Bonus payments and reference point violations

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– Online Appendix –

Appendix A: Survey method

The procedure guaranteed that no party involved in data generation and processing could combine the information about contact details, background data and survey answers of the participants. First, we collected the administrative data from the personnel records of the company and encoded the data set. Then the company received the encoded data set, added email addresses of all managers and transferred the data to an independent consulting firm who administered the survey. This firm then invited the managers by email to take part in the survey, which was conducted in the intranet of the firm with an anonymous code, and deleted the email addresses afterwards. Finally, we received the encoded data set including survey answers without information that allowed identification of individuals. Managers were informed on the first page of the survey that their answers would be matched anonymously with their individual compensation and background data and had to agree to this procedure to participate in the survey.

We note that the company has a few subgroups whose personnel data was stored in a different system at the time of our survey, so that we could not match all survey responses with compensation data. Also, as we conducted a larger survey in the company that covered a wide range of topics concerning the labor environment and workplace characteristics, managers from sales departments and from a merged company took also part in the survey, yet could not be used for our analysis as they are subject to a different bonus system.

Appendix B: Further descriptive statistics and robustness checks

Table B1. Descriptive statistics for participating and non-participating managers

	Not participated	Participated
German sample		
Average age in years	44.48	43.64
Average years at company	13.89	13.77
Share of female managers (%)	21.37	14.37
Base Salary (USD 1,000s)	107.74	107.81
Bonus Payments (USD 1,000s)	22.26	22.24
US sample		
Average age in years	48.40	48.69
Average years at company	15.52	16.55
Share of female managers (%)	29.41	24.90
Base Salary (USD 1,000s)	112.08	115.05
Bonus Payments (USD 1,000s)	21.95	23.98

Table B2. Participation in the online survey (Probit models with a dummy variable "participated in survey" as the dependent variable)

Country	D	US
Dependent Variable	Dummy(Participate)	Dummy(Participate)
Model	Probit	Probit
Between 35 and 50 years of age	-0.060	-0.031
	[0.072]	[0.108]
Over 50 years of age	-0.270***	-0.111
	[0.102]	[0.120]
Total years at company	0.003	-0.002
	[0.003]	[0.003]
Base salary (1,000s)	-0.001	0.000
	[0.002]	[0.002]
Bonus payment (1,000s)	0.006	0.005
	[0.005]	[0.003]
Female	-0.282***	-0.033
	[0.058]	[0.062]
Observations	3822	2540
Pseudo-R^2	0.031	0.056
Log-likelihood	-2489	-1590

The dependent variable is a dummy variable equal to one if the manager participated in the survey. Standard errors are given in brackets. *** denotes significance on the 1%-level. The models also include dummies for company units.

Table B3. Distribution of performance ratings (in % of all managers)

	Germany 2006	US 2007
'excellent'	0.6	1.7
'above average'	22.4	32.8
'fully meets expectations'	74.1	64.0
'below average'	2.8	1.5
'inadequate'	0.1	0.0

Table B4. Distribution of agreements to the statement: I am very satisfied with my job. (in % of all managers who participated in the survey)

	Germany 2006	US 2007
1 - totally disagree	1.0	1.1
2	3.0	3.9
3	6.0	6.6
4	10.2	13.9
5	27.9	27.5
6	40.0	34.4
7 - fully agree	11.9	12.7
Mean	5.29	5.24
Std.Dev.	1.25	1.25

Table B5. Determinants of job satisfaction in Germany – robustness checks
(Ordered Probit models with the 'job satisfaction' score as dependent variable)

Dependent Variable	Job Satisfaction (Score '7' excluded)	Job Satisfaction (Score '7' excluded)
Model	Ordered Probit	Ordered Probit
Salary (000s)	0.000	0.001
	[0.004]	[0.005]
Bonus Payment (000s)	0.000	-0.001
	[0.011]	[0.012]
Dummy 'Above meets'	0.283***	
	[0.101]	
Dummy 'Below meets'	-0.439**	
	[0.210]	
Positive Deviation from Bonus	-0.009	-0.008
Budget (=100%)	[0.006]	[0.012]
Negative Deviation from Bonus	-0.025***	-0.030***
Budget (=100%)	[0.006]	[0.007]
Sample	All	'fully meets'
Observations	1827	1366
Pseudo-R^2	0.041	0.033
Log-Likelihood	-2390	-1817

Robust standard errors clustered on the level of supervisors are given in brackets. ** and *** denote significance on the 5% and 1%-level, respectively. The dummy variables 'Above meets' ('Below meets') refer to higher (lower) performance ratings than 'fully meets expectations'. Control variables include age interval dummies, gender, total years of affiliation to the company, a dummy for a promotion in the previous year, and dummies for company units.

Table B6. Determinants of job satisfaction in a combined country sample – (Ordered Probit models with the 'job satisfaction' score as dependent variable)

Dependent Variable	Job Satisfaction	Job Satisfaction
Country	D + US	D + US
Model	Ordered Probit	Ordered Probit
Salary (000s)	-0.000	-0.002
	[0.002]	[0.003]
Bonus Payment (000s)	0.001	0.006
	[0.004]	[0.005]
Dummy 'Above meets'	0.232***	
	[0.068]	
Dummy 'Below meets'	-0.577***	
	[0.187]	
Positive Deviation from Bonus	-0.002	-0.010
Budget (=100%)	[0.007]	[0.029]
Positive Deviation from Bonus	-0.001	0.012
Budget (=100%) X 'GER'	[0.007]	[0.031]
Negative Deviation from Bonus	-0.007	0.002
Budget (=100%)	[0.006]	[0.011]
Negative Deviation from Bonus	-0.014**	-0.025**
Budget (=100%) X 'GER'	[0.007]	[0.013]
Dummy 'GER'	-0.836***	-0.102
	[0.225]	[0.577]
Sample	All	'fully meets'
Observations	3000	2105
Pseudo-R^2	0.038	0.030
Log-Likelihood	-4516	-3207

Robust standard errors clustered on the level of supervisors are given in brackets. ** and *** denote significance on the 5% and 1%-level, respectively. The dummy variables 'Above meets' ('Below meets') refer to higher (lower) performance ratings than 'fully meets expectations'. Control variables include age interval dummies, gender, total years of affiliation to the company, a dummy for a promotion in the previous year, and dummies for company units. The dummy variable 'GER' takes the value of one if the manager is from Germany.

