The Robustness of Laboratory Gift Exchange: A Reconsideration*

Dirk Engelmann†
Royal Holloway, University of London

Andreas Ortmann†
Australian School of Business, University of New South Wales

July 20, 2009

Abstract

We report a gift-exchange experiment in which we systematically vary the following experimental design and implementation characteristics: the choice of equilibrium (interior versus corner point), the extent of potential efficiency gains, and the choice of frames (abstract versus employer-worker). We also employ a matching mechanism that has been shown to best preserve the nature of one-shot interactions (rotation) and a design that favours the employer in equilibrium, which, arguably, is a typical feature of labor markets.

Much of the observed play of our participants, especially responders, is at or close to equilibrium. Our results therefore stand in stark contrast to what has been reported in much of the literature. Specifically, we find little evidence for positive reciprocity. We do find more evidence for negative reciprocity which, however, is relatively inexpensive in our setting.

Our results, together with other evidence we discuss, suggest that laboratory gift exchange is highly sensitive to the parametrization of the model and the way the model is implemented.

Keywords: laboratory gift exchange, anomalies, robustness

*We thank Gary Charness, Simon Gächter, Werner Güth, Glenn Harrison, Steffen Huck, Bernd Irlenbusch, Eric Johnson, John Kagel, Axel Ockenfels, Mary Rigdon, Dale Stahl, Eline van der Heijden as well as participants of ESA, ESEM and GEW meetings and seminars at Nottingham and UCL for their comments. All errors in fact and judgement are ours. The first author acknowledges gratefully financial support by the Deutsche Forschungsgemeinschaft (DFG, Grant No. 459/1-1). Both authors acknowledge financial support from the institutional research grant AV0Z70850503 of the Economics Institute of the Academy of Sciences of the Czech Republic, v.v.i. Part of this research was conducted while the first author visited the IEW at the University of Zurich; its hospitality is greatly appreciated.

†Department of Economics, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, United Kingdom, dirk.engelmann@rhul.ac.uk. Dirk Engelmann is also an Affiliate of the Centre for Experimental Economics at the University of Copenhagen and a Senior Researcher at the Economics Institute of the Academy of Sciences of the Czech Republic, v.v.i.

‡School of Economics, Australian School of Business, The University of New South Wales, UNSW Sydney, NSW 2052, Australia. Andreas Ortmann is also a Senior Researcher at the Economics Institute of the Academy of Sciences of the Czech Republic, v.v.i.
1 Introduction

Numerous studies have shown that many people trust and reciprocate positively (e.g., Berg et al. 1995; Ortmann et al. 2000; Fehr et al. 1993; Fehr et al. 1997; Maximiano et al. 2007a,b). Surveying the research on trust and reciprocity, Van der Heijden et al. (2001) assert that “by now there is much experimental evidence that people engage in reciprocal exchange. People are observed to return favors even in the absence of binding pre-commitments” (p. 280; see also Fehr and Gächter 1998). The evidence has been interpreted as showing that “the exclusive reliance on selfishness and, in particular, the neglect of reciprocity motives may lead to wrong predictions and to wrong normative inferences” (Fehr et al. 1997, p. 833). Relatedly, it has been argued that financial incentives are likely to undermine intrinsic motivation. The findings on trust, reciprocity, and intrinsic motivation suggest that the incentive compatible design of institutions and organizations may be less imperative than some economists have argued (e.g., Smith 1759 and Smith 1776, especially book V; or Tirole 2006).

The well-documented (e.g., Fehr and Gächter 1998), now classic, results of laboratory gift exchange have captured economists’ attention because they contradict canonical theory’s predictions1 for one-shot or finitely repeated interactions.2

Below we argue that most classic gift-exchange studies have features that are biased in favor of finding gift exchange and against the canonical theory for one-shot and finitely repeated games. Specifically, much of the literature features corner point equilibria that allow only for deviations consistent with trust and positive reciprocity and thus systematically bias results in that direction whenever subject behavior is noisy (as much of experimental participant behavior surely is).3 In

1New theoretical developments (e.g., McKelvey and Palfrey 1995, 1998; Anderson et al. 1998, 2001; Goeree and Holt 2001; see also Reny 1992 for similar arguments) have incorporated noise into explanatory models of experimental data. Canonical theory, such as that found in standard micro graduate textbooks (e.g., Kreps 1990 and Mas-Colell et al. 1995), does not. While game theory does allow formally for all kinds of preferences, in the present context canonical theory is meant to be understood as rational income maximization.

