Online Appendix for "On the power of surprising versus anticipated gifts"

August 26, 2025

A Figures

Figure 1: Average effort by period and wage schedule.

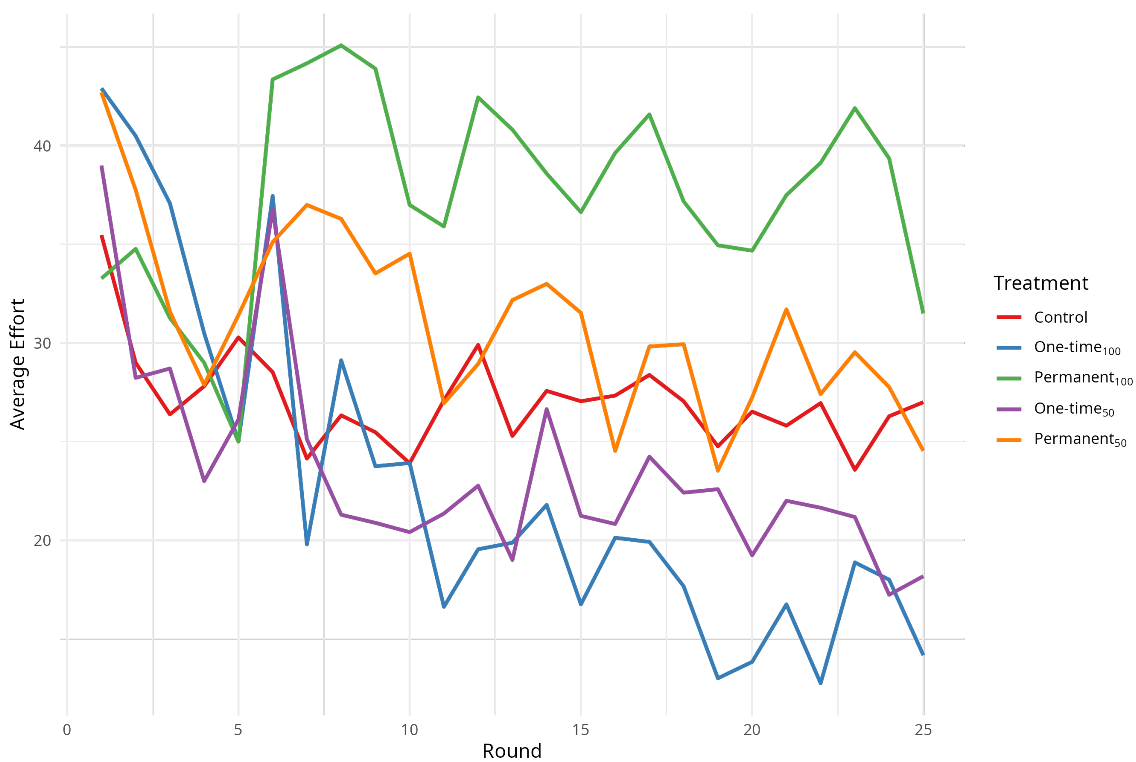
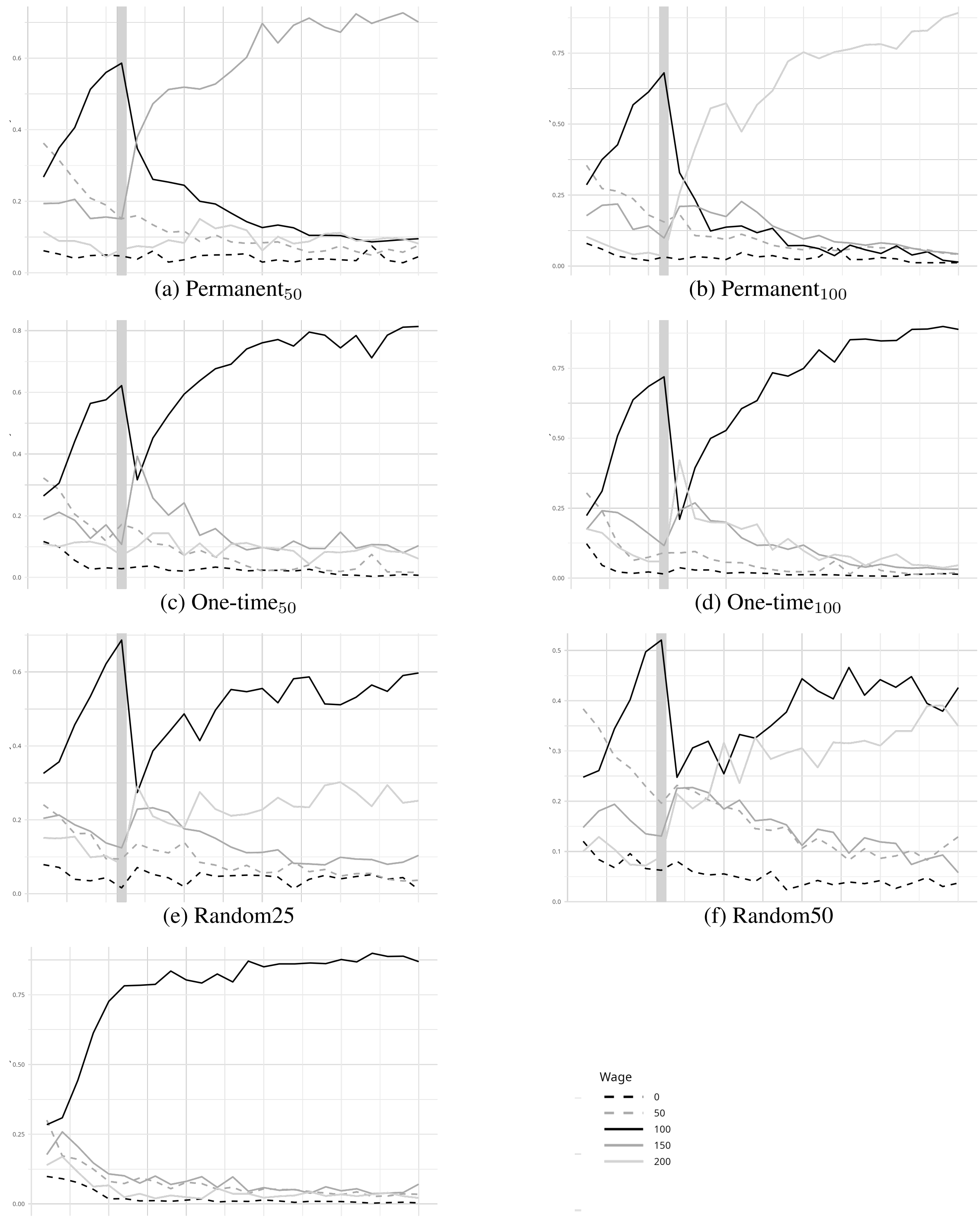