Table B7. Determinants of job satisfaction – robustness checks (linear models with unit-normal transformation of the 'job satisfaction' score as dependent variable)

Country	Germany	US
Model	FE	FE
Salary (000s)	-0.003	-0.006
	[0.004]	[0.004]
Bonus Payment (000s)	0.012	0.004
	[0.010]	[0.006]
Dummy 'Above meets'	-0.037	0.094
	[0.123]	[0.177]
Dummy 'Below meets'	-0.613***	-0.927**
	[0.229]	[0.422]
$z < 90\%$	-0.295**	-0.112
	[0.143]	[0.381]
$90\% \leq z < 100\%$	-0.182**	-0.065
	[0.091]	[0.314]
$100\% < z < 110\%$	0.013	0.065
	[0.091]	[0.295]
$z \geq 110\%$	0.061	0.144
	[0.150]	[0.297]
Sample	All	All
Observations	2091	956
R^2 (within)	0.04	0.04

The dependent variable is a unit normal transformation of the job satisfaction score. z denotes a manager's bonus percentage. All models include supervisor fixed effects. Robust standard errors clustered on the level of supervisors are given in brackets. ** and *** denote significance on the 5% and 1%-level, respectively. The dummy variables 'Above meets' ('Below meets') refer to higher (lower) performance ratings than 'fully meets expectations'. Control variables include age interval dummies, gender, total years of affiliation to the company and a dummy for promotion in the last year. The reference group for the bonus percentage intervals consists of managers who receive exactly their budgets ($z_i = 100\%$).

Table B8. Determinants of job satisfaction (separately for female and male managers)

Dependent Variable	Job Satisfaction	Job Satisfaction
Sample	Male managers	Female managers
Model	Ordered Probit	Ordered Probit
Salary (000s)	0.002	-0.000
	[0.004]	[0.008]
Bonus Payment (000s)	-0.002	-0.004
	[0.010]	[0.019]
Dummy 'Above meets'	0.251**	0.523**
	[0.100]	[0.247]
Dummy 'Below meets'	-0.409*	-0.502
	[0.246]	[0.431]
Positive Deviation from Bonus	-0.003	-0.021
Budget (=100%)	[0.006]	[0.015]
Negative Deviation from Bonus	-0.022***	-0.040***
Budget (=100%)	[0.006]	[0.014]
Observations	1759	285
Pseudo-R^2	0.044	0.093
Log-Likelihood	-2616	-404

Robust standard errors clustered on the level of supervisors are given in brackets. *,** and *** denote significance on the 10%, 5% and 1%-level, respectively. The dummy variables 'Above meets' ('Below meets') refer to higher (lower) performance ratings than 'fully meets expectations'. Control variables include age interval dummies, total years of affiliation to the company, a dummy for a promotion in the previous year, and dummies for company units.

Table B9. Determinants of job satisfaction (by age of the manager)

Dependent Variable	Job Satisfaction	Job Satisfaction
Sample	≤ median age (44 years)	> median age (44 years)
Model	Ordered Probit	Ordered Probit
Salary (000s)	0.001	0.000
	[0.005]	[0.005]
Bonus Payment (000s)	0.006	0.003
	[0.014]	[0.012]
Dummy 'Above meets'	0.252**	0.207
	[0.111]	[0.178]
Dummy 'Below meets'	-0.262	-0.399
	[0.367]	[0.266]
Positive Deviation from Bonus	-0.001	-0.009
Budget (=100%)	[0.006]	[0.014]
Negative Deviation from Bonus	-0.024**	-0.027***
Budget (=100%)	[0.010]	[0.008]
Observations	1064	980
Pseudo-R^2	0.061	0.045
Log-Likelihood	-1551	-1464

Robust standard errors clustered on the level of supervisors are given in brackets. ** and *** denote significance on the 5% and 1%-level, respectively. The dummy variables 'Above meets' ('Below meets') refer to higher (lower) performance ratings than 'fully meets expectations'. Control variables include gender, total years of affiliation to the company, a dummy for a promotion in the previous year, and dummies for company units.

Table B10. Bonus percentages and career progression in Germany

Dependent Variable	Promotion 2006	Promotion 2005	Promotion 2005/2006	Salary Increase 2006	Salary Increase 2005	Salary Increase 2005/2006
Model	FE	FE	FE	FE	FE	FE
Independent variables from year	2005	2004	2004	2005	2004	2004
Salary (000s)	-0.002***	-0.003***	-0.005***	0.000	0.003	-0.002
	[0.001]	[0.001]	[0.002]	[0.005]	[0.007]	[0.013]
Bonus Payment (000s)	0.000	0.000	-0.002	0.016	-0.000	0.001
	[0.002]	[0.003]	[0.004]	[0.014]	[0.020]	[0.038]
Positive Deviation from	0.008***	0.008**	0.013***	0.131***	0.112***	0.180***
Bonus Budget (=100%)	[0.003]	[0.004]	[0.005]	[0.020]	[0.022]	[0.032]
Negative Deviation from	-0.005***	-0.006***	-0.010***	-0.075***	-0.063***	-0.119***
Bonus Budget (=100%)	[0.001]	[0.001]	[0.002]	[0.008]	[0.008]	[0.017]
Sample	'fully meets'	'fully meets'	'fully meets'	'fully meets'	'fully meets'	'fully meets'
Observations	2454	1922	1922	2447	1914	1926
R^2 (within)	0.04	0.06	0.13	0.19	0.16	0.23

'Promotion' is a dummy variable equal to one if a manager is on a higher hierarchy level in a given year than in the base year of the model. Salary increases are measured in 1,000s of Euros. All models include supervisor fixed effects. Robust standard errors clustered on the level of supervisors are given in brackets. ** and *** denote significance on the 5% and 1%-level, respectively. Control variables include age interval dummies, gender and total years of affiliation to the company.