2The experimental results on gift exchange are, however, quite in line with game theoretic predictions for indefinitely repeated interactions. Hoffman et al. (1996, p. 300) suggested that most people conceptualize important aspects of real life in such a manner and accordingly import into the laboratory decision rules that evolved for contexts where seemingly trusting or reciprocal behavior may be observationally equivalent to selfish behavior. Fundamentally, this view questions whether one-shot and finitely repeated games of the social dilemma kind are at all implementable in the laboratory (see also Ortmann and Hertwig 2000; Harrison and Rutström 2001; Samuelson 2005; Binmore 2007).

3That subject behavior is noisy is generally accepted. It is this fact that has prompted insightful probabilistic
addition, the typical corner equilibrium tends to be unattractive because it yields only minimal payoffs for the subjects and hence gives them substantial incentives to move away from the equilibrium. This effect is often reinforced by dramatic potential efficiency gains. For example, in Fehr et al. (1993) the achievable efficiency gains were up to 1100% and were still 300% at the maximal possible effort. Furthermore, offering a higher wage implied small risk and could not lead to negative payoffs, because the wage cost paid by the employer were equal to the product of wage and effort. Hence an employer had a substantial incentive to initiate cooperation at an above equilibrium wage-effort combination, with very little risk. And, since the cost to the worker of providing effort was trivial, workers had a (subjective) incentive to reciprocate (especially if the matching mechanism did not best preserve the one-shot nature of the interaction.) Aspects of implementation that may also have biased results in favour of trust and reciprocity include framing, anonymity, subject pools, and matching schemes.

The robustness of laboratory gift exchange to such parametrization and implementation issues has only recently received significant attention. For the present context, robustness is understood to denote the following three meanings: One, which we shall call third-degree robustness below, simply denotes the variability within one cell of the design matrix (e.g., Table 1 below), i.e., robustness to replication. For gift exchange (or any other behavioral regularity) to be a notable phenomenon, it should be essentially immune to replication. Another meaning, which we shall call second-degree robustness below, is concerned with the robustness of experimental results to variations in experimental procedures such as framing, nature of the task, anonymity, subject pools, and other implementation details. For gift exchange to be a notable phenomenon, it should be essentially immune to implementation details, too. If it is not, the question of generalizability needs to be addressed: is gift exchange observed in the laboratory settings and for the tasks and subject pools that correspond most closely to the field settings to which the experimental results are to be extrapolated? Finally, the meaning that we shall call first-degree robustness below, refers to sensitivity towards parametrization characteristics such as the nature of the equilibrium choice models that have been able to rationalize systematic patterns of “anomalous” subject behavior, for example, in public good provision experiments that feature corner point equilibria (Holt and Laury 2008; Goeree et al. 2002). Interestingly, in their review of results from public good provision experiments with interior Nash equilibria (Laury and Holt 2008), the authors do not find persuasive evidence that moving equilibria away from corner points always produces behavior closer to the predictions of canonical game theory.

4We note that the last feature was changed in most later gift-exchange experiments, so that employers faced larger risks, including possible losses, as the result of exploitation.

5See our discussion of related literature in Section 5; see also Gächter and Fehr (2002).
(corner versus interior), the degree of possible efficiency gains, the degree of asymmetry between the surplus that employers and workers can capture, the risk to the employer of being exploited when trusting, and the cost to the worker of reciprocating. While such kind of parametric variation should be expected to lead to some variation in gift exchange, for gift exchange to be a robust phenomenon its very existence should not fundamentally be undermined by moderate and realistic variations. If first-degree robustness is shown to be limited, the question of generalizability arises once more: is gift exchange robust in experimental settings calibrated to relevant field settings (see, e.g., List 2006, Levitt and List, 2007, Ortmann and Hertwig, 2000)?

We note that the degrees of robustness are not to be understood as binary measures. Any phenomenon is expected to be affected by parametric variation and to some measure by implementation details. The crucial question is whether these limits to robustness are reached easily and for parameters and implementations that one would consider as realistic for relevant field settings.

One way to think about the distinction between first-degree robustness and second-degree robustness is whether it entails changes of the parameters of the underlying game that is being used to implement the experiment: second-degree robustness is tied to the (lack of) variability in results that comes from implementation details typically not part of the underlying model, while first-degree robustness is tied to the (lack of) variability in results that comes from changes in the parameters of the game. These two kinds of robustness are linked to the issue of the generalizability (or external validity) of laboratory results (Levitt and List 2007). We return to the issue in our concluding discussion. The distinction between first-degree and second-degree robustness is not always straightforward: the choice of matching scheme (which in principle is an implementation issue), can, for example, affect the equilibrium. Similarly, anonymity can be an aspect of first-degree robustness, because if play is not even anonymous among participants, then they might conceive the experimental game as part of a larger game and hence the game that they play is changed and not just its implementation. Likewise, when implementing real-effort tasks (e.g., Brüggen and Strobel 2007; Gneezy and List 2006) actual effort costs are unknown and hence equilibrium predictions might be affected.

