0.001 for employers' profits).

²¹ The p -values are calculated using a probit panel model with robust standard errors using the following regressors: *High Benefits Dummy*, *Table Value*, *Period* and *Round*. The binary dependent variable takes value one if an employer had enough funds to pay the worker's wage and value zero otherwise.

Result 2. (*Gift-exchange and benefits*).

- i) Production levels as well as gift-exchange collapsed over time in the high benefits treatment whereas it was not the case in the low benefits treatment.*
- ii) Employers' profits were substantially reduced in the high benefits treatment compared to the low benefits treatment whereas workers' income was unaffected by the level of benefits. This implied that the difference in income between workers and employers was reduced in the high benefits treatment.*

We now turn to the analysis of the effect of economic conditions on the magnitude of gift-exchange.

4.3. Gift-exchange and economic conditions

In Table 4, we report descriptive statistics regarding wages, production and internet use across different economic conditions in Round 2. In order to be able to compare production levels between economic conditions, we divide production levels (in ¢) by the value of a table in a given round. We refer to this variable as table production which measures the number of tasks completed correctly in a given round.

We show that workers' wages were substantially decreased under negative economic conditions compared to stable conditions whereas they were not substantially increased under positive conditions (see p -values for Round 2 in Table 4). In line with our model with self-serving biases, employers lowered wages under negative conditions (124.6¢) relative to stable conditions (211.1¢) while not increasing wages significantly under positive conditions (224.3¢). Employers seemed to use Round 1 wages (219.9¢) as reference points for Round 2 when economic conditions were positive while adjusting for new productivity levels when economic conditions were negative. Thus, wages are not significantly different between stable and positive economic conditions. By contrast, wages are significantly lower under negative conditions than under stable conditions and they are significantly lower than Round 1 wages (see Table 4). These findings give credence to our model with self-serving biases (Hypothesis 4).

In addition, production under stable conditions was higher than under both negative (12.6% higher) and positive (34.4% higher) conditions although only the latter difference is statistically significant (see p -values for Round 2 in Table 4). However, we do not observe statistically significant differences in internet use across economic conditions. In the last three rows of Table 4, we also show that table

production decreased between Round 1 and Round 2 under both negative and positive economic conditions whereas it remained constant across rounds under stable economic conditions.²²

TABLE 4.- Wage, production and internet use across economic conditions

Average (standard deviation)	Wage [in ¢]	Production [in tables]	Production [in ¢]	Internet use [in seconds]
Round 1	219.89 (204.20)	3.99 (3.76)	239.69 (225.46)	111.66 (157.60)
Round 2				
Negative conditions	124.59 (166.01)	3.125 (3.69)	62.50 (73.85)	169.37 (178.40)
Stable conditions	211.08 (193.04)	3.52 (3.68)	210.94 (220.65)	163.66 (169.64)
Positive conditions	224.31 (211.27)	2.62 (3.46)	262.50 (346.18)	181.99 (182.49)
<i>P</i> -values ²³ (Round 2)				
Negative vs. Stable	0.004	0.311	<0.001	0.505
Positive vs. Stable	0.331	0.049	0.177	0.411
Negative vs. Positive	0.001	0.275	<0.001	0.671
Negative (Round 1 vs. Round 2)	<0.001	0.005	<0.001	0.010
Stable (Round 1 vs. Round 2)	0.632	0.125	0.131	0.091
Positive (Round 1 vs. Round 2)	0.804	0.008	0.277	<0.001

Our model predicts that the magnitude of gift-exchange in Round 2 depends on whether economic conditions are stable or not. In Table 5, we confirm Hypothesis 3 by showing that stable conditions promote gift-exchange. This is the case because the coefficient for the interaction term between the *Stable Conditions Dummy*, which takes value one if economic conditions are stable in Round 2 and value zero otherwise, and *Wages* is positive and significant (p -value < 0.001 and p -value = 0.030 for columns (1) and (3) in Table 5) when considering table production whereas this coefficient is positive but not significant when considering monetary production (p -value = 0.140 and p -value = 0.217 for columns (2) and (4) in Table 5).

²² These differences were calculated comparing the same workers in Rounds 1 and 2.

²³ The p -values were calculated for the *Low Conditions Dummy* or the *High Conditions Dummy* coefficient in a linear panel regression with random effects taking each column header as a dependent variable. We also added *Period* and *High Benefits Dummy* as regressors.

TABLE 5.- Gift-exchange and economic conditions²⁴

This table reports the results from linear [tobit] panel regressions with random effects and robust standard errors (reported in parentheses) [with a lower bound at zero] in columns (1) and (2) [(3) and (4)]. The number of observations corresponds to the number of workers (48) multiplied by the number of second rounds they played in the entire duration of the experiment. The *Stable (High) Conditions Dummy* takes value one if the value of a correct table in Round 2 was 60¢ (100¢).

Dependent variable:	Linear panel regressions		Tobit panel regressions	
	Table	Production	Table	Production
	Production	(in ¢)	Production	(in ¢)
	(1)	(2)	(3)	(4)
Intercept	4.900*** (0.642)	166.026*** (35.151)	5.127*** (0.904)	147.936** (62.636)
Wage	0.007*** (0.002)	0.494*** (0.165)	0.011*** (0.002)	0.783*** (0.137)
Wage × Stable Conditions Dummy	0.005*** (0.001)	0.203 (0.137)	0.006** (0.002)	0.270 (0.218)
Stable Conditions Dummy	-1.194*** (0.391)	60.205*** (22.218)	-1.931* (0.985)	56.733 (69.909)
High Conditions Dummy	-1.101** (0.521)	149.405*** (45.340)	-2.104*** (0.745)	150.764*** (51.814)
High Benefits Dummy	-0.592 (0.487)	-34.902 (31.400)	-0.982 (0.768)	-66.848 (51.602)
Period	-0.674*** (0.101)	-41.683*** (7.234)	-1.215*** (0.178)	-80.986*** (12.511)
Observations	$n = 192$	$n = 192$	$n = 192$	$n = 192$
Prob > χ^2	<0.001	<0.001	<0.001	<0.001
R ²	0.470	0.467		

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

²⁴ The results reported in Table 5 are robust to controlling for session fixed effects and to estimating standard errors with the wild bootstrap procedure (Cameron and Miller, 2011) which might be preferred to clustering the standard errors at the session level given that we have only four distinct sessions per treatment.