Table B11. Performance effects of reference point violations in Germany – robustness checks (dependent variable: adjusted supervisor performance rating in subsequent year)

	D5	D6	D7	D8
Dependent Variable	Rating $t+1$	Rating $t+1$	Rating $t+1$	Rating $t+1$
Model	FE	FE	FE	OLS
Share of Managers rated 'fully meets'	-0.787***			
with Bonus Percentage <100% in department	[0.281]			
Share of Managers with Bonus Percentage		-0.689***	-0.671***	-0.246*
<100% among 'fully meets' Managers		[0.214]	[0.211]	[0.128]
Bonus Budget per Manager		-0.014		
		[0.019]		
Team Size			-0.020	
			[0.023]	
Supervisor Rating t				0.685***
				[0.093]
Controls for Rating Distribution	Yes	Yes	Yes	Yes
Observations	468	468	468	468
R^2 (within)	0.07	0.09	0.09	0.23[1]

[1] Overall R-squared value.

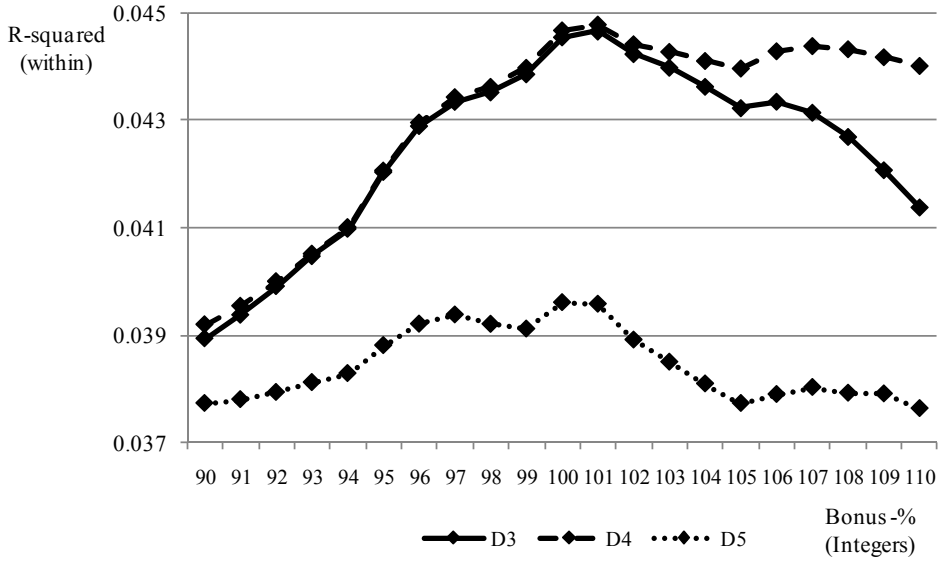
Models D5, D6, D7 include supervisor fixed effects. Robust standard errors clustered on the level of supervisors are given in brackets. * and *** denote significance on the 10% and 1%-level, respectively. All models include control variables for the age and hierarchy level of the supervisor. Model D8 additionally includes dummy variables for company entities. A supervisor's rating distribution is measured by the share of performance ratings 'excellent', 'above average' and 'below average'.

Table B12. Determinants of job satisfaction in Germany – control for perceived appropriateness of a manager's performance evaluation
(Ordered Probit model with the 'job satisfaction' score as dependent variable)

Dependent Variable	Job Satisfaction
Model	Ordered Probit
Salary (000s)	0.001
	[0.004]
Bonus Payment (000s)	-0.003
	[0.009]
Dummy 'Above meets'	0.133
	[0.092]
Dummy 'Below meets'	-0.301
	[0.221]
Positive Deviation from Bonus	-0.008
Budget (=100%)	[0.005]
Negative Deviation from Bonus	-0.013**
Budget (=100%)	[0.006]
Supervisor's Accuracy	0.275***
	[0.019]
Observations	2035
Pseudo-R^2	0.080
Log-likelihood	-2919

Robust standard errors clustered on the level of supervisors are given in brackets. ** and *** denote significance on the 5% and 1%-level, respectively. The dummy variables 'Above meets' ('Below meets') refer to higher (lower) performance ratings than 'fully meets expectations'. Control variables include age interval dummies, gender, total years of affiliation to the company, a dummy for promotion in the previous year, and dummies for company units.

Figure B1. R-squared (within) values of regression models with alternative bonus percentages used as reference points



The graph is based on linear regression models on a unit-normal transformation of the job satisfaction score with supervisor fixed effects. As explanatory variables we use individual base salaries (in 1,000s Euros), absolute bonus payments (in 1,000s Euros), the dummies 'Above meets' and 'Below meets' referring to higher respectively lower performance ratings than 'fully meets expectations', and variables for positive or negative deviations of bonus percentages from the respective reference point. Demographic control variables include age interval dummies, gender, total years of affiliation to the company, and a dummy for a promotion in the previous year.