Most things we could learn about robustness in the past we had to learn across studies. Namely, Fehr et al. (1993) and Fehr et al. (1997) studied one-sided auctions while, for essentially the same parameterizations, Fehr and Falk (1999) studied double auctions and Falk et al. (1999) and Gächter and Falk (2002) used a matching scheme that best preserves the nature of one-shot interactions (“rotation matching”; see Kamecke 1997); there are no qualitative differences in trust and reciprocity across these studies. Fehr et al. (1998a) systematically compare a market with
partners treatment and a market with an excess supply of workers, and again find no difference in behavior. Falk et al. (1999) and Gächter and Falk (2002) compare rotation matching and partners matching and find, not surprisingly, higher efforts and an endgame effect in the latter.

Addressing the issue of subject pools, the studies by Gächter and Falk (2002) and Falk et al. (1999) compare Austrian and Hungarian subjects; while the authors find somewhat higher effort in Hungary, they replicate the findings from earlier studies of positive reciprocity on the part of Austrian subjects. Similar results have been found by various studies in the USA, the Netherlands, and Switzerland. Relatedly, Fehr et al. (1998a) study trust and reciprocity of student and military subjects and find no difference here either. Fehr et al. (2002) investigated the impact of high stakes on subjects in Russia and, somewhat surprisingly, find trust and reciprocity alive and well.

A number of frames have also been used (e.g., buyer-seller in Fehr et al. 1993, Fehr et al. 1997, and List 2006, and employer-worker in Fehr, et al. 1998b) and again the results do not seem to differ across different frames. For other treatments, see Gächter and Fehr (2002). The bottom line is that none of these variations undermine the robustness of gift-exchange.

In contrast, recent investigations that systematically address aspects of the first-degree and second-degree robustness of laboratory gift exchange identify limits to the robustness of trust and reciprocity. Interesting recent examples include: List (2006), Gneezy and List (2006), Pereira et al. (2006), Healy (2007). We will address these recent studies below in Section 5.

Here we report a gift exchange experiment in which we systematically vary the following experimental design and implementation characteristics. First, we compare interior and corner-point equilibria. Second, we systematically vary the efficiency gains. Third, we systematically vary the framing of the laboratory decision problem. We also employ a matching mechanism that has been shown to best preserve the nature of one-shot strategic situations. We therefore address crucial issues of both first-degree and second-degree robustness. The issues we address are explicitly those where arguably previous studies have employed designs that are biased in favor of gift exchange. Our design also differs by an equilibrium that favours the employer, which, arguably, is a typical feature of labor markets.

The paper is structured as follows: In Section 2 we present our model of gift exchange. In Section 3 we present our experimental design and implementation and in Section 4 we present our results. Section 5 provides a brief interpretation of our results and relates them to the literature. In Section 6 we proffer some concluding remarks.
2 Our model of gift exchange

Gift exchange games are sequential principal-agent games in which the first mover (a principal such as an employer) can propose to the second mover (an agent such as a worker) an incomplete contract. The key characteristic of this contract is that a generous offer on the part of the principal, if reciprocated, will lead to Pareto improvements. In one-shot games, reciprocal behavior would contradict canonical game theory’s reliance on selfishness. Likewise, generous offers would be inconsistent with rational expectations of selfishness.\(^6\)

For ease of exposition, we use employer–worker interaction to explain our model in which a principal chooses a wage and suggests an effort. While neither principal (employer) nor agent (worker) can adjust a wage that the principal has decided to offer, the agent can adjust his effort. Both gross revenue and effort cost are increasing in effort, typically in such a manner that there are efficiency gains. The wage partly determines the transfer from the employer to the worker.

A key element of all gift-exchange games is the cost function of effort (Rigdon 2002). Typically, marginal costs of effort are assumed to be increasing. Here we follow this widely used and intuitive assumption. Specifically, we use the following two cost schedules \(c_1\) and \(c_2\).

<table>
<thead>
<tr>
<th>(e)</th>
<th>1.0</th>
<th>1.2</th>
<th>1.4</th>
<th>1.6</th>
<th>1.8</th>
<th>2.0</th>
<th>2.2</th>
<th>2.4</th>
<th>2.6</th>
<th>2.8</th>
<th>3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c_1(e))</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>(c_2(e))</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td>19</td>
<td>23</td>
<td>27</td>
</tr>
</tbody>
</table>

Note that these cost schedules differ only for high effort choices, and even there do so only slightly. As we will see presently, the choice of either cost schedule has no effect on the equilibria but they do allow us, in conjunction with a productivity parameter, to construct high and low potential efficiency gains.