Figure 2: Median beliefs about the probability of each wage by period in each treatment. The "Random25" and "Random50" treatments are not discussed in the main text but are included here; see Online Appendix C below.



(a) Permanent_{50} (b) Permanent_{100}

(c) One-time_{50} (d) One-time_{100}

(e) Random25 (f) Random50

(g) Control

	(1)	(2)
Permanent$_{100}$	6.417	13.235
	(9.172)	(5.944)**
Surprise	0.121	0.121
	(0.049)**	(0.049)**
Baseline effort		1.059
		(0.157)***
Constant	28.505	24.927
	(5.589)***	(3.731)***
R^2	0.02	0.50
N	780	780
Controls?	N	Y

Table 1: OLS regression of effort levels in periods 6-25 in the Permanent$_{100}$ and Permanent$_{50}$ treatments. Standard errors are robust and clustered by worker. "Surprise" is the average, by round and treatment, of individual evaluation of the current wage, as defined in the text. Controls include gender and economic student status, and controls and baseline effort are all centered to have mean zero. Statistical significance denoted at the 10% (*), 5% (**) and 1% (***) levels.

B Appendix: An alternative measure of surprise

In this section, we develop an alternative theory-driven measure of surprise to that used in Table **??** in the main text. This time, the "surprise" variable is now a continuous measure defined as in the stochastic reference point model. For an individual who beliefs that wage level w_i will be paid with probability p_i, their reference-dependent evaluation of the wage w is $\sum_i \eta \lambda^{\mathbb{1}(w<w_i)} p_i(K(w) - K(w_i))$. For participants in the Permanent$_{100}$ treatment, the wage is always in the gain domain, and so λ is irrelevant. For participants in the Permanent$_{50}$ treatment, we use a value of $\lambda = 2$ when calculating the loss that participants feel when considering the possibility that they might have been paid 200 ECUs instead of 150. (Regression coefficients are nearly identical if instead choosing $\lambda = 1$). Additionally, when comparing two discrete wage levels, η and K can be ignored without loss of generality. We therefore calculate individual surprise as $\sum_i p_i(w - w_i)2^{\mathbb{1}(w<w_i)}$. Lastly, because individual surprise on a period-by-period basis is very noisy, we use the average value of surprise in each round of each treatment as a measure of "objective", rather than idiosyncratic, surprise. Using idiosyncratic surprise instead eliminates the relationship shown, as expected from severe attenuation bias. Table 1 confirms the importance of surprise for the impact of bonuses. When a permanent raise is granted, the impact on effort is greatest immediately afterwards when it is most surprising. This effort response decreases significantly as workers grow accustomed to it. Controlling for baseline effort and demographics in Column 2 does not affect this finding at all, but does indicate that effort is higher overall when the raise is larger.

C Random wage treatments

Beyond the Permanent and One-time gifts treatments, we also implemented two ”Random” wage treatments, in which a small or large wage increase was randomly granted across periods. In the Random25 and Random50 treatments, in each period, subjects received a gift of 100 ECU with a 25% and 50% likelihood, respectively, after an initial gift in period 6.[1] These treatments introduce more complex dynamics by varying wages throughout the work relationship, implementing a stochastic wage contract of the type analyzed in Section **??**. They, however, offer similar insights to those of the main treatments.

Figure Figure 2 in Online Appendix A above shows that the wage expectations in these treatments follow similar adaptation pattern as in main five treatments. That is, in the Random treatments, the period-6 gift is surprising, and by period 17, subjects expect a gift with an accurate probability.

Table 2 the positive response to the higher wage wanes over the course of the study as expectations approach equilibrium values, although this decrease is not statistically significant in the Random25 treatment. Columns 3 and 4 show that effort also slightly decreases in the low-wage periods, indicating that negative reciprocity towards low wages may be arising as low wages come to be interpreted in the loss domain, but this decrease is not statistically significant. This pattern overall is consistent with our prediction that surprising gifts cannot be used repeatedly as effectively as credible one-time gifts in short-term interactions and is similar to our findings of waning reciprocity in the Permanent_{50} and Permanent_{100} treatments. However, because no gifts were profitable in our setting even when surprising, our random treatments don't provide any additional illustration of the backfiring effect of repeated gifts, and so we omit these treatments from our main analysis.