Appendix C: A simple theoretical framework

Motivated by Observations 1 and 2 in the main text, this appendix presents a simple theoretical framework to fix ideas about the impact of transparency on managers' utility (C.1) and supervisors' evaluation behavior (C.2) based on the idea that managers evaluate outcomes relative to reference standards. As we argue in the main text, there can be two complementary interpretations of reference standards in our context: dislike of falling behind others (as captured by inequity aversion models) and disappointed expectations (as captured by loss aversion models). This section illustrates that these different approaches to reference-dependent preferences are very similar in their mathematical structure, and that they can thus be mostly boiled down to a simple utility function that can in principle capture both approaches in our setting. The advantage of such a model is that all results are robust in the sense that they hold regardless of the underlying interpretations of the reference-dependency.

C.1 Transparency and social comparison

We assume that each manager has a piecewise linear utility function, comparing his own bonus b_i to a (potentially uncertain) reference standard *B*:

$$u(b_i, B) = \begin{cases} \eta \cdot b_i - \beta(b_i - B) & if \quad b_i \geq B \\ \eta \cdot b_i - \alpha(B - b_i) & if \quad b_i < B \end{cases}, \tag{1}$$

where η measures the weight placed on the absolute bonus. When *B* is the average bonus paid to his colleagues, (1) boils down to a Fehr and Schmidt (1999) type utility function where the comparison standard is the average income such as in Bolton and Ockenfels (2000). With this interpretation, α measures the manager's dislike of disadvantageous and β ($< \alpha$) that of advantageous inequality. But the model can also be interpreted as a model of loss aversion (Kahneman and Tversky 1979) where *B* is the agent's "entitlement" shaped by her expectations. In this interpretation, α / β measures the agents' degree of loss aversion. In each of the two interpretations, we speak of a "reference point violation" whenever $b_i < B$.

The model implies that reference point violations cause a marginal utility loss α in addition to η that comes with the corresponding loss of absolute payoffs. For simplicity, assume that there is a continuum of managers. In order to capture the effect of transparency, we assume that a manager is uncertain about the reference point. Managers share a prior belief that the reference bonus *B* is drawn from a normal

distribution $B \sim N(m, \sigma^2)$. Furthermore, each manager knows that his own bonus b_i is equal to $B + \varepsilon$ where $\varepsilon \sim N(0, \sigma_\varepsilon^2)$. Hence, in a social comparison interpretation, the model captures that managers are uncertain about the average bonus payment B to their colleagues. In the loss aversion interpretation managers compare the actual outcome with their "entitlement" but may be uncertain about this entitlement because they know that the budget is stochastic and update their expectations when learning their actual bonus. Managers realize gain/loss utility weighted with the relative probabilities of the potential outcomes for the entitlement (in that sense the approach is similar to Köszegi and Rabin (2006), but here the entitlement is equal to the assigned budget). Hence, the entitlement captures the intuition that a manager who has been graded as 'fully meets expectations' interprets this as achieving his personal goals and therefore expects to receive at least the reference bonus.

In this framework, σ^2 is a straightforward measure of transparency. If σ^2 is equal to zero, a manager knows exactly where he stands relative to his reference standard or has very precise expectations about the outcome. If, however, σ^2 is positive, there is uncertainty about one's standing (as it is the case in the US branch) relative to the reference standard. A manager's posterior belief on the reference point is then:

$$E[B|b] = \frac{\sigma_\varepsilon^2}{\sigma^2 + \sigma_\varepsilon^2} m + \frac{\sigma^2}{\sigma^2 + \sigma_\varepsilon^2} b \quad \text{and} \quad V[B|b] = \frac{\sigma^2 \sigma_\varepsilon^2}{\sigma^2 + \sigma_\varepsilon^2}.$$

We now compute a manager's conditional expected utility, after he has learned his own bonus payment, as:

$$\begin{aligned} E[u(b,B)|b] &= E[I_{B \le b}((\eta - \beta)b + \beta B)|b] + E[I_{B>b}((\eta + \alpha)b - \alpha B)|b] \\ &= (\eta + \alpha)b - \Pr(B \le b|b)b(\alpha + \beta) + \beta E[I_{B \le b} B|b] - \alpha E[I_{B>b} B|b]. \end{aligned}$$

After applying standard results on the truncated normal distributions and some rearrangements, we obtain the following:

Proposition C1: *The manager's expected utility is given by*

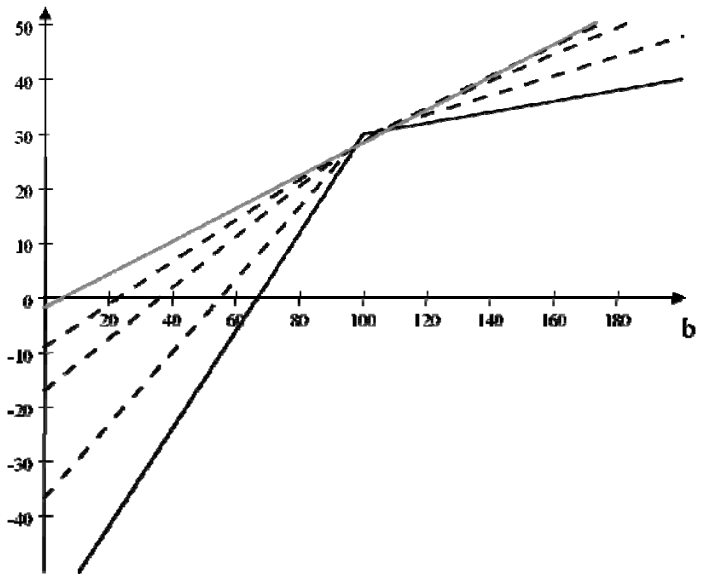
$$\begin{aligned} E[u(b,B)|b] = {} & \eta b + \alpha \tfrac{\sigma_\varepsilon^2}{\sigma^2 + \sigma_\varepsilon^2}(b - m) \\ & + (\alpha + \beta)\left(\tfrac{\sigma_\varepsilon^2 (m-b)}{\sigma^2 + \sigma_\varepsilon^2} \Phi\left(\tfrac{\sigma_\varepsilon (b-m)}{\sigma \sqrt{\sigma^2 + \sigma_\varepsilon^2}} \right) - \sqrt{\tfrac{\sigma^2 \sigma_\varepsilon^2}{\sigma^2 + \sigma_\varepsilon^2}} \phi\left(\tfrac{\sigma_\varepsilon (m-b)}{\sigma \sqrt{\sigma^2 + \sigma_\varepsilon^2}} \right) \right). \end{aligned} \tag{2}$$