This leads us to the following result.

Result 3. (*Gift-exchange under changing and stable economic conditions*).

- i) *Round 2 wages decreased under negative conditions but they did not increase under positive conditions. Round 2 wages under stable conditions remained at their Round 1 level and did not differ from wages under positive conditions.*
- ii) *The gift-exchange relationship was more pronounced under stable than under changing economic conditions.*

Finally, we test whether the positive effect of stable economic conditions on gift-exchange was most pronounced for the high benefits treatment (Hypothesis 5). In Table D5 (Appendix D), we report that the gift-exchange interaction coefficient ($Wage \times Stable\ Conditions\ Dummy$) is systematically larger for the high benefits compared to the low benefits treatment. In the tobit regressions (columns [3] and [4]), the interaction coefficient is significant for the high benefits treatment (p -value = 0.049) while not reaching significance for the low benefits treatment (p -value = 0.211).²⁵ However, the difference between these interaction coefficients across treatments is not significant. Using a three-way interaction between $Wage$, $Stable\ Conditions\ Dummy$ and $High\ Benefits\ Dummy$, the coefficient ($Wage \times Stable\ Conditions\ Dummy \times High\ Benefits\ Dummy$) failed to reach statistical significance at standard levels (p -value = 0.266 [0.294] for the linear [tobit] panel regression). In sum, we do not report compelling evidence for Hypothesis 5 although the direction of the effect is in line with theory. We capture these findings below.

Result 4. (*Gift-exchange and the interaction between benefits and economic conditions*).

- i) *The positive effect of stable economic conditions on gift-exchange was systematically significant in the high benefits treatment whereas this was not the case for the low benefits treatment.*
- ii) *However, the difference in the effect of stable economic conditions on gift-exchange between the two benefits treatments was not statistically significant.*

²⁵ Because the high benefits case could also be interpreted as a situation in which there is fierce competition for workers, these findings suggest our main results might be robust to an experimental setting in which there exists competition between employers.

5. Discussion

In this section, we highlight how our research helps understand empirical regularities regarding wage setting and labor conflicts. The evidence provided here is correlational and only serves as possible guidance for future empirical research on the topic.

5.1. Unemployment benefits, workers' morale and labor conflicts

There are considerable differences in unemployment benefits across countries with similar standards of living. For example, according to the IMF, a Portuguese worker would receive three times more benefits when unemployed than a British or North American worker. This difference may be affecting workers' perceptions of a fair compensation and hence their reference wages. Ultimately, an increase in reference wages due to increased unemployment benefits could abate workers' morale. Our study suggests workers might be less inclined to engage in a gift-exchange relationship with their employers when unemployment benefits are high.

Fahr and Frick (2007) show how several changes in dismissal protection that occurred in Germany between 1991 and 2004 affected workers' morale as measured with the rate of absenteeism at work. In particular, they find that generous unemployment insurance is associated with higher rates of work absenteeism. Hutchens et al., (1992) takes advantage of the institutional differences in the unemployment insurance systems across U.S. states to study the relationship between strike activity and unemployment insurance. They find that higher unemployment benefits are related to higher strike frequency, which may indicate a negative effect of unemployment benefits on workers' morale.

Although these findings are consistent with our gift-exchange model, they could also be explained by relying exclusively on standard explicit incentive effects because high unemployment benefits reduce the monetary costs of shirking. It seems particularly challenging to tease out the effect of unemployment benefits on gift-exchange from their standard incentive effects using field data. Our laboratory workplace thus provides a unique testbed for our conjectures.

5.2. Wage setting and labor conflicts under changing economic conditions

Our model and our experimental findings support the conjecture that changing economic conditions might weaken gift-exchange. Our work suggests this happens because, under changing conditions, workers and employers are more likely to disagree on the reference wage. Because the choice of a reference wage is a crucial part of unions' wage negotiations (Akerlof, 1982; Babcock and Loewenstein 1997; Mas, 2006), any discrepancies between workers' and employers' reference points are likely to

promote labor conflicts. In line with our conjecture, several studies have reported that the duration and number of strikes tend to be correlated with the state of the economy (see Kennan, 1985). A more direct test of our conjecture comes from Tracy's (1986) work. Using panel data of contract negotiations to study the determinants of strike activity in the U.S., the author finds the somewhat counterintuitive result that the firm's level of profits has no impact on the likelihood of a strike. However, the variability of firms' profits increases both the incidence and duration of strikes. Our model provides a plausible explanation for these "striking" findings, namely that changing economic conditions may generate a bargaining impasse between employers and workers because they are more likely to form different reference wages than under stable economic conditions.

Our model as well as our experimental findings put forth that labor conflicts might be due to upward rigidity in (real) wages when economic conditions are changing.²⁶ That is, employers would tend not to compensate workers enough for increased productivity levels when the economy is growing. This implication might seem at odds with the well-known downward rigidity of nominal wages (e.g., Bewley, 2009; Fehr and Goette, 2005). However, recent evidence on downward wage rigidity is rather mixed and highly dependent on many institutional factors associated to employment protection and contractual regulation (e.g., Dickens et al., 2007; Babecký et al., 2010). Using data from all OECD countries on wages and GDP levels from 1990 to 2017, we find evidence of upward rigidity in real wages (see Figure D5 in Appendix D).²⁷ Indeed, real wages tend to go down when the economy is in recession whereas they tend to level off when the economy is growing. This pattern is consistent with wage setting in our experimental study. In Table D6, we show that real wages decreased substantially during years in which GDP contracted whereas it was not the case for years in which the GDP expanded. An increase in real wages occurred after expansion years only with a one-year lag (see GDP growth in year $t-1$) whereas the decrease in real wages in recession years occurred in the same year and was more pronounced.