[1] In the Random25 treatment, subjects actually received the gift in periods 6, 10, 15, 17, and 22. In Random50, the gift was delivered in periods 6, 8, 9, 11, 15, 16, 18, 21, 24, and 25.

	Wage= 200		Wage= 100	
	Random50	Random25	Random50	Random25
Round number	-0.400	-0.142	-0.075	-0.147
	(0.225)*	(0.387)	(0.301)	(0.202)
Baseline effort	0.738	0.666	0.664	0.571
	(0.140)***	(0.240)***	(0.070)***	(0.189)***
Constant	40.613	35.753	26.950	26.367
	(4.029)***	(6.129)***	(4.518)***	(2.873)***
R^2	0.41	0.25	0.49	0.35
N	330	160	330	480
Controls?	Y	Y	Y	Y

Table 2: OLS regression of effort levels in periods 6-25 in the Random25 and Random50 treatments, separately for rounds with high (200) and low (100) wages. Standard errors are robust and clustered by worker. Controls include gender and economic student status, and controls and baseline effort are all centered to have mean zero. Statistical significance denoted at the 10% (*), 5% (**) and 1% (***) levels.

D The effort response to a fully surprising wage cut

Building on the analysis of Section **??**, here we show that awareness about a wage cut matters: managing expectations prior to a wage cut can ameliorate the effort decrease induced by negative reference-dependent reciprocity. This is important as, unsurprisingly, when firms cut wages, workers frequently respond by reducing effort (Lee & Rupp 2007, Krueger & Mas 2004, Kube, Maréchal & Puppe 2013).[2]

To formalize the role of full surprises in the response to a wage cut, we extend K to negative values. In accordance with prospect theory, which holds that people have diminishing sensitivity to both gains and losses, we assume that K is convex over $\mathbb{R}^-$. In particular, for simplicity, assume that K is rotationally symmetric around $\underline{w}$: $K(\underline{w}+w) = -K(\underline{w}-w)$ for all w.

The worker anticipates $\underline{w}$ and plans to exert effort $\underline{e}$, but he is surprised by a wage cut $w_c < \underline{w}$. With this new information, the worker's problem is to immediately choose an effort level e^* to maximize his utility given his (unrealized) reference point. This e^* solves

$$e^* \in \operatorname*{argmax}_e w_c - \frac{\gamma}{2}(e-\underline{e})^2 + \eta\mu(-\frac{\gamma}{2}(e-\underline{e})) + \alpha\eta\mu(K(w_c) - K(\underline{w}))\mu(b(e-\underline{e}) - (w_c - \underline{w})) \quad (1)$$

where $K(w_c) - K(\underline{w}) < 0$. Depending on whether the worker reduces effort enough to hurt the firm's profits on net (e_l) or not (e_g), the two potential interior solutions to this optimization problem (not at the kink) are derived from the first-order condition of this utility function. These effort levels, and the wage cut sizes for which they indeed correspond to local maxima, are,

$$e_g - \underline{e} = \frac{\alpha\eta\lambda K(w_c)b}{\gamma(1+\eta\lambda)} \qquad \Leftrightarrow \qquad \frac{\alpha\eta\lambda K(w_c)b^2}{\gamma(1+\eta\lambda)} > w_c - \underline{w} \quad (2)$$

and

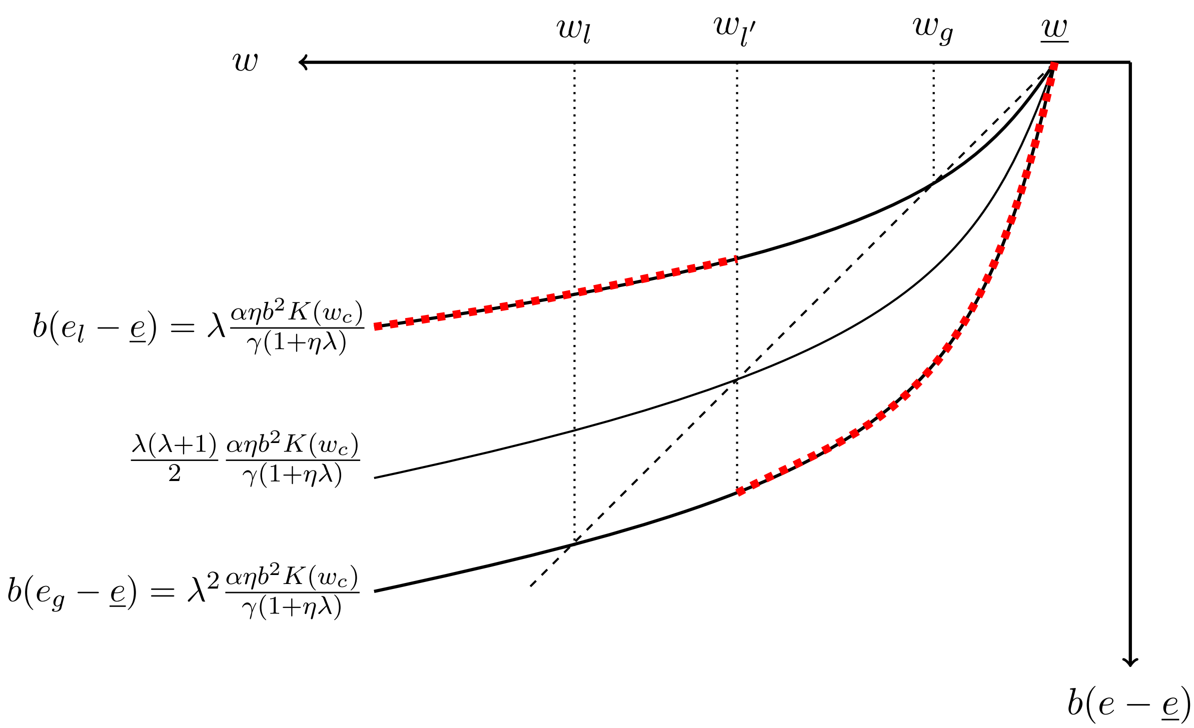
$$e_l - \underline{e} = \frac{\alpha\eta\lambda^2 bK(w_c)}{\gamma(1+\eta\lambda)} \qquad \Leftrightarrow \qquad \frac{\alpha\eta\lambda^2 K(w_c)b^2}{\gamma(1+\eta\lambda)} < w_c - \underline{w}. \quad (3)$$