The dissatisfaction from a reference point violation (and the corresponding kink) disappears as the prior becomes uninformed ($\sigma^2 \to \infty$)*, even when managers are strictly inequity or loss averse.*

In case of full transparency ($\sigma^2 = 0$), the marginal utility loss due to falling behind the reference point is $\alpha > 0$ (Equation (1)). Because the corresponding gain β from income above the reference point is smaller, there is a 'kink' at the reference point. If, however, the prior becomes uninformed ($\sigma^2 \to \infty$), the conditional expected utility (Equation (2)) converges to $E[u(b,B) \mid b] = \eta b - (\alpha + \beta)\frac{\sigma_\varepsilon}{\sqrt{2\pi}}$, which is *independent* of the reference point. The reason is that a manager's conditional expectation on the reference standard converges to his own bonus payment *b* ($= \lim_{\sigma \to \infty} E[B|b]$). As a result, there can be no loss in expected utility due to reference point violations.

For intermediate values of reference point transparency σ^2, it is instructive to study the shape of the conditional expected utility graphically. The solid curve in Figure C1 shows the conditional utility function when there is full transparency (Equation (1)). The dashed curves show the conditional expected utility for different values of σ^2.[1] The grey line finally shows the expected utility function for $\sigma^2 \to \infty$. The figure demonstrates that decreasing transparency reduces dissatisfaction from reference point violations and 'softens' the kink.

Figure C1. Conditional expected utility as a function of the bonus *b*



[1] The variance σ^2 is equal to 4, 8 and 12, respectively. The other parameter values are $m = 100$, $\sigma_\varepsilon = 5$, $\alpha = 0.6$, $\beta = 0.2$, and $\eta = 0.3$. If the managers' utility is not affected by their absolute but only by their relative bonuses (i.e. $\eta = 0$), the expected utility becomes entirely flat for an uninformed prior even when there is a pronounced kink with complete information.

Our model is related to two issues discussed in the literature. For one, we generalize an aspect of a model proposed by Card et al. (2012), in which individuals also care for their relative pay as compared to a reference group, and may either receive information on their relative pay or not. When there is no information about the others' bonuses, Card et al. assume that the conditional expectation about the average wage in the reference group is equal to the individual's own wage, which is endogenized in our model as $\sigma^2 \to \infty$. Second, our model is consistent with findings in the social psychology literature that demonstrate that social judgments critically depend on which comparison standards are made accessible in the judgmental situation. That is, comparison standards that are not (made) transparent are not used (see references in Section 6).

C.2 Reference-dependent preferences and the allocation of bonuses

In a second step we analyze the impact of reference-dependent preferences on performance evaluation. For this, we take a standard model of subjective performance evaluations, as developed by Prendergast and Topel (1996) and Prendergast (2002), and only add reference-dependent preferences to the managers' preferences as specified above.

Following Prendergast and Topel (1996) and Prendergast (2002), we assume that the supervisor cares for the well-being of her subordinates and for the accuracy of the bonus. More specifically, we assume that the supervisor's utility function is linearly increasing in the subordinates' utility, and that the supervisor incurs a utility loss $\nu \cdot (s_i - b_i)^2$ when assigning the bonus b_i to a manager i with true performance s_i. Applying this framework to our context, we also assume that the supervisor has to allocate an average bonus B, and – for simplicity – that she only has two subordinates, 1 and 2. We start with a fully transparent social reference point. The supervisor's utility function then is

$$\mu \cdot u_1(b_1, b_2) + \mu \cdot u_2(b_2, b_1) - \nu \cdot (s_1 - b_1)^2 - \nu \cdot (s_2 - b_2)^2$$

where $u_i(b_i, b_j)$ is given by Equation (1). Substituting the budget constraint $b_1 + b_2 = 2B$ and the managers' utility functions, the supervisor's decision problem is to maximize

$$U(b_1) = \mu(\eta 2B - 2(\alpha + \beta) \cdot |b_1 - B|) - \nu(s_1 - b_1)^2 - \nu(s_2 - 2B + b_1)^2.$$

This function is continuous but not continuously differentiable as it has a kink at $b_1 = B$. The second derivative is negative to the left and to the right of B and $\partial U_+(B) < \partial U_-(B)$, and hence, the function is

strictly concave. Suppose that the optimal bonus b_1^* is strictly smaller than B. In that case it must be characterized by the first order condition

$$2\mu(\alpha+\beta)+2\nu(s_1-b_1^*)-2\nu(s_2-2B+b_1^*)=0$$

implying

$$b_1^* = B+\frac{\mu(\alpha+\beta)}{2\nu}+\frac{s_1-s_2}{2}.$$

But the first order condition only characterizes the optimal choice if at this point indeed $b_1^* < B$, which is the case if $s_1 - s_2 < -\frac{\mu(\alpha+\beta)}{\nu}$. By symmetry we thus obtain the supervisor's optimal strategy for fully transparent settings:

$$b_1^{T*}(s_1,s_2)=\begin{cases} B+\frac{s_1-s_2}{2}+\frac{\mu(\alpha+\beta)}{2\nu} & if \quad s_1-s_2 < -\frac{\mu(\alpha+\beta)}{\nu} \\ B & if \quad -\frac{\mu(\alpha+\beta)}{\nu} \le s_1-s_2 < \frac{\mu(\alpha+\beta)}{\nu} \\ B+\frac{s_1-s_2}{2}-\frac{\mu(\alpha+\beta)}{2\nu} & if \quad s_1-s_2 \ge \frac{\mu(\alpha+\beta)}{\nu} \end{cases}. \qquad (3)$$