One could argue that employers are likely to dedicate time and resources to uncover workers' reference wages so as to avoid unnecessary conflicts. If this were the case, we would expect that the negative effect of unstable economic conditions on labor conflicts might be of limited magnitude in the field. However, our work puts forward that employers who suffer from self-serving biases will not accurately update their beliefs about workers' reference wages. In sum, our model as well as our

²⁶ In our model as well as in our experimental design workers' wages should be interpreted as real wages.

²⁷ Data is available here: <https://www.oecd.org/sdd/labour-stats/>.

experimental findings, suggest that the impact of changing economic conditions on labor conflict is likely to be persistent.

6. Conclusion

In this paper, we studied the behavioral foundations of the gift-exchange relationship starting by extending the Akerlof's (1982) model to a case in which reference wages are impacted by changes in the work environment such as unemployment benefits and workers' productivity levels. The main implication of our model is that economic instability is detrimental to gift-exchange as it generates a divergence in beliefs between workers and employers regarding what the reference wage is. This discrepancy in beliefs is even more pronounced when we consider the case in which workers and employers act self-servingly (Konow, 2000). For example, employers would tend to invoke the status-quo when the economy is doing well whereas employers would want to adjust wages upwards. We found support for our main conjectures in a laboratory workplace which allowed us to manipulate workers' productivity levels and assess their impact on the gift-exchange relationship.

Our research echoes Hart and Moore's (2008) idea that "when the contract permits more than one outcome, each party may feel entitled to a different outcome" (p.3). In our setup, expansions and recessions broaden the set of plausible reference points thus leading employers and workers to feel entitled to different wages. This phenomenon opens the door to labor conflicts. By contrast, stable economic conditions provide a natural reference point (the status-quo) for workers and employers to agree upon. In our model we made the simplifying assumption that the status-quo was the only possible reference wage under stable economic conditions. Evidently, there are other possible reference points in richer work environments. However, we still presume that the set of possible reference wages will tend to expand when economic conditions are unstable. A potential line of future research would thus be to consider more complex work setups in which there exist many possible alternatives for picking the reference wage. For example, a particularly interesting endeavor would be to incorporate labor market competition to our study. In that case, reference wages would also be affected by the wages paid by competing firms. In addition, social preferences may influence reference wages when co-workers compare each other's pay. Although social preferences, as measured using the elicitation task of Bartling et al., (2009), did not explain workers' behavior in our study, fairness concerns might play a role in a multi-worker setup.

Drawing on the lessons of this paper, we expect that expanding the set of plausible reference points would make gift-exchange even weaker. This might be one of the reasons why gift-exchange has been

found to be relatively weaker in field settings in which many alternative reference points might coexist compared to simple lab environments (see Gneezy and List, 2006 for example).

Finally, our findings shed new light on field data by showing why labor conflicts might be more severe when economic conditions are unstable. Moreover, our paper contributes to public policy debates by highlighting the hidden costs of generous social benefits which might unintendedly affect workers' reference wages thus threatening gift-exchange between workers and employers.

7. References

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8. Appendices

Appendix A: Proofs

Proof of Proposition 1

Given the anticipated worker's effort for a given wage, the employer's maximization problem becomes:

If $w_R < \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2$, the solution of this problem is:

$$w^* = w_R + \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2$$

Substituting w^* in $e^*(w)$ we get:

$$e^* = \frac{q}{2} \left(\frac{\alpha}{\alpha+\beta}\right)^2$$

Substituting w^* and e^* in $\pi(w)$, we get:

$$\pi(w^*) = \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2 - w_R$$

If $w_R \geq \left(\frac{q}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ then $\pi(w) \leq 0$ for any $w | e^*(w) \geq 0$. Therefore, in this case, the employer would maximize profits by offering $w^* = 0$ which would result in $e^*(0) = 0$ and $\pi(0) = 0$. ■

Proof of Proposition 2

From Proposition 1 we know that the optimal wage and effort under stable conditions are given by:

$$w_S^* = w_{SR} + \left(\frac{q_S}{2} \frac{\alpha}{\alpha+\beta}\right)^2, \quad e_S^* = \frac{q_S}{2} \left(\frac{\alpha}{\alpha+\beta}\right)^2$$

(i) We start the proof by showing that $w_H^* < w_S^*$ and $e_H^* < e_S^*$.

Since $e_{H,R} = 0$ the employer's profit maximization problem under high economic conditions becomes:

$$\max_w q_H(1-p) \frac{\alpha}{\alpha+\beta} (w - w_{SR})^{1/2} - w$$

The solution of this problem is:

$$w_H^* = w_{SR} + \left(\frac{q_H(1-p)}{2} \frac{\alpha}{\alpha+\beta}\right)^2,$$

Where $w_H^* < w_S^*$ iff $q_S > (1-p)q_H$.

Since $e_i^* = \frac{\alpha}{\alpha+\beta}(pe_{i,R} + (1-p)e_{S,R})$, the optimal effort under high economic conditions is given by:

$$e_H^* = \frac{q_H(1-p)}{2} \left(\frac{\alpha}{\alpha+\beta} \right)^2,$$

Where $e_H^* < e_S^*$ iff $q_S > (1-p)q_H$.

(ii) We finish showing that $w_L^* < w_S^*$ and $e_L^* < e_S^*$

The profit maximization problem under low economic conditions is:

$$\max_w q_L \frac{\alpha}{1+\alpha} (p(w - w_{LR})^{1/2} + (1-p)(w - w_{SR})^{1/2}) - w$$

Even though there is no closed-form solution of this problem, it is clear that $w_L^* < w_S^*$ for all $p > 0$. This is because $w_L^* = w_S^*$ if $p = 0$ and $w_L^* = w_{LR} + \left(\frac{q_L}{2} \frac{\alpha}{\alpha+\beta}\right)^2 < w_{SR} + \left(\frac{q_S}{2} \frac{\alpha}{\alpha+\beta}\right)^2 = w_S^*$ if $p = 1$, and the solution lies somewhere in between if $0 < p < 1$.