Figure 3 shows with a red line the worker's response in terms of decreased revenue $b(e-\underline{e})$ as a function of the size of the wage cut. As before, the diagonal line is the break-even profit line where the decrease in revenue equals the savings from the cut; above the line it is profitable to cut wages and below the line it is not. The first dotted concave curve (closer to the x-axis) shows the revenue decrease that occurs when the worker responds with e_g, as defined in equation (2). Since he only does this when profits increase as a result of the wage cut, he follows this curve as long as it is below the diagonal, or equivalently, if the wage is smaller than the threshold $w_g = \underline{w} + \frac{\alpha\eta K(w_g)b}{\gamma(1+\eta\lambda)}$, which makes the inequality in (2) hold with equality. Similarly, the second dotted concave curve (the one further below from the x-axis) shows the revenue decrease that occurs when the worker chooses e_l, as defined in equation 3. Since he only does this when this revenue does not

[2] The effort reduction in response to a wage cut does not seem to depend on the nature of the employer-employee relationship, however. Chen & Horton (2016) show that wage cuts harm effort even in online labor markets where the employment contract resembles a spot contract more than a labor contract.

compensate for the cost of the gift, he follows this curve as long as he is in the loss domain, i.e., below the diagonal line or equivalently, if gifts are greater than a threshold $w_l = \underline{w} + \frac{\alpha\eta\lambda K(w_l)b}{\gamma(1+\eta\lambda)}$, which makes the inequality in (3) hold with equality. Since $w_l < w_g$, notice that—to the contrary of Figure **??**—for wages between w_l and w_g, both e_l and e_g, are local best responses. The proof of Proposition 1 shows that for this range there exists a $w_{l'}$, $w_l < w_{l'} < w_g$, such that e_g is optimal when $w_c < w_{l'}$ and e_l is optimal when $w_c > w_{l'}$. Thus, the agent never prefers effort at the kink $e = \underline{e} - (\underline{w} - w_l)/b$ and the decreased revenue is discontinuous at $w_{l'}$.

Figure 3: Revenue response function to fully surprising wage cut



The discontinuity in this response function is the key qualitative difference between the wage raise and the wage cut cases. In the wage raise case, small gifts are easily reciprocated, but as the wage rises and reciprocation becomes more expensive, workers are strongly dissuaded from switching to the loss domain by the loss aversion parameter, which increases the weight on reciprocation when in the loss domain. Workers therefore toe the line by exactly reciprocating profits until the wage rises enough that even reciprocating that much is too expensive to be worthwhile. On the other hand, in the wage cut case, small cuts are easily punished. When the cut gets large enough, the worker no longer wants to fully punish the cut, and switching to partial punishment *reduces* the weight on reciprocity, creating the discrete drop in punishment at that point.

The resulting revenue response function in Figure 3 shows that, whatever the size of the wage cut, the worker responds with a drop in effort. But had the wage cut been anticipated, Lemma **??** would have applied and effort would not have decreased at all. Proposition 1 summarizes:

Proposition 1 *A worker who is expecting to receive $\underline{w}$ with certainty but who surprisingly receives $w_c < \underline{w}$ and does not have time to update his expectations, responds with effort*

$$e^* = \underline{e} - \begin{cases} \frac{\alpha\eta\lambda^2 bK(w_c)}{\gamma(1+\eta\lambda)} & \text{if } w_c > w_{l'} \\ \frac{\alpha\eta\lambda K(w_c)b}{\gamma(1+\eta\lambda)} & \text{if } w_c < w_{l'} \end{cases}$$

where $w_{l'} = \underline{w} + \frac{\lambda(\lambda+1)}{2}\frac{\alpha\eta b^2 K(w_l)}{\gamma(1+\eta\lambda)}$ *and* w_l *solves* $w - \underline{w} = \frac{\alpha\eta\lambda K(w)b}{\gamma(1+\eta\lambda)}$ *for* w.

Proof of Proposition 1

Proceeding as in the proof of Corollary **??**, as shown in the text, the possible optima that are not at the kink in the utility function, and the profit constraints that they require/imply, are given by

$$e_g = \underline{e} + \frac{\alpha\eta\lambda K(w_c)b}{\gamma(1+\eta\lambda)} \qquad \text{requiring} \qquad w_c - \underline{w} < \frac{\alpha\eta\lambda K(w_c)b^2}{\gamma(1+\eta\lambda)}. \tag{4}$$

and

$$e_l = \underline{e} + \frac{\alpha\eta\lambda^2 K(w_c)b}{\gamma(1+\eta\lambda)} \qquad \text{requiring} \qquad w_c - \underline{w} > \frac{\alpha\eta\lambda^2 K(w_c)b^2}{\gamma(1+\eta\lambda)} \tag{5}$$

The middle black line in Figure 3 shows the curves defined by the RHS of these profit constraints, so that the inequalities hold with equality when $w_c = w_g$ and $w_c = w_l$ respectively, so that e_g is a valid local optimum when $w_c < w_g$ and e_l is a valid local optimum when $w_c > w_l$.