In a fully non-transparent setting, however, the kink in the managers' utility function disappears, as stated in Proposition B1. Hence, the bonus payment becomes

$$b_1^{I*}(s_1,s_2)=B+\frac{s_1-s_2}{2}.$$

Thus, compared to a non-transparent setting (as in the US in our field context), transparency about the budget leads to compressed performance evaluations (as we see in Observation 1),[2] as there is an upward bias for the manager with the lower and a downward bias for the manager with the higher performance. Moreover, even when there is an atomless continuous distribution of the true performance levels, our model predicts a mass point of evaluations at B. To illustrate this, assume that s_1 and s_2 are *iid* and drawn from a normal distribution with variance $2\sigma^2$. Hence, the bonuses awarded without transparency about the budget $b^I = B+\frac{s_1-s_2}{2}$ are also normally distributed, with mean B and variance σ^2. But when the budget is transparent, the bonuses b^T will not be normally distributed as the following result shows:

[2] This gives a rationale for the so-called 'centrality bias' in subjective performance evaluations (see for instance Prendergast and Topel, 1993).

Proposition C2: *Transparency leads to less reference point violations. Specifically, assuming that performance is normally distributed, bonuses are also normally distributed in a non-transparent system, but have a mass point at the reference point B in a transparent system.*

Proof: We have $b^T = b^I + \frac{\mu(\alpha+\beta)}{2\nu}$ if $b^I < B - \frac{\mu(\alpha+\beta)}{2\nu}$, and $b^T = b^I - \frac{\mu(\alpha+\beta)}{2\nu}$ if $b^I \geq B + \frac{\mu(\alpha+\beta)}{2\nu}$. Hence, for the lower tail of the distribution of b^T we must have that

$$\Pr\left(b^T < b\right) = \Pr\left(b^I + \tfrac{\mu(\alpha+\beta)}{2\nu} < b\right) = \Phi\left(\frac{1}{\sigma}\left(b - \tfrac{\mu(\alpha+\beta)}{2\nu} - B\right)\right)$$

as long as $b^I < B - \frac{\mu(\alpha+\beta)}{2\nu}$ or $b^T = b^I + \frac{\mu(\alpha+\beta)}{2\nu} < B$. By symmetry this also holds for the upper tail. Furthermore the probability mass at B is equal to

$$\Pr\left(B - \tfrac{\mu(\alpha+\beta)}{2\nu} \leq b^I < B + \tfrac{\mu(\alpha+\beta)}{2\nu}\right) = \Phi\left(\tfrac{\mu(\alpha+\beta)}{2\nu\sigma}\right) - \Phi\left(-\tfrac{\mu(\alpha+\beta)}{2\nu\sigma}\right) = 2\Phi\left(\tfrac{\mu(\alpha+\beta)}{2\nu\sigma}\right) - 1$$

which is strictly larger than zero as long as $\alpha + \beta > 0$, as well as strictly increasing in α and β.

■

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Appendix D: Experimental Instructions (Translation from German)

D.1 Instructions for Workers

Instructions: General Information

Welcome to the experiment! From now on, please do not communicate with other participants. If you have a question, please raise your hand! We will come to you and answer your question. If you violate these rules, we have to exclude you from the experiment and all payoffs.
In this experiment you can earn money. How much depends on your decisions and the decisions of other participants. We use ECU (Experimental Currency Unit) as the laboratory currency. At the end of the experiment, your payoff in ECU is converted into Euro and paid out in cash. The exchange rate is 20 ECU = 1 Euro.
The experiment consists of three parts. After the experiment, you receive the sum of payoffs from these parts. In addition, you receive 4 Euros for your participation in the experiment, which is paid out at the end regardless of the decisions.