It remains to be proved that $e_L^* = \frac{\alpha}{\alpha+\beta}(pe_{L,R} + (1-p)e_{S,R})$ is lower than under stable conditions, $e_S^* = \frac{\alpha}{\alpha+\beta}e_{S,R}$. From equation [1] in the main text, we know that $e_{i,R}$ increases with $(w_i^* - w_{iR})$. Moreover, using Proposition 1 we know that $w_i^* - w_{iR} = \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ increases in the economic conditions q_i . Therefore, $e_{L,R} < e_{S,R}$ and the result follows.

Proof of Corollary 1

The result follows directly from Proposition 1. ■

Proof of Proposition 3

From equation [6] in the main text, we know that $e_S^* > e_L^*$. This is because $q_S > q_L$ and $\Delta_L > \Delta_S = 0$. Moreover, $e_S^* > e_H^*$ if $\left(\frac{q_S}{2} \frac{\alpha}{\alpha+\beta}\right)^2 > \left(\frac{q_H}{2} \frac{\alpha}{\alpha+\beta}\right)^2 - \Delta_H$ which is true if and only if $\Delta_H > \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_H^2 - q_S^2)$. Finally, the optimal wage is $w_i^* = \hat{w}_{i,R} + \left(\frac{q_S}{2} \frac{\alpha}{\alpha+\beta}\right)^2$. From Table 1 we know that $\hat{w}_{L,R} = w_{LR}$ and $\hat{w}_{i,R} = w_{SR}$ for $i \in \{S, H\}$. Since $q_H > q_S > q_L$ and $w_{SR} > w_{LR}$ this implies that $w_H^* > w_S^* > w_L^*$. ■

Appendix B: Additional results of the self-serving bias model

An additional distinct prediction of the model with self-serving biases is that employers will tend to cut wages when economic conditions worsen while being reluctant to increase wages when economic conditions improve. In particular, in the symmetric case in which $\Delta_H = \Delta_L$, we can show that the decrease in wages under low economic conditions will surpass the increase in wages under high economic conditions. This finding is summarized in Corollary 2.

Corollary B1 (Self-serving biases and wage setting)

If $\Delta_H = \Delta_L$ and $e_S^* > \max\{e_L^*, e_H^*\}$ then $w_H^* - w_S^* < w_S^* - w_L^*$

Proof

The optimal wage is $w_i^* = \hat{w}_{i,R} + \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$. Therefore:

$$w_H^* - w_S^* = \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_H^2 - q_S^2) \text{ and } w_S^* - w_L^* = \Delta_L + \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_S^2 - q_H^2)$$

Thus, $w_H^* - w_S^* < w_S^* - w_L^*$ if and only if $\Delta_L > \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_H^2 + q_L^2 - 2q_S^2)$. If $\Delta_L = \Delta_H$ a sufficient condition for this inequality to hold is $\Delta_H > \left(\frac{1}{2} \frac{\alpha}{\alpha+\beta}\right)^2 (q_H^2 - q_S^2)$ which, by Proposition 3, implies that $e_S^* > \max\{e_L^*, e_H^*\}$. ■

The last prediction of the model with self-serving biases is that the negative effect of the disagreement on the worker's reference wage is magnified when unemployment benefits (b) are high. This follows from the fact that unemployment benefits and economic conditions are complementary features of the reference wage. Applying the definition of Δ_i and the definition of the reference wage in [6] we get that $\Delta_i = b^u |r_i^{1-u} - r_S^{1-u}|$. Therefore, high unemployment benefits magnify the marginal impact that a change in economic conditions has on the reference wage. As a result, low unemployment benefits would induce workers' reference wages and employers' beliefs to be more similar thus lowering the disagreement over the reference wage (Δ_i) hence facilitating gift-exchange under changing economic conditions. As we show in the corollary below, this implies that the positive effect of stable conditions relative to unstable conditions on gift-exchange increases with unemployment benefits.

Corollary B2 (Self-serving biases and unemployment benefits)

If $\Delta_i < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ for all $i \in \{L, S, H\}$ then $\frac{\partial(e_S^* - e_i^*)}{\partial b} > 0$

Proof

This result follows from differentiating the optimal wage $w_i^* = \hat{w}_{i,R} + \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ and optimal effort function (see [7]), assuming that the disagreement is low enough for effort to be positive. That is, $\Delta_i < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$. Note that from [6] and Table 1 we know that $\Delta_i = b^u |r_i^{1-u} - r_S^{1-u}|$. So, $\Delta_i < \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ if and only if $b^u < \frac{1}{|r_i^{1-u} - r_S^{1-u}|} \left(\frac{q_i}{2} \frac{\alpha}{\alpha+\beta}\right)^2$ and the result follows. ■

To finish, note that the self-serving model in Section 2.3 as well as the model without self-serving biases presented in Section 2.2. can be seen as special cases of a more general model. This general model would assume that workers adopt a new reference wage under high (low) economic conditions with probability $p_H = k + (1 - k)p$ ($p_L = (1 - k)p$) while employers would believe that workers adopt a new reference wage under low (high) economic conditions with probability $\hat{p}_H = (1 - k)p_H$ ($\hat{p}_L = k + (1 - k)p_L$) where $k \in [0, 1]$ measures the extent of self-serving biases. In the model without self-serving biases (Section 2.2), we considered the case in which self-serving biases were totally absent (i.e., $k = 0$) whereas the current section focuses on the case in which self-serving biases are maximum ($k = 1$). The general version of our models leads to conjectures which are qualitatively similar to our main predictions regarding the negative impact of unstable economic conditions and high unemployment benefits on gift-exchange.²⁸

Appendix C. An extension of the self-serving biases model

We solve a self-serving bias model where people can choose between two *malleable reference wages*: the default wage (r_S), and an alternative wage in line with the economic conditions (r_i). We interpret the default wage as the previously received wage, and the alternative as a reference wage that people can rationalize when facing economic shocks, which can be either low, stable or high.