The worker must then compare these options, when they exist, to the kink in his utility function. The utilities of all three options are derived similarly to the positive reciprocity case. Comparing e_g or e_l to $\underline{e} + (w_c - \underline{w})/b$, we find that the utility at the kink is never optimal, similarly to the demonstration in the proof of Corollary **??**; the difference between these propositions is that either e_g or e_l is always an available option in the negative surprise case, so that $\underline{e} + (w_c - \underline{w})/b$ is in fact never chosen. That is, $w_l < w_g$, to the contrary of Corollary **??**.

In the region between w_g and w_l where both e_l and e_g are valid optima, the worker prefers e_l to e_g only when

$$w_c - \underline{w} > \frac{\lambda(\lambda+1)}{2}\frac{\alpha\eta b^2 K(w_l)}{\gamma(1+\eta\lambda)}.$$

Define $w_{l'}$ as the value of w_c that makes this relationship hold with equality.

This relationship is a multiple of the revenue response curves that also determine the validity of the profit constraints above, so they are shown on Figure 3 together. By noticing that because $\lambda > 1$ and $1 < \frac{\lambda+1}{2} < \lambda$, the aggregate set of conditions imply that e_l is chosen for $w_c > w_{l'}$, and e_g is chosen otherwise. Regardless, a surprising wage cut is negatively reciprocated.

Extreme or corner cases in which w_c and/or w_g/w_l are $\underline{w}$ are straightforward to account for.

As before, in order to focus on the effect of surprises, we have not included non-reference-dependent reciprocity in levels. Nonetheless, Proposition 1 is qualitatively robust to the inclusion of such preferences; negative reciprocity is made worse by the surprise factor. Indeed, if a surprising wage cut occurs when workers are being paid above-market wages and exerting above-minimum effort, retaliation is even cheaper and more damaging for the firm. These issues are discussed in Online Appendix E below for interested readers.

We can also compare the size of the effort response between raises and equivalently sized cuts. This is most easily done by comparing Figure **??** in the main text to Figure 3 (rotated $180°$). Note that the point labeled w_l in Figure **??** exactly corresponds to the point labeled w_g in Figure 3. Then it is easy to see that small wage raises provoke a smaller effort response than equivalently sized cuts, but large wage cuts and raises are responded to in equal magnitude:[3] Corollary 1 summarizes the effect of surprising wage cuts relative to anticipated cuts (analogously to Corollary **??**) and relative to surprising raises.

Corollary 1 *Retaliation against wage cuts is worse for surprising than for anticipated cuts. Furthermore, surprising wage cuts are reciprocated at least as strongly as equivalently sized surprising wage increases.*

The predicted asymmetry between wage cuts and wage increases in corollary 1 is well grounded in the experimental evidence. Hannan (2005) modifies a standard laboratory gift-exchange experiment to add an exogenous shock to the firm's profit after which firms and workers can change their wage and effort choices. She finds that adjusting wages downwards has a negative impact on effort choice, which is twice as large as the effect of a wage increase of the same magnitude. Field evidence also supports this asymmetry. Kube, Maréchal & Puppe (2013) hired workers for a data-entry task for a "projected" wage of 15 Euros. Right before work, one group of workers received a wage cut to 10 Euros and the other group a wage raise to 20 Euros. They found that cutting the payment reduced average output by 20% relative to the control that received the expected 15 Euros, while the high wage group did not exhibit increased effort even though effort did respond positively to monetary incentives. [4] These results are in line with the well established stylized fact that firms are reluctant to cut wages to avoid hurting workers' "morale" (e.g., Bewley (2009)).

[3]The asymmetric response of effort to wage increases vis-a-vis wage decreases is well established in the empirical literature (Offerman 2002, Al-Ubaydli & Lee 2009, Kube, Maréchal & Puppe 2013). Moreover, this asymmetry has also been established in prices in general (Ahrens, Pirschel & Snower 2017).

[4]To test whether the lack of positive reciprocity was due to workers being unable to reciprocate, they hired workers for a piece rate and verified that there was room for a productivity increase above the baseline. Workers, however, were recruited under the piece rate, opening the possibility that the subjects working for the piece rate where more productive workers relative to those hired for a fixed wage.

E Appendix: Non-reference-dependent reciprocity

Incorporating baseline (non-reference-dependent) reciprocity into the model leads to the following utility function for workers:

$$u(e, w|\tilde{e}, \tilde{w}) = w - c(e) + \alpha K(w)\pi(e, w) + \mu(c(\tilde{e}) - c(e)) + \alpha\mu(K(w) - K(\tilde{w}))\mu(\pi(e, w) - \pi(\tilde{e}, \tilde{w})).$$

This utility function implies that workers generally reciprocate higher wages with higher effort. But it also affects the reciprocal response to surprising wage changes. This response is now moderated by the expected wage in addition to the gift wage and reservation wage, because workers may already be planning to exert above-minimal effort in order to reciprocate (positively or negatively) any expected wage that departs from the reservation wage.

Assuming that workers are hired at their reservation wage $\underline{w}$ and then surprised with a higher wage w_h thus leads to a greater reciprocal response than what is found in our primary analysis (see below). But if higher wages are profitable for the firm even without surprises, it makes sense for the firm to choose a higher wage from the beginning. This higher wage would thus be incorporated into the workers' reference points, and additional surprising wage changes would lead to positive or negative reciprocity relative to a baseline effort level that is higher than $\underline{e}$. As shown below, this makes positive surprising gifts less likely to exist, to the extent that a firm who is fully exploiting its workers' baseline reciprocity has *no* further room for profitable surprising gifts. It also greatly amplifies the dangers of failing to manage workers' expectations about future gifts. Our assumption of baseline reciprocity thus serves not only to emphasize the role of surprises, but represents a relatively agnostic and generous stance regarding the potential for profitable gift exchange.