Payoffs for workers and employers in the \textit{interior equilibrium} treatments are given by

\[
U = w \left( \min \left( 1 + \frac{e - 1}{2}, 1.5 \right) \right) - c(e)
\]

and

\[
\Pi = em - w \left( \min \left( 1 + \frac{e - 1}{2}, 1.5 \right) \right)
\]

where \(m \in \{50, 80\}\).

\(^6\)In finitely repeated games, by standard backward induction arguments, both generous offers and reciprocal behavior would be inconsistent with common knowledge of rationality and selfishness.
A couple of comments are in order: First, $m$ is a multiplier that scales employers’ return on workers’ effort. It is useful to think of $m$ as a productivity parameter. Second, the (gross) payoff function for workers is increasing in the wage $w$ throughout and in effort for $e \in [1.0, 2.0]$. Specifically, it is linear in effort with slope $\frac{w}{2}$ for $e \in [1.0, 2.0]$ and constant for $e \geq 2$. Thus, the marginal (gross) payoff function is first positive at $\frac{w}{2}$ and then drops to zero.\(^7\) Since marginal costs are positive and increasing, the payoff maximizing effort for the workers is (weakly) monotonic in wage but never exceeds 2.

Specifically, the best-reply schedule of workers is

\[
e^*(w) = \begin{cases} 
= 1.0 & \text{for } w < 10 \\
\in \{1.0, 1.2, 1.4\} & \text{for } w = 10 \\
= 1.4 & \text{for } 10 < w < 20 \\
\in \{1.4, 1.6, 1.8\} & \text{for } w = 20 \\
= 1.8 & \text{for } 20 < w < 30 \\
\in \{1.8, 2.0\} & \text{for } w = 30 \\
= 2.0 & \text{for } w > 30 
\end{cases}
\]

Note that the best-reply schedule of workers is the same for cost schedules $c_1$ and $c_2$. Since higher wages yield higher effort (given selfishness of workers), the profit maximizing wage offer exceeds the minimal wage for $m$ sufficiently large. This is particularly true for the values of $m$ we have chosen here, $m = 50$ and $m = 80$, which both induce interior equilibria. In fact, given the values of $m$ we have chosen our configuration yields the same two subgame-perfect equilibria, namely $w^* = 20, e^* = 1.8$ (if workers choose for $w = 20$ the maximal effort from the available set of best replies $\{1.4, 1.6, 1.8\}$) and (otherwise) $w^* = 21, e^* = 1.8$.\(^8\) The equilibrium payoffs in the first case are

\[
U = 1.4w - c(e) = 28 - 6 = 22 \quad \text{and} \\
\Pi = 1.8m - 1.4w = 90 - 28 = 62 \quad \text{for } m = 50 \quad \text{and} \\
= 144 - 28 = 116 \quad \text{for } m = 80
\]

\(^7\)A commentator suggested that the transfer function $w \left( \min \left( 1 + \frac{e-1}{2}, 1.5 \right) \right)$ looked somewhat scary and wondered whether our participants understood the payoff function. In Section 3.2 we explain how we insured that they did. The specific form of the payoff function is motivated simply by our attempt to introduce interior equilibria in wages and efforts; other ways to introduce interior equilibria in effort are possible (e.g., Pereira et al. 2006) but arguably not any more persuasive. We note that our payoff functions are economically not unrealistic. They reflect profit-sharing agreements where workers receive a bonus (that is some percentage of the base wage) that depends on profits but is capped at some level.

\(^8\)This multiplicity is caused by our restriction to integer wages.
and in the second case are

\[ U = 1.4w - c(e) = 29.4 - 6 = 23.4 \quad \text{and} \]
\[ \Pi = 1.8m - 1.4w = 90 - 29.4 = 60.6 \quad \text{for } m = 50 \quad \text{and} \]
\[ = 144 - 29.4 = 114.6 \quad \text{for } m = 80. \]

The equilibria clearly favor employers.\(^9\) Employers, however, bear all the risk of initiating cooperative outcomes.

Note that the equilibrium effort is below the maximally inducible effort 2.0 which requires a wage of 30 (or 31 if the worker chooses the lower effort from the set of best replies when indifferent). An equal split of the maximal joint payoff is achieved at \( w = 60, e = 3.0 \) for \( m = 50 \) (yielding \( U = \Pi = 60 \)) and at \( w = 89, e = 3.0 \) for \( m = 80 \) (and cost schedule \( c_2 \)) (yielding \( U = \Pi = 106.5 \)).