We consider the case in which workers can, at a cost, change r_i from the status-quo to the alternative. On the one hand, workers want to have a higher reference wage so they can justify working less (i.e., generating a lower e_R for any given wage). On the other hand, employers might behave as if the worker's

²⁸ Proofs are available upon request from the authors.

reference wage coincides with what they want the reference wage to be (“wishful thinking”). In essence, our model can be seen as a generalization of the basic gift-exchange model to consider situations where workers may not only deviate from the reference level of effort (e_R) but also adjust their reference wage.

The workers’ utility function used in our self-serving model in Section 2.3 is augmented by a *rationalization* cost (B_i) which workers incur when choosing a reference wage ($w_{i,R} = r_i^{1-u}b^u$) that is different from the default ($w_{S,R} = r_S^{1-u}b^u$). Thus, in our model, workers have two control variables: effort and reference wages.

The worker’s problem is to choose a level of effort and a reference wage such that:

$$\max_{e, r_i} U(w, e, r_i) \equiv w - \alpha \frac{(e_R - e)^2}{2} - \beta \frac{e^2}{2} - B_k$$

Where $B_k = \begin{cases} \frac{1}{\rho_k} (w_{i,R} - w_{S,R}) & \text{if } r_i > r_S \\ 0 & \text{otherwise} \end{cases}$ is the worker’s rationalization cost and $\rho_k \in (0, \infty)$ can be interpreted as the degree of a worker’s self-serving bias.

In Section 2.1 we showed that for a given $w_R < w$, the optimal effort is given by:

$$e^*(w, r_i) = \frac{\alpha}{\alpha + \beta} (w - w_{i,R})^{\frac{1}{2}}$$

Substituting $e^*(w)$ in the maximand we get:

$$U(w, r_i) = w - (w - w_{i,R}) \frac{\alpha\beta}{\alpha + \beta} - B_k$$

The worker would change the reference point from r_S to r_i if the following condition is satisfied:

$$U(w, r_i) > U(w, r_S)$$

Which is true if $r_i > r_S$ and $\rho_k > \frac{\alpha+\beta}{\alpha\beta}$. Thus, if $\rho_k > \frac{\alpha+\beta}{\alpha\beta}$:

$$r_i^* = \begin{cases} r_S & \text{if } i = \{L, S\} \\ r_H & \text{if } i = H \end{cases}$$

As a result, if the degree of self-serving biases is sufficiently high, the worker will change reference wages whenever economic conditions are high. Intuitively, the worker might change their reference wages only during high economic conditions because it will create a higher sense of entitlement that will justify working less.

When making wage decisions, the employer anticipates that the worker will choose effort according to the function $e^*(w, \hat{r}_i)$ where \hat{r}_i is the employer's belief about the worker's reference wage.

The employer's problem is to choose a wage and belief about the worker's reference wage to solve the following maximization problem:

$$\max_{w, \hat{r}_i} V(w, \hat{r}_i) \equiv q_i e^*(w, \hat{r}_i) - w - B_m$$

Where $B_m = \begin{cases} \frac{1}{\rho_m}(w_{i,R} - \hat{w}_{i,R}) & \text{if } w_{i,R} > \hat{w}_{i,R} \\ 0 & \text{otherwise} \end{cases}$ is the employer's rationalization cost. In this case, $\rho_m \in$

$(0, \infty)$ can be interpreted as the degree of the employer's wishful-thinking.²⁹

The optimal wage is given by:

$$w^*(\hat{r}_i) = \hat{w}_{i,R} + \left(\frac{q_i}{2} \frac{\alpha\beta}{\alpha + \beta} \right)^2$$

Substituting $w^*(\hat{r}_i)$ in the maximand we get:

$$V(w^*, \hat{r}_i) = \left(\frac{q_i}{2} \frac{\alpha\beta}{\alpha + \beta} \right)^2 - \hat{w}_{i,R} - B_m$$

The employer would choose to believe the reference wage is the lowest possible during high economic conditions if $V(w^*, r_{S,R}) > V(w^*, r_{H,R})$ and during low economic conditions if $V(w^*, r_{L,R}) > V(w^*, r_{S,R})$. Both conditions are satisfied when $\rho_m > 1$. Therefore, if employers' wishful thinking is strong enough, their belief about the worker's reference wage will be given by:

$$\hat{r}_i^* = \begin{cases} r_L & \text{if } q = q_L \\ r_S & \text{if } q \in \{q_H, q_H\} \end{cases}$$

Finally, note that by plugging r_i^* and \hat{r}_i^* in the reference wage function, $w_{i,R} = r_i^{1-u} b^u$ and $\hat{w}_{i,R} = \hat{r}_i^{1-u} b^u$, we obtain the reference wage and beliefs described in Table 1 in the main text.

²⁹ Alternatively, $\rho_m > 0$ can be interpreted as capturing an employer with imperfect "theory of mind" (Frith and Frith, 1999). When reasoning, a person with high theory of mind is aware of the thinking process, so he is able to represent a belief as separate from the world is representing (Stanovich 2015). In other words, employers with perfect theory of mind ($\rho_m = 0$) are able to acknowledge that workers are forming self-serving reference wages, which would lead to rational beliefs ($\hat{w}_{i,R} = w_{i,R}$). Employers with imperfect theory of mind, on the other hand, lack this ability to mentalize and hence will think that their wishful-thinking beliefs are shared by workers, leading to a false sense of consensus. Of course, in a repeated interaction, employers with high theory of mind might be able to infer workers' true reference wages over time even if they start with the wrong beliefs because of lack of information about their preferences. However, people with low theory of mind will not so easily adjust their wrong beliefs, which is the essence of confirmation bias.