Instructions: First Part

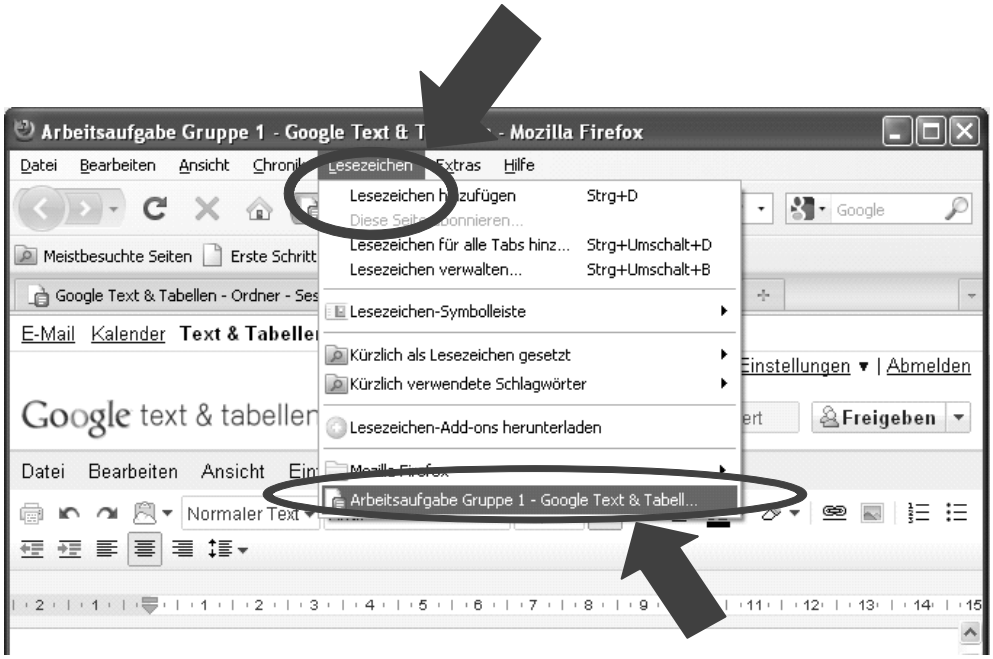
In the first part of the experiment, you will be matched with another participant. During the next 30 minutes, you will jointly work on the following task:
Which are the best and the worst homepages on electric cars you can find? Why? List the best arguments for and against electric cars.
You and the other participant have to prepare a joint document for the summary. In the document, contributions of each participant have to be marked. The preparation of the document will be explained on the following pages.
You and the other participant are assigned to an evaluator. After your document has been prepared, the evaluator receives an excerpt of both participants' contributions and evaluates the performance of each participant.
The evaluators are other participants in the experiment who receive a fixed payment for the evaluation of the excerpts.
You and the other participant will receive an individual bonus payment depending on the evaluations. There is a budget for bonus payments; on average there is a certain bonus amount available for each participant.
[**Treatment TRANSPARENCY**] Individual bonus payments can be as low as 80% and as high as 120% of this average amount.
After the first part of the experiment, you will be informed about your bonus payment.
The identity of the other participant is confidential, and no other participant will be informed about your identity: your decisions are anonymous.

Description of the task

During the next 30 minutes, you and the other participant will work on the following task: **Which are the best and the worst homepages on electric cars you can find? Why? List the best argument for and against electric cars.**
You will work on the task online on the "**Google Docs**" website. Please open the **Mozilla Firefox** browser by clicking the symbol 

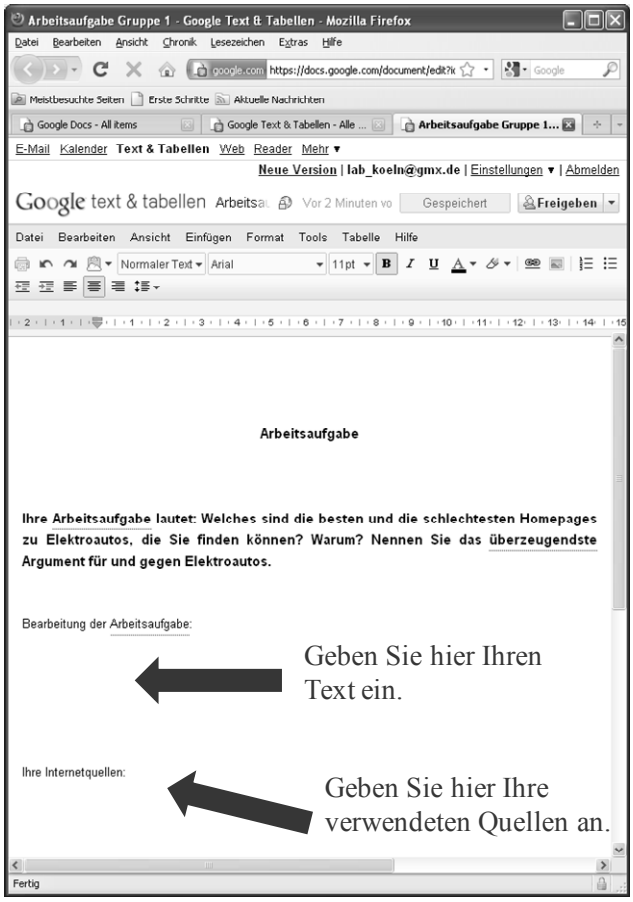
on your desktop. In the **Favorites menu** (see Screenshot 1 below), you find the link for your joint document.

Screenshot 1. Access to the joint document on "Google Docs".



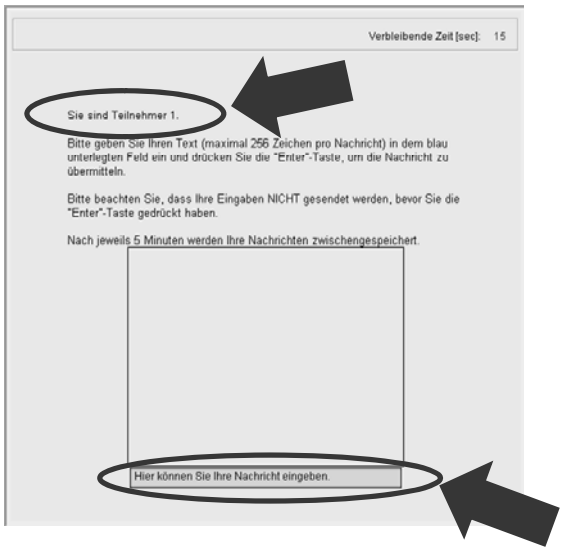
The link "Task Group X", will direct you to the joint document. The following screen appears (Screenshot 2), in which you can enter the text. You and the other participant work simultaneously in this document. You will immediately see the other participant's entries; likewise, the other participant will see your entries in real-time.
The text has to be written in German. Copied parts have to be identified. Please leave the header of the document unchanged and enter your text in the designated part (see Screenshot 2). Please list all references you used (it is sufficient to paste the hyperlinks of the references in the document).
"**Google Docs**" will automatically save your entries. If you close the browser while working, you can access your document by starting **Mozilla Firefox** and choosing the link in the **Favorites** menu.
You will have to search the information required for the task in the internet. Please open other browser windows for your research.