Since a major goal of our study was to better understand the effects of potential efficiency gains, our interior equilibrium treatments (while featuring the same interior equilibria) are distinguished accordingly: For the treatments with high efficiency gains we used the larger multiplier \( m = 80 \) and the flatter cost curve \( c_2. \(^{10}\) This implies efficiency gains at the equilibrium effort (i.e. when the effort is increased from 1.8 to 2.0) of 433\% (since the employer gains 16 at a cost of 3 for the worker) and at the maximal effort (i.e. when the effort is increased from 2.8 to 3.0) of 300\%. For the treatments with low efficiency gains we used the smaller multiplier \( m = 50 \) and the steeper cost curve \( c_1 \); for this configuration the efficiency gains are 233\% at the equilibrium effort and 100\% at the maximal effort.

In yet another treatment we induced an equilibrium near the corner point (which for the sake of economy of expression we call corner-point equilibrium or corner equilibrium). Specifically, we replaced the transfer function \( (w(\min(1 + \frac{e-1}{2}, 1.5))) \) with one that is constant in effort for \( e > 1.0. \) The payoff functions for workers and employers were thus given by

\[ U = wn - c_1(e) \]

and

\[ \Pi = 50e - wn \]

\(^9\)This, arguably, is a desirable feature. Equilibria that favor employees seem at odds with reality.

\(^{10}\)We chose two cost schedules that, to recall, were identical in the lower effort range (including and slightly exceeding the equilibrium effort) but differed slightly in higher effort choices. The first fact guaranteed that the equilibria would not be affected. The second fact allowed us to increase the difference between our high and low efficiency gain treatments.
with $n = 1.0$ for $e = 1.0$ and $n = 1.5$ for $e > 1.0$. Thus, workers’ marginal (gross) payoff function is 0 for $e \geq 1.2$. The best-reply schedule for workers is thence

$$e^*(w) = \begin{cases} 
1.0 & \text{for } w < 2 \\
\{1.0, 1.2\} & \text{for } w = 2 \\
1.2 & \text{for } w > 2 
\end{cases}$$

which yields the (subgame-perfect) equilibria $w^* = 2, e^* = 1.2$ (if workers choose for $w = 2$ the maximal effort from the available set of best replies $\{1.0, 1.2\}$) and (otherwise) $w^* = 3, e^* = 1.2$. The equilibrium payoffs in the first case are

$$U = 1.5w - c(e) = 3 - 1 = 2 \quad \text{and} \quad \Pi = 1.2m - 1.5w = 60 - 3 = 57$$

and in the second case are

$$U = 1.5w - c(e) = 4.5 - 1 = 3.5 \quad \text{and} \quad \Pi = 1.2m - 1.5w = 60 - 4.5 = 55.5.$$ 

These equilibria are even more biased in favor of employers, but also imply high risks for them. On the one hand, punishing an employer for a low offer by rejecting it (which yields a payoff of 0 for both players) becomes relatively inexpensive for a worker. On the other hand, exploiting an employer who has offered a high wage becomes relatively expensive for an employer, since the best-reply effort of the worker is lower. For example if the employer offers $w = 60$ (which coupled with $e = 3.0$ would still lead to a fair split $U = \Pi = 60$) and the worker chooses the best reply $e = 1.2$ then the payoffs are $U = 89, \Pi = -30$, whereas in the interior equilibrium low efficiency treatment the best reply is $e = 2.0$ which leads to payoffs $U = 81, \Pi = 10$.

3 Experimental design and implementation

3.1 Experimental design

Drawing on our model of gift exchange, we developed treatments along three dimensions, namely the nature of the equilibrium (interior vs. corner), efficiency gains, and frames. (A fourth dimension was added by our use of two subject pools, one of them on a site which has produced many of the classic gift exchange data.) We also employ a matching mechanism that has been shown to best preserve the nature of one-shot interactions (see the next subsection for details).
For the interior equilibria we chose two realizations of efficiency gains (low and high, from here on denoted L and H) and two realizations of frames, namely one frame using abstract descriptors and another one using employer-worker interactions (from here on A and EW). The arguments in favor of real-world frames are spelled out in Ortmann and Gigerenzer (1997) and Harrison and Rutström (2001).

In contrast, for the corner-point equilibrium we chose only the low efficiency gains and the abstract frame. We consider corner equilibria the most striking feature of the classic gift-exchange experiments. The present treatment was hence designed both as a benchmark of sorts and as a treatment meant to explore how the presence of a corner-point equilibrium affects attempts to induce reciprocity. We chose the equilibrium to be slightly off the corner point of zero wage and minimal effort in order to keep a fundamental aspect of our interior-equilibria treatments, namely that employers can induce a somewhat higher effort from a rational and selfish worker by paying a positive wage. This feature is dramatically reduced but not eliminated in our corner-point treatment.