Appendix D. Additional Figures, Tables and Robustness analyses

	Column1	Column2	Column3	Column4	Column5	Column6	
	3.00	0.00	0.00	2.00	3.00	0.00	
	2.00	3.00	3.00	2.00	1.00	1.00	
	1.00	1.00	2.00	0.00	0.00	1.00	
	3.00	0.00	0.00	1.00	1.00	2.00	
	1.00	3.00	0.00	3.00	2.00	1.00	
	1.00	3.00	1.00	1.00	2.00	3.00	
Sum Column:							

FIGURE D1.- Example of table summation for the work task.

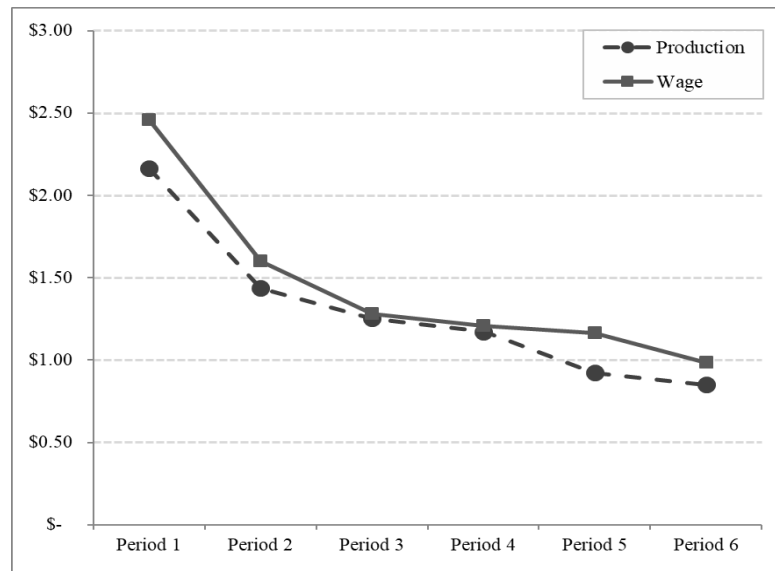


FIGURE D2. Average workers' production and wages (in \$) per period pooled across the two benefits treatments.

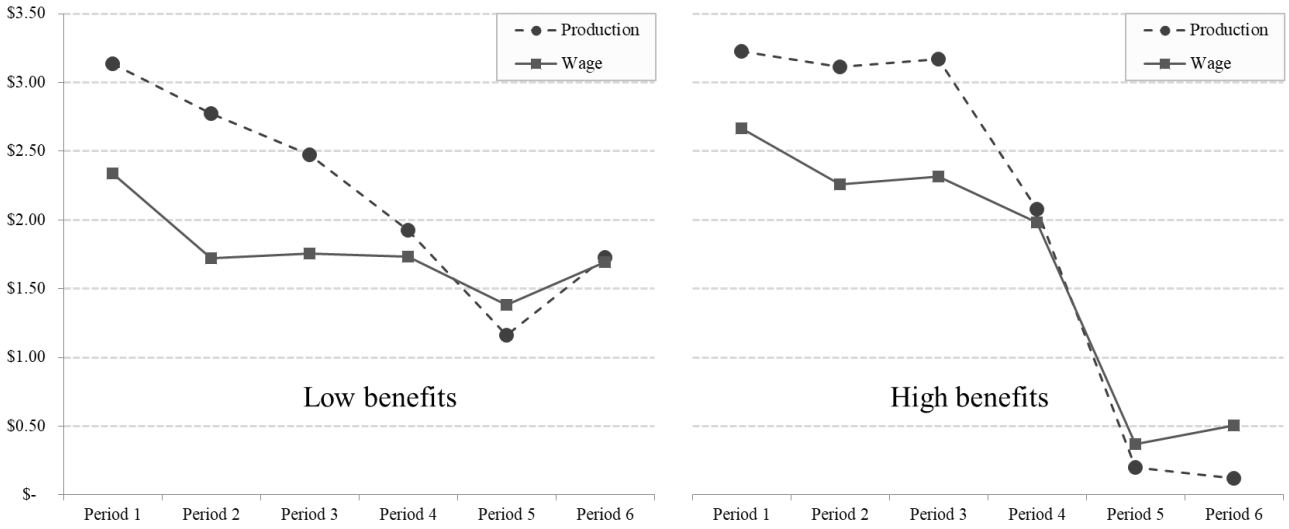


FIGURE D3. Average workers' production and effectively-paid wage (in \$) per period for the low (left panel) and high (right panel) benefits treatments.

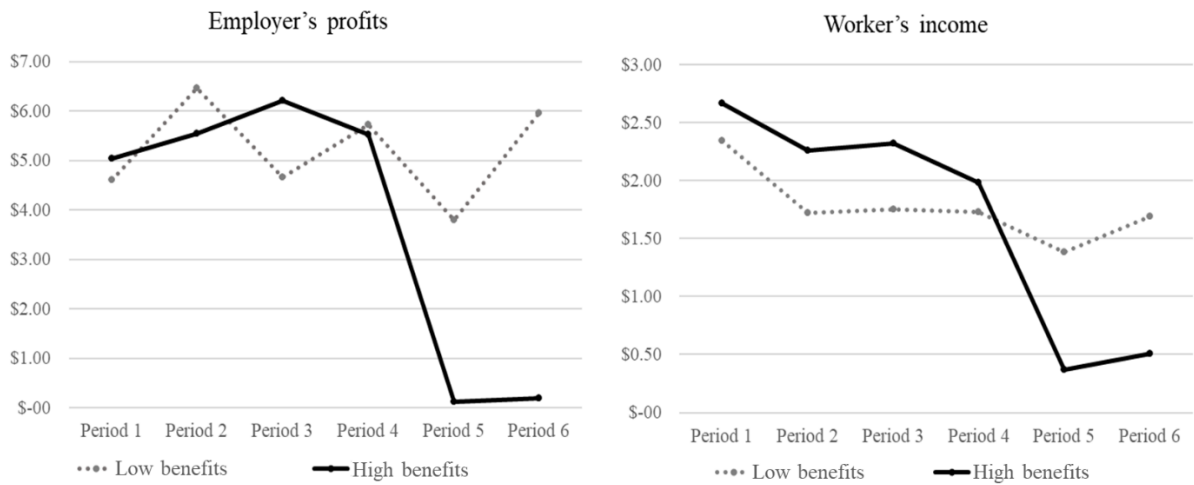


FIGURE D4. Period-evolution of average employers' profits (workers' income) across treatments in the left (right) panel.