First consider the response to a surprising wage w_h paid to workers who are expecting $\underline{w}$ with certainty. This is exactly the situation considered in Corollary **??**, but with baseline reciprocity.

As in Corollary **??**, upon realizing the high wage, workers maximize $U(e, w|\underline{e}, \underline{w})$. The first-order condition implies that

$$e = \underline{e} + \frac{\alpha b K(w_h)(1 + \eta\mu'_\pi)}{\gamma(1 + \eta\lambda)}$$

(so long as μ'_π exists). This gift is profitable when w_h is sufficiently small, in which case $\mu'_\pi = 1$ and $e = \underline{e} + \frac{\alpha b K(w_h)(1+\eta)}{\gamma(1+\eta\lambda)}$. Compared to the effort response in Corollary **??**, $e = \underline{e} + \frac{\alpha b K(w_h)}{\gamma(1+\eta\lambda)}$, this is a larger degree of positive reciprocity, as expected.

However, once this high wage w_h has been incorporated into expectations, effort does not wane back to the minimal level $\underline{e}$. Instead, workers maximize their non-reference-dependent utility, which requires $c'(e) = \alpha b K(w_h)$ or $e = \frac{\alpha b}{\gamma} K(w_h) + \underline{e}$. The reader can verify that the optimal surprising wage raise is larger than the optimal wage once expectations have updated, and that any time there exists a profitable fully-surprising wage raise there is also a profitable fully-expected wage greater than the reservation wage. This suggests that any firm who wishes to use surprising gifts will not be starting from the reservation wage at all.

Following this reasoning, let's assume that the firm starts with a contracted wage at the optimal level, taking into account baseline reciprocity. Workers who anticipates a wage $\tilde{w} > \underline{w}$ maximize their non-reference-dependent utility, yielding $\tilde{e} = \underline{e} + \frac{\alpha b}{\gamma} K(\tilde{w})$ as above. The firm, anticipating this, maximizes its profits $\frac{\alpha b^2}{\gamma} K(\tilde{w}) - \tilde{w}$, yielding $K'(\tilde{w}) = \frac{\gamma}{\alpha b^2}$. With this as the expected wage, the firm then surprises the worker with a gift wage $w_h > \tilde{w}$. We can show that there is never any such wage that can lead the firm to higher profits, even in a one-shot interaction.

To see this, assume towards contradiction that such a wage $w_h > \tilde{w} = K'^{-1}\left(\frac{\gamma}{\alpha b^2}\right)$ exists that workers will respond to in such a way as to increase the firm's profits beyond what they would earn by sticking with the expected wage $\tilde{w}$. The worker responds to this surprise by choosing a new level of effort e_g satisfying the first order condition $\gamma(1 + \eta\mu_c')(e_g - \underline{e}) = \alpha b K(w_h)(1 + \eta\mu_\pi') - \alpha\eta b\mu_\pi' K(\tilde{w})$, where following the notation in the proof of Corollary **??**, $\mu_c' = \mu'(c(\tilde{e}) - c(e_g))$. As opposed to that result, it is now possible for the worker to choose a level of effort with a lower cost than planned. Two kinks in the utility function exist, corresponding to the two dimensions of reference dependence.[5]

Because we are assuming that $\pi(e_g, w_h) > \pi(\tilde{e}, \tilde{w})$, and this can only happen if the worker increases effort (and the cost of effort) relative to his plan, $\mu_c' = \lambda$ and $\mu_\pi' = 1$. We can therefore define the function $e_g(w_h) = \underline{e} + \frac{\alpha b((1+\eta)K(w_h) - \eta K(\tilde{w}))}{\gamma(1+\eta\lambda)}$ that represents the effort response to the wage w_h *given* that this effort will in fact increase the firm's profits.

Now if we imagine a graph akin to Figure **??**, plotting the revenue response $r(w_h) = b(e_g(w_h) - \tilde{e})$ as a function of the wage w_h, the curve $r(w_h)$ *must* rise above the 45-degree line $w_h - \tilde{w}$ in order for this effort response to successfully raise the firm's profits. Because of the concavity of K, this is equivalent to requiring that $\frac{\partial}{\partial w_h} r(w_h)|_{w_h=\tilde{w}} > 1$. But using the form of $e_g(w_h)$ above, this quantity equals $\frac{\alpha b^2(1+\eta)K'(w_h)}{\gamma(1+\eta\lambda)}|_{w_h=\tilde{w}} = \frac{\alpha b^2(1+\eta)\left(\frac{\gamma}{\alpha b^2}\right)}{\gamma(1+\eta\lambda)} = \frac{1+\eta}{1+\eta\lambda}$, which is always strictly less than 1. We have therefore contradicted our assumption that $e_g(w_h)$ does improve the firm's profits, for any possible $w_h > \tilde{w}$.

Our interpretation of these results is that the potential for profitable surprising gifts is mitigated by baseline reciprocity. This can be elaborated on further by examining the response to wage cuts relative to an above-market wage, which is intuitively strongly negatively reciprocated because it is a very cheap punishment to withdraw high effort. Combining this effect with the mitigated positive response to positive surprises, it is also intuitive that the potential for repeated gifts to be profitable is also lessened relative to the model analyzed in our primary results. Our analysis thus paints a perhaps overly-pessimistic view of reciprocity overall, but presents the most optimistic possible case for surprising gifts.