All in all, we conducted 13 sessions. For details of the design see Table 1; details of the exact implementation of the design follow in Section 3.2 below.

### 3.2 Experimental implementation

All sessions were conducted in the experimental laboratories of the economics department at Humboldt-University Berlin (B) or the Institute for Empirical Research in Economics at the University of Zurich (Z). The exact breakdown is indicated in Table 1. Subjects were recruited in line with the standard procedures in the two labs. The Berlin subject pool was predominantly economics and business administration students; the Zurich participants were from a wide variety of fields. For the treatment EW-L two sessions each were conducted in Berlin and Zurich. While both wage offers and efforts were somewhat higher in Zurich, the differences are far from statistically significant (see Table 5 in Section 4 for details.) Hence in the descriptive statistics we report pooled data from the Zurich and Berlin sessions in this treatment.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Interior equilibrium</th>
<th>“Corner” equilibrium</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low eff gains [L]</td>
<td>high eff gains [H]</td>
</tr>
<tr>
<td>abstract [A]</td>
<td>3 (B)</td>
<td>2(Z)</td>
</tr>
<tr>
<td>empl-wrkr [EW]</td>
<td>4(2B, 2Z)</td>
<td>2(Z)</td>
</tr>
</tbody>
</table>

Table 1: Number of sessions for the individual treatments. Z=Zurich, B=Berlin
Participants seated themselves (Berlin) or were seated randomly (Zurich). Excess subjects were paid a show-up fee that was in line with the conventions in the respective labs, i.e. DM 10 (EUR 5.11) in Berlin and CHF 10 (about EUR 6.50) in Zurich.

Instructions (which were in German - for a sample translation see the appendix; for the complete set of instructions see http://home.cerge-ei.cz/Ortmann/instructions.html) were then read aloud. Questions were answered in the usual manner (e.g., privately or by repetition of the relevant passage of the instructions). At the end of the instructions we asked a dozen control questions to identify subject confusion. An experimental session was started only after all subjects had answered all questions correctly. Each set of instructions included a flow diagram that illustrated the sequencing of decisions and summarized the key parameters of the session. The relation between the effort and the transfer from the employer to the worker was explained with the aid of a wage multiplier that depended on the effort. This multiplier was included in the table below the flow diagram that presented the cost schedule. (For a sample of such a flow diagram see http://home.cerge-ei.cz/Ortmann/instructions.html.)

The experimental software was developed and the experiments were run in z-Tree (Fischbacher 2007). The experimental software included a profit calculator that was displayed on the left side of the computer screen and that allowed subjects to calculate both workers' and employers' payoffs for all admissible wage-effort pairs. There was no restriction on the time subjects could use the calculator. Subjects used the calculator extensively and intensively."

Each experimental session employed 12 subjects which were randomly assigned to one of the two roles (by seating themselves or being seated) and kept these roles throughout. The number of subjects was limited by the number of seats in the Berlin laboratory. Each of the subjects in a session was matched with each participant in the other role (“rotation matching”) which has been shown to best preserve the one-shot nature of the interaction by precluding any indirect reputation or spill-over effect (Kamecke 1997). We explained to subjects that their behavior in

11 Specifically, all employers used the calculator in at least 2 periods (mean 5.49, 52 of 78 employers used the calculator in all six periods). In the periods in which the calculator was used, individual employers on average made 16.9 computations per period (median 12, maximum 123). The average time that an employer used the calculator was 109.5 seconds per period (median 86 seconds, maximum 548 seconds). Workers used the calculator in more periods. While one worker never used the calculator, the others did so in at least 4 periods, 68 of 78 in all six periods (mean 5.76). On the other hand, workers performed fewer computations per period (mean 9.9, median 9, maximum 33) and used the calculator for a shorter time (mean 67.2 seconds, median 57 seconds, maximum 379 seconds). The reason seems to be that most workers did not perform any computations for a wage other than that chosen by the employer.
any one period could not affect any future interactions. For the exact wording, see the second paragraph of the sample instructions. We ran the maximum number of periods (6) possible under this matching procedure.

In each period the employers had to make an offer to the worker they were matched with for that period; they could enter that wage offer and an effort they suggested to the worker on the right hand side of the computer screen. Wage offers had to be integers between 0 and 100 (for $m = 50$) or 0 and 200 (for $m = 80$). After all employers had made their offers, the workers were informed about their wage offer and the effort suggested by the employer they were matched with; they were then asked to enter their decision whether to accept or reject the offer and, in case of acceptance, their effort level. A rejection led to zero payoffs for employers and workers. When all workers had made their choice, all players were informed about the choices in their pair and about their own payoff. No subject was ever informed about the choices of any other employer or worker.