Screenshot 2. Joint Document



[The screenshot repeats the task ("Arbeitsaufgabe"), and the arrows indicate where to put the summary ("Geben Sie hier Ihren Text ein.") and the Internet hyperlinks ("Geben Sie hier Ihre verwendeten Quellen an".).]
You and the other participant have to coordinate who works on which part of the task. For this purpose, you can use the chat window that will be displayed in the upper left part of the screen (Screenshot 3).
You and the other participant can communicate via the chat window during the whole 30 minutes. Please use only the chat window for your communication.
Please mark unambiguously, which participant has written which part of your document, as your individual evaluation and your bonus payment will depend on this. Please identify the respective parts in the document with **"Participant 1"** and **"Participant 2".** Your participant number will be displayed in the first line on your chat window.
It is not allowed to reveal information in the chat or in the document that allows inferences on your identity. If you violate this rule, we have to exclude you from the experiment and all payoffs.

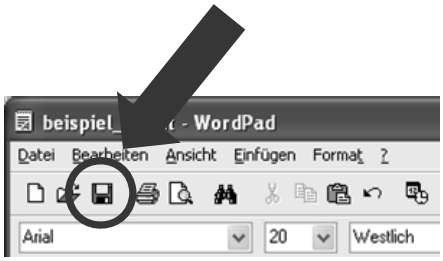
Screenshot 3. Chat Window



After you have finished the task, you have the opportunity to send a message to the evaluator. On the desktop of your computer, you find a WordPad document in which you can enter your message. 

Please open the message file after the working task has ended and you are asked to do so. You can save your message by clicking on the disk symbol (Screenshot 4).

Screenshot 4. Saving the message to the evaluator.



If you have questions before and during the task, please raise your hand. We will come to your desk and help you.

Message to the Supervisor

Please type in you number here (Participant 1/2): ___
How do you assess your performance in the task relative to the other participant (please tick one option):
_____ higher than the other participant
_____ equal to the other participant
_____ lower than the other participant

Please enter your message to the evaluator here: _____

Feedback: Bonus Payments

[**Treatment TRANSPARENCY**]

You receive a bonus payment of _____ % of the average bonus payment.

This accounts for _____ ECU.

[**Treatment NON-TRANSPARENCY**]

You receive a bonus payment of _____ ECU for the working task.

Instructions: Second Part

The second part of the experiment starts now.
In this part, you are matched with the same participant as in the first part of the experiment. In the second part, you and the other participant both receive an endowment of 100 ECU.
Each participant can decide whether he/she wants to contribute part of the endowment to a joint project. The sum of contributions will be multiplied by the factor 1.5 and equally distributed among both participants.
Your payoffs in the second part of the experiment are calculated as follows:

	100 ECU
−	Your contribution
+	1.5 · sum of all contributions, divided by 2
=	Payoffs in the second part

You will be informed about your payoffs from the second part at the end of the experiment.

Instructions: Third Part

The third part of the experiment starts now. You receive an endowment of 40 ECU and can decide whether you want to transfer part of this endowment to your evaluator of the working task from the first part of the experiment. Any transfer will be doubled. The other participant that you were matched with before has to make the same decision.
That is, your payoffs in the third part of the experiment are calculated as follows:
Payoff = 40 ECU – transfer
The payoffs of the evaluator in the third part of the experiment are calculated as follows:
Payoff evaluator = 2 · sum of transfers of the two participants

D.2 Instructions for Supervisors

Instructions: General Information

Welcome to the experiment! From now on, please do not communicate with other participants. If you have a question, please raise your hand! We will come to you and answer your question. If you violate these rules, we have to exclude you from the experiment and all payoffs.
In this experiment you can earn money. We use ECU (Experimental Currency Unit) as the laboratory currency. At the end of the experiment, your payoff in ECU is converted into Euro and paid out in cash. The exchange rate is 20 ECU = 1 Euro.

The experiment consists of three parts. After the experiment, you receive the sum of payoffs from the parts that are relevant for you. In addition, you receive 18 Euros for your participation in the experiment, which is paid out at the end regardless of the decisions.

Instructions: First Part

In the first part of the experiment, you will be matched with two other participants. During the next 30 minutes, these two participants will work on the following task:
Which are the best and the worst homepages on electric cars you can find? Why? List the best argument for and against electric cars.
The two participants will jointly prepare a document, in which the results of their research are summarized. They will enter their texts online in a joint document on the "**Google Docs**" website. They have to list all references used (it is sufficient to paste the hyperlinks of the references in the document). The text has to be written in German. Copied parts have to be identified.
After the task has ended, the two participants have the possibility to send you an anonymous message with a self-assessment of their performances.
Your task is to rank the participants' performance. For this purpose, you receive an excerpt of each participant's contribution to the summary. The assignment of identical ranks is not possible.
For the task, the two participants will receive an individual bonus payment depending on your evaluation. The average bonus is fixed. Your evaluations are anonymous. The identity of the other participants is confidential, and no other participant will be informed about your identity. During the 30 minutes the participants work on the task, you should make yourself familiar with the task on the internet.

Feedback: Supervisor

The higher performance in the working task was achieved by (please mark):

_____ Participant 1
_____ Participant 2

Instructions: Second Part

The second part of the experiment starts now.
In this part of the experiment, you will make no decisions and receive no payoffs.

Instructions: Third Part

The third part of the experiment starts now.
In this part of the experiment, each of the two participants you have evaluated in the first part receives an endowment of 40 ECU.
Participants can now decide whether they want to transfer part of their endowments to you. Any transfer to you will be doubled by the experimenter.
You will make no decision in the third part of the experiment.

Your payoffs in the third part of the experiment are calculated as follows:
Payoff = 2 · sum of transfers of the two participants.

Payoffs of each participant in the third part of the experiment are calculated as follows:
Payoff participant = 40 ECU – transfer