[5] Technically, three kinks exist because there are two points, symmetric around $\underline{e}$, at which effort costs cross from the gain domain to the loss domain. But it is trivially seen that in this case the worker would never consider effort below the lower kink, so we will ignore this region of the utility function.

References

Ahrens, Steffen, Inske Pirschel, and Dennis J. Snower. 2017. "A theory of price adjustment under loss aversion." *Journal of Economic Behavior and Organization*, 134: 78–95.

Al-Ubaydli, Omar, and Min Sok Lee. 2009. "An experimental study of asymmetric reciprocity." *Journal of Economic Behavior and Organization*, 72(2): 738–749.

Bewley, Truman F. 2009. *Why Wages Don't Fall During a Recession.* Harvard University Press.

Chen, Daniel L., and John J. Horton. 2016. "Are online labor markets spot markets for tasks? A field experiment on the behavioral response to wage cuts." *Information Systems Research*, 27(2): 403–423.

Hannan, R. Lynn. 2005. "The combined effect of wages and firm profit on employee effort." *Accounting Review*, 80(1): 167–188.

Krueger, Alan B., and Alexandre Mas. 2004. "Strikes, scabs, and tread separations: Labor strife and the production of defective Bridgestone/Firestone tires." *Journal of Political Economy*, 112(2): 253–289.

Kube, Sebastian, Michel André Maréchal, and Clemens Puppe. 2013. "Do wage cuts damage work morale? Evidence from a natural field experiment." *Journal of the European Economic Association*, 11(4): 853–870.

Lee, Darin, and Nicholas G. Rupp. 2007. "Retracting a gift: How does employee effort respond to wage reductions?" *Journal of Labor Economics*, 25(4): 725–761.

Offerman, Theo. 2002. "Hurting hurts more than helping helps." *European Economic Review*, 46(8): 1423–1437.

F Experimental Protocol

This Appendix contains the complete experimental instructions and screen shots, for workers and then employers. In repeating rounds, representative rounds for each role are shown.

WORKER INSTRUCTIONS

Instructions

Please read these instructions carefully before proceeding! You will be asked several questions on the next page to make sure you understand your task.

In this game you will play the role of a "worker" who will do a job for your "employer" during 25 work periods. In each period, you will receive a wage and will respond to it with effort.

By receiving a wage and exerting effort, in each period you will earn Experimental Credit Units (ECUs). At the end of the study your accumulated ECUs be converted to dollars at a rate 400 ECUs = 1 AUD, and will be paid in cash before you leave. You will also receive a $10 show-up fee.

Wages and effort are chosen as follows:

- Your employer will set the wage for **all** your work periods **before** you start working. S/he will not be able to adjust any period's wage once you start working.
- You will learn each period's wage right before working in that period.
- Once you observe your wage for a given period, you will choose an "effort" level for that period. This is a number between 0 and 100.

Each unit of effort costs you one ECU and earns 3 ECUs for your employer. Therefore your total payment in each period is:

Your payment: wage - effort

And your employer's total payment in each period is:

Employer's payment: 3 x effort - wage

Consider an example:

Suppose that your employer chooses to pay you a total wage of 50 ECUs in the first work period. After learning this wage, you choose an effort level of 20.

In this situation, you would earn a total of 30 ECUs: 50 ECUs in wages minus 20 ECUs paid for "effort".

Your employer would earn 10 ECUs: 20 times 3 provides an income of 60. After paying you 50 ECUs, the employer is left with 60 - 50 = 10 ECUs.

Next

Understanding check

1. If you choose an effort level of 100, it would cost you:

- ○ 50 ECUs.
- ○ 100 ECUs.
- ○ 200 ECUs.

2. If you choose an effort level of 100, it will create this much income for your employer:

- ○ 300
- ○ 400
- ○ 500

3. If the employer pays a wage of 200 ECUs and you choose an effort level of 100, you will earn ____ and your employer will earn ____:

- ○ 100; 300
- ○ 200; 100
- ○ 100; 100

Submit

Beginning of work periods

Your employer has now chosen your wages for all 25 work periods. These work periods will begin on the next page. In each period you will learn your wage and choose an effort level. Your employer will spend this time taking a survey for an unrelated study.

Remember: Your wages are already set for all periods! Your employer will not be able to see your effort levels until the end and will not be able to update their chosen wages at any time.

Next

Wage expectations

In each period we will also ask you what wage you expect to be paid in that period, from the five possible wages: 0, 50, 100, 150, and 200. Each question like this will allow you to earn up to 50 ECUs. The best way to maximize your earnings on these questions is to accurately report how *likely* you think each possible wage is.

Consider an example: Suppose you think that there is a 20% chance that the wage will be 0 and an 80% chance that it will be 50. (You think every other possible wage has a 0% chance of happening.) **You will earn the most ECUs, on average, if you answer 20% for wage 0 and 80% for wage 50**. *Don't* try to guess exactly which wage you will receive because if you're wrong you will lose out on many ECUs.

In this example, if you guessed that there is a 100% chance of wage 50, then if the wage is in fact 50, you would earn 50 ECUs. But if the wage is 0, you will earn none. On the other hand, if you guess 20% and 80% as recommended, then if the wage is 50 you will still earn **48 ECUs**, and if it's 0 you will earn **18 ECUs**. It's therefore better to guess an accurate percentage chance.

Now try guessing the wage you will receive in work period number 1:

There are five possible wage levels: 0, 50, 100, 150, and 200. How likely do you think it is that you will receive each wage in period 1? Please indicate the percentage chance you think applies to each wage. Your answers must sum to 100%.