4 Results

Descriptive statistics. In Table 2 (which uses as a template Table 1) we report for each treatment in the top row the average wage offers across all experimental sessions (and in parentheses the number of data points on which the averages are based) and in the bottom row the average effort in case of acceptance (and in parentheses the number of data points on which the averages are based).

In Table 3 we condition the wage offer data on whether an offer was accepted or rejected; in each cell the first row denotes the acceptance and the second the rejection case. The distribution of wage offers and efforts chosen (in case of acceptance) is shown in Figures 1 and 2, respectively.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Interior equilibrium</th>
<th>“Corner”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low eff gains [L]</td>
<td>high eff gains [H]</td>
</tr>
<tr>
<td>abstract [A]</td>
<td>31.4 (108)</td>
<td>37.4 (72)</td>
</tr>
<tr>
<td></td>
<td>1.78 (102)</td>
<td>1.68 (64)</td>
</tr>
<tr>
<td>empl-wrkr [EW]</td>
<td>32.3 (144)</td>
<td>51.4 (72)</td>
</tr>
<tr>
<td></td>
<td>1.73 (137)</td>
<td>1.84 (70)</td>
</tr>
</tbody>
</table>

Table 2: Average wage offers (top) and average efforts in case of acceptance (bottom) by treatment. Low efficiency gains correspond to $m = 50$ and cost schedule $c_1$, high efficiency gains to $m = 80$ and cost schedule $c_2$. Number of data points on which averages are based in parentheses.
Table 3: Average wage offers by treatment, separated into those accepted (top) and those rejected (bottom). Low efficiency gains correspond to $m = 50$ and cost schedule $c_1$, high efficiency gains to $m = 80$ and cost schedule $c_2$. Numbers of observations on which averages are based in parentheses.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Interior equilibrium</th>
<th>“Corner”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low eff gains [L]</td>
<td>high eff gains [H]</td>
</tr>
<tr>
<td>abstract [A]</td>
<td>32.49 (102)</td>
<td>40.3 (64)</td>
</tr>
<tr>
<td></td>
<td>12.5 (6)</td>
<td>14.5 (8)</td>
</tr>
<tr>
<td>empl-wrkr [EW]</td>
<td>33.24 (137)</td>
<td>52.21 (70)</td>
</tr>
<tr>
<td></td>
<td>12.86 (7)</td>
<td>23 (2)</td>
</tr>
</tbody>
</table>

We observe the following facts.

Wage offers are somewhat above the equilibrium, in particular:

1. The majority of wage offers are clustered somewhat above the equilibrium offer, but substantially below the equitable wage offer for all interior equilibria treatments except the EW-H one. The majority of wage offers in the EW-H treatment lie substantially above the equilibrium.

2. In the C treatment, the majority of wage offers are below the wage offers in the interior equilibrium treatments. However, there is a non-negligible number of very high wage offers as well. Consequently, average wage offers in treatment C are substantially above those predicted by the corner-point equilibrium.

3. The interaction of high efficiency gains and the EW frame clearly influences wage offers. In treatment C, wage offers are much more dispersed. Specifically, we observe these facts:

   The interaction of high efficiency gains and the EW frame clearly influences wage offers. In treatment C, wage offers are much more dispersed. Specifically, we observe these facts:

3. The distribution of wage offers is, for the interior equilibria treatments, clearly affected by the efficiency gains. In the abstract frame, this effect materializes only as a relatively low number of high wage offers for the A-H treatment. In contrast, for EW-H the whole wage offers distribution is shifted to the right relative to that in the EW-L frame. These trends are also reflected in the average wage offers. In the abstract frame, the relatively small number of very high wage offers translates into an increase of approximately 20% only. In contrast, for EW-H, average wage offers are about 60% higher than in EW-L. Using the variance in the individual sessions as independent observations, the variance of the treatments with high efficiency gains is clearly and significantly higher than that in the treatments with low efficiency gains (Mann-Whitney test, $p < 0.01$).
4. The distribution of wage offers seems, for the interior equilibria, also affected by the frame. For low efficiency gains, we observe for the EW frame a higher share of offers both below and substantially above the equilibrium, resulting in nearly identical averages for EW and A frames. In contrast, for high efficiency gains, we again observe a substantial upward shift of the whole distribution, resulting in about 40% higher average wages in EW.

5. Together, high efficiency gains and the EW frame lead to a substantial shift upward in wage offers relative to the A-L treatment, with high efficiency gains (A-H vs A-L) and the EW frame (EW-L vs A-L) alone having much less of an impact.