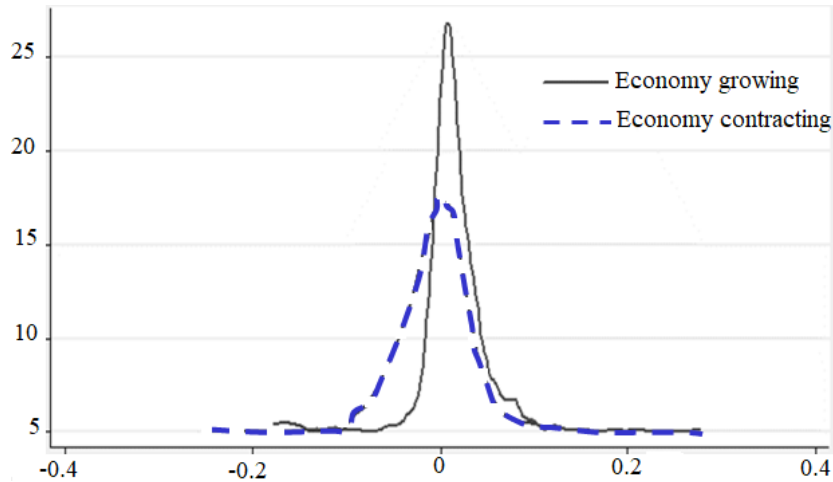


FIGURE D5. Kernel density estimates for yearly changes in real wages (in %) for all OECD countries between 1990 and 2017 for the case in which real GDP was either growing or contracting in the corresponding year.

TABLE D1.- Wage, production and internet use across treatments

Average (standard deviation)	Wage [in ¢]	Production [in ¢]	Internet use [in seconds]
Round 1			
Low benefits	192.28 (203.36)	245.62 (218.52)	127.18 (155.04)
High benefits	247.50 (202.33)	233.75 (233.19)	106.15 (160.25)
All	219.89 (204.20)	239.69 (225.46)	116.66 (157.60)
Round 2			
Low benefits	177.92 (210.80)	194.37 (265.37)	168.55 (171.88)
High benefits	195.41 (178.75)	162.92 (242.86)	174.80 (181.19)
All	186.66 (195.11)	178.65 (254.19)	171.68 (176.16)
<i>P</i> -values ³⁰			
Low vs. high (Round 1)	0.121	0.781	0.442
Low vs. high (Round 2)	0.428	0.721	0.943
Low vs. high (All rounds)	0.196	0.263	0.949
Low (Round 1 vs. Round 2)	0.401	0.018	0.002
High (Round 1 vs. Round 2)	0.002	0.010	0.001
All (Round 1 vs. Round 2)	0.008	<0.001	<0.001

³⁰ The *p*-values were calculated for the *High Benefits Dummy* or the *Round* coefficient in a linear panel regression with random effects taking each column header as dependent variable. We also added *Period* as a regressor and *Table Value* (20¢, 60¢ or 100¢) when Round 2 observations were included in the regression.

TABLE D2.- Gift-exchange: internet use and wages³¹

This table reports the results from linear [tobit] panel regressions with random effects and robust standard errors (reported in parentheses) [with a lower bound at zero and an upper bound at 600 seconds] in columns (1) and (2) [(3) and (4)]. The number of observations corresponds to the number of workers (48) multiplied by the number of rounds they played in the entire duration of the experiment which is equal to twice the number of periods.

Dependent variable: Internet use (seconds)	(1)	(2)	[3]	[4]
Intercept	48.408 (37.572)	48.910 (50.426)	-121.258* (69.017)	-86.885 (75.035)
Wage	-0.317*** (0.052)	-0.320** (0.125)	-0.813*** (0.097)	-1.026*** (0.211)
Wage \times Period		0.001 (0.027)		0.059 (0.051)
High Benefits Dummy	1.586 (25.033)	1.579 (28.069)	28.519 (57.302)	29.523 (58.088)
Table value	0.441 (0.285)	0.441 (0.285)	1.057** (0.514)	1.074** (0.513)
Period	18.583*** (6.463)	18.454* (10.587)	29.487*** (7.446)	20.516* (10.697)
Round	44.463*** (12.361)	44.464*** (12.380)	76.481*** (23.353)	75.316*** (23.299)
Observations	$n = 384$	$n = 384$	$n = 384$	$n = 384$
Prob $> \chi^2$	<0.001	<0.001	<0.001	<0.001
R ²	0.225	0.225	-	-

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

³¹ Following Cameron and Miller (2011), we also estimated standard errors using the wild bootstrap procedure because clustering at the session level given that we have only four distinct sessions per treatment is not an adequate procedure. The use of this procedure led to p -values that are similar to the ones reported in the results section. Similar results are also obtained when controlling for session fixed effects.

TABLE D3.- Gift-exchange: production and wages³²

This table reports the results from linear panel regressions with random effects and robust standard errors (reported in parentheses). The number of observations corresponds to the number of workers (32) multiplied by the number of rounds they played in the entire duration of the experiment (12).