Remember: You can earn up to 50 ECUs for guessing these percentages accurately.

likelihood wage is **0:** **0** percent

likelihood wage is **50:** **0** percent

likelihood wage is **100:** **0** percent

likelihood wage is **150:** **0** percent

likelihood wage is **200:** **0** percent

Total (must equal 100): 0

Submit

Wage expectations

There are five possible wage levels: 0, 50, 100, 150, and 200. How likely do you think it is that you will receive each wage in period 2? Please indicate the percentage chance you think applies to each wage. Your answers must sum to 100%.

Remember: You can earn up to 50 ECUs for guessing these percentages accurately.

likelihood wage is **0:** **0** percent

likelihood wage is **50:** **0** percent

likelihood wage is **100:** **0** percent

likelihood wage is **150:** **0** percent

likelihood wage is **200:** **0** percent

Total (must equal 100): 0

Submit

Work Period 1

For work period number 1 your employer will pay you:

Wage 1: 100 ECUs

Please choose an effort level for this work period. Remember, every unit of effort costs you 1 ECU and provides an income to your employer of 3 ECUs.

From 0 to 100, what effort level do you choose for this work period?

0

Next

Results, Work Period 1

In work period number 1 your wage was 100 ECUs and you chose effort level 43. Your total earnings were therefore 57 ECUs.

Your guesses of the likelihood of each wage earned you a bonus for accuracy of 0 ECUs.

Next

(periods 2-25 similar).

Results

You have completed all work periods. Your total payment is 158 ECUs, which converts to 1.0 AUD. Including the $10 show-up fee, your total payment is 11.0 AUD. Please write this number on your payment receipt and quietly take it to the experimenter to receive your payment.

Next

EMPLOYER INSTRUCTIONS

Instructions

Please read these instructions carefully before proceeding! You will be asked several questions on the next page to make sure you understand your task.

In this game you will play the role of an "employer" who has 2 workers that will do a job for you for 25 work periods. You have to decide how much to pay each of your workers in each period. You will select all 25 wages for each worker before they start working, from a set of options we will give you.

In each period, the worker will learn his/her wage for that period and will then choose an effort level between 0 and 100. This effort level and the wage will determine the amount you and your worker earn in that period, in terms of "Experimental Credit Units" (ECUs). These ECUs will be converted to dollars at a rate of 1000 ECUs = 1 AUD and paid to you in cash before you leave today. In addition, you will receive a $10 show-up fee.

Each unit of effort costs the worker one ECU and earns you 3 ECUs. Therefore your total payment in each period is:

Your payment: 3 x effort - wage

And your worker's total payment in each period is:

Worker's payment: wage - effort

Consider an example:

Suppose that in the first work period you choose to pay one of your workers 50 ECUs. The worker then chooses an effort level of 20.

In this situation you would earn 10 ECUs: 20 times 3 provides an income of 60. After paying the worker 50 ECUs, you are left with 60 - 50 = 10 ECUs.

In the same situation situation, the worker would earn a total of 30 ECUs: 50 ECUs in wages minus 20 ECUs paid for "effort".

Next

Instructions

Next you will choose wages for each of your two workers. For each worker, you will be given a choice between two set of 25 wages, which designate what that worker will be paid in each of the 25 work periods.

The worker will find out each period's wage at the beginning of the period, just before choosing an effort level. That is, they will not see the full wage schedule in advance, but will learn the wage period by period.

Next

Understanding check

1. If a worker chooses an effort level of 100, it would cost him/her:

- 50 ECUs.
- 100 ECUs.
- 200 ECUs.

2. If a worker chooses an effort level of 100, it will create this much income for you:

- 300
- 400
- 500

3. If you pay a wage of 200 ECUs and the worker chooses an effort level of 100, the worker will earn ____ and you will earn ____:

- 100; 300
- 200; 100
- 100; 100

Submit

Choose wages for worker number 1

Please choose between one of the following wage schedules for worker number 1. You have a budget of 4500 ECUs that you can use to pay this worker; whatever is left over is yours to keep. But, the worker will learn the wage before choosing an effort level, so they may be motivated to work harder with higher wages.

Option 1: The worker will receive a wage of 100 in all periods *except* in work period number 6, when they will receive a wage of 150. This option costs 2550 ECUs.

Option 2: The worker will receive a wage of 100 for the first five periods and will then receive a wage of 150 for the remaining 20 periods. This option costs 3500 ECUs.

Which option do you want to choose for this worker?

- Option 1
- Option 2

Next

Choose wages for worker number 2

Please choose between one of the following wage schedules for worker number 2. You have a budget of 4500 ECUs that you can use to pay this worker; whatever is left over is yours to keep. But, the worker will learn the wage before choosing an effort level, so they may be motivated to work harder with higher wages.

Option 1: The worker will receive a wage of 100 in all periods *except* in work period number 6, when they will receive a wage of 150. This option costs 2550 ECUs.

Option 2: In all 25 work periods, the worker will receive a wage of 100. This option costs 2500 ECUs.

Which option do you want to choose for this worker?

- ○ Option 1
- ○ Option 2

Next

Beginning of work periods

Now that you have chosen wage schedules for each of your workers, the workers will now begin working. During this time, you will take a survey for a different research study.

Next

(unrelated survey shown here)

Results

Your employees have now all completed their work periods.

Your payments for accurate guesses in the survey total 2000 points ECUs. Your income from your employees, net of their wages, totals 9075 points ECUs. Altogether you earned 11002 ECUs, which converts to 22.0 AUD. Including the $10 show-up fee, your total payment is 32.0 AUD. Please write this number on your payment receipt and quietly take it to the experimenter to receive your payment.

Next