6. Returning to the C treatment, we see a more dispersed set of wage offers (low equilibrium wages cause a higher number of low wages, but also low equilibrium efficiency leads to more high wage offers). Using the variance in the individual sessions as independent observations, the difference between the corner-equilibrium treatment and the other treatments with low efficiency gains just misses significance (Mann-Whitney test, $p = 0.14$) which, given that there are only two sessions in the C treatment, strikes us as remarkable.

Effort choices are close to the best replies to wage offers, and workers sometimes react to low wage offers with rejections. Specifically, we observe these facts:

7. As Table 3 shows, in all treatments (interior and corner) rejections of wage offers are triggered by comparatively low wage offers, in line with negative reciprocity.

8. In contrast to wage offers, there are no discernible differences in effort choices across interior equilibrium treatments. Since, furthermore, efforts are clustered at equilibrium and maximal best-reply, the average effort choices are close to the equilibrium in all treatments.

9. The only difference that might qualify as discernible are the effort choices in EW-H which overwhelmingly are at the maximal best-reply effort and likely result from the higher wage offers in EW-H. See also Table 6 below.

10. Returning once more to the C treatment, we note that virtually all effort choices are at the equilibrium and that the number of rejections is substantially higher than in the other treatments.

Table 4 shows the average payoffs for employers and workers by treatment (in Experimental Currency Units and excluding show-up fees to keep the Berlin and Zurich data comparable).
Table 4: Average payoffs by treatment for employers (top) and workers (bottom) in Experimental Currency Units. ECUs were exchanged in the L treatments at a rate of 1 ECU=0.10 DM (Berlin) or 1 ECU=0.10 CHF (Zurich) and in the H treatments at a rate of 1 ECU=0.05 CHF. Participants in Zurich were paid a show-up fee of 10 CHF in addition.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Interior equilibrium</th>
<th>“Corner”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low eff gains [L]</td>
<td>high eff gains [H]</td>
</tr>
<tr>
<td>abstract [A]</td>
<td>246</td>
<td>419</td>
</tr>
<tr>
<td></td>
<td>221</td>
<td>264</td>
</tr>
<tr>
<td>empl-wrkr [EW]</td>
<td>231</td>
<td>421</td>
</tr>
<tr>
<td></td>
<td>226</td>
<td>394</td>
</tr>
</tbody>
</table>

Statistical analysis. Observations within sessions are not independent. To analyze whether the treatment variables have significant influence on wage offers and effort choices, we estimate random-effects regression models with the sessions as independent units of observations. Table 5 reports the coefficients for dummy variables for high efficiency gains, employer-worker frame, the interaction effect of high efficiency gains and employer-worker frame, the corner point equilibrium and Zurich sessions. The left column refers to the analysis for wage offers, the middle column to effort choices, and the right column to excess efforts, i.e. differences between efforts and best-reply efforts.

The only significant influence on effort choices is the corner equilibrium. In line with the theoretical prediction, effort is substantially and significantly lower than in the interior equilibrium treatments. Furthermore, the corner equilibrium has a positive impact on the difference between effort and best-reply effort (probably because negative differences were restricted to 0.2 and negative reciprocity was hence executed by rejections.)

Confirming the descriptive statistics, the only significant determinant of wage offers is the interaction of the extent of efficiency gains with the frame: High efficiency gains coupled with the employer-worker frame extract significantly larger wage offers. High efficiency gains or the employer-worker frame by themselves do not have a significant or substantial impact. We particularly note that the dummy variable Zurich has neither substantial nor significant influence on wage offers, efforts or excess efforts.\textsuperscript{12}

Trust and reciprocity. As we have seen, wage offers are somewhat higher than canonical theory predicts. We emphasize that this could be trust in positive reciprocity or, similar to what

\textsuperscript{12}Dropping the Zurich dummy does not change any level of significance with respect to the threshold values $p = 0.01$, $p = 0.05$, $p = 0.1$ in the analyses presented in Table 5.

15
Table 5: Random-effects regression for wage offers (column 2), efforts (column 3) and differences between effort and best-reply effort (column 4). The rows list coefficients for the following dummy variables: high efficiency gains (High), employer-worker frame (E-W frame), the interaction effect of high efficiency gains and employer worker frame (High x E-W), corner point equilibrium (Corner), and Zurich sessions (Zurich), z-statistics are given in parentheses. + = significant at $p = 0.1$, * = significant at $p = 0.05$, ** = significant at $p = 0.01$.

we typically observe in ultimatum games, it could be an attempt to prevent negative reciprocity. Of course, it could also reflect altruism or inequality aversion given that the equilibrium payoffs (which subjects had time to evaluate) favored the employer. Little such “generous” behavior is found on the worker side. Table 6