Dependent variable:	Worker's production (1)	Internet use (2)
Intercept	297.479*** (61.368)	-7.513 (50.800)
Wage	0.448*** (0.088)	-0.311*** (0.054)
High Benefits Dummy	-48.438 (29.277)	7.233 (26.959)
Table value	1.969*** (0.517)	0.423 (0.285)
Cognitive Reflection Test scores	-41.378*** (15.303)	14.881 (18.216)
Social preferences ³³		
Prosociality	-50.221* (30.587)	11.951 (35.034)
Costly prosociality	-8.640 (39.479)	-5.397 (31.739)
Envy	31.865 (32.722)	-20.051 (30.164)
Costly envy	-8.378 (36.567)	68.729** (34.848)
Period	-48.476*** (6.456)	18.368*** (6.471)
Round	-46.028*** (17.206)	44.943 (12.350)
Observations	$n = 384$	$n = 384$
Prob > χ^2	<0.001	<0.001
R ²	0.416	0.234

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

³² Following Cameron and Miller (2011), we also estimated standard errors using the wild bootstrap procedure because clustering at the session level given that we have only four distinct sessions is not an adequate procedure. The use of this procedure led to p -values that are similar to the ones reported in the results section. Adding session fixed effect also lead to similar results.

³³ Social preferences are defined as in Bartling et al., (2009) (see p.94). People are categorized as prosocial (costly prosocial) if they choose the egalitarian allocation that gives more money to the other person at no (a) cost for themselves. The prosociality variable is binary and takes value one only if a person is categorized as prosocial (costly prosocial). People are categorized as envious (costly envious) if they choose the egalitarian allocation that gives less money to the other person at no (a) cost for themselves. The envy (costly envy) variable is binary and takes value one only if a person is categorized as envious (costly envious).

TABLE D4.- Gift-exchange: production, internet and wages per round³⁴

This table reports the results from linear panel regressions with random effects and robust standard errors (reported in parentheses). The number of observations corresponds to the number of workers (32) multiplied by the number of first or second rounds they played in the entire duration of the experiment.

Dependent variable:	Worker's production		Internet use	
	Round 1 (1)	Round 2 (2)	Round 1 (3)	Round 2 (4)
Intercept	352.605*** (42.400)	134.205*** (32.525)	115.413*** (28.271)	154.773*** (35.011)
Wage	0.398*** (0.079)	0.558*** (0.135)	-0.331 (0.050)	-0.326*** (0.062)
High Benefits Dummy	-32.555 (34.094)	-34.172 (31.993)	-1.487 (24.328)	7.287 (30.698)
Table value		1.787 (0.573)		0.436 (0.311)
Period	-53.857*** (7.981)	-42.657*** (7.178)	21.436*** (6.661)	13.072* (7.809)
Observations	$n = 192$	$n = 192$	$n = 192$	$n = 192$
Prob > χ^2	<0.001	<0.001	<0.001	<0.001
R ²	0.327	0.456	0.215	0.173

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

³⁴ Following Cameron and Miller (2011), we also estimated standard errors using the wild bootstrap procedure because clustering at the session level given that we have only four distinct sessions per treatment is not an adequate procedure. The use of this procedure led to p -values that are similar to the ones reported in the results section. Adding session fixed effect also lead to similar results.

Table D5.- Gift-exchange interaction between economic conditions and benefits³⁵

This table reports the results from linear [tobit] panel regressions with random effects and robust standard errors (reported in parentheses) [with a lower bound at zero] in columns (1) and (2) [(3) and (4)]. The number of observations corresponds to the number of workers multiplied by the number of second rounds they played in the entire duration of the experiment.

Dependent variable:	Low benefits	High benefits	Low benefits	High benefits
Table Production	(1)	(2)	[3]	[4]
Intercept	4.004*** (0.856)	5.130*** (0.826)	3.940*** (1.184)	5.724*** (1.075)
Wage	0.007*** (0.002)	0.008*** (0.002)	0.009*** (0.003)	0.012*** (0.003)
Wage × Stable Conditions Dummy	0.004*** (0.001)	0.006*** (0.002)	0.005 (0.004)	0.009** (0.005)
Stable Conditions Dummy	-1.138** (0.578)	-1.461** (0.661)	-1.771 (1.281)	-2.834** (1.408)
High Conditions Dummy	-0.785 (0.819)	-1.608** (0.669)	-1.518 (0.979)	-2.870*** (1.069)
Period	-0.436*** (0.121)	-0.914*** (0.143)	-0.804*** (0.239)	-1.677*** (0.240)
Observations	$n = 96$	$n = 96$	$n = 96$	$n = 96$
Prob > χ^2	<0.001	<0.001	<0.001	<0.001
R ²	0.439	0.533		

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

³⁵ Following Cameron and Miller (2011), we also estimated standard errors using the wild bootstrap procedure because clustering at the session level given that we have only four distinct sessions is not an adequate procedure per treatment. The use of this procedure led to p -values that are similar to the ones reported in the results section.

TABLE D6.- Real wages and GDP growth

This table reports the results from linear panel regressions with robust standard errors (reported in parentheses) and country and year fixed effects for yearly changes in real wages (in %) in the 35 OECD countries between 1990 and 2017.³⁶

Dependent variable:		
	Real wages growth (%) in year t	
	Expansion years (GDP growth > 0)	Recession years (GDP growth < 0)
Years	(1)	(2)
Intercept	0.012 (0.007)	-0.022 (0.036)
GDP growth (%) in year t	0.083 (0.150)	0.988*** (0.223)
GDP growth (%) in year $t-1$	0.136** (0.059)	-0.029 (0.209)
Country and year fixed effects	Yes	Yes
Observations	$n = 787$	$n = 62$
Prob > χ^2	<0.001	<0.001
R ²	0.355	0.894

* p -value<0.10, ** p -value<0.05, and *** p -value<0.01

³⁶ This excludes the two countries which recently joined the organization: Latvia (in 2016) and Lithuania (in 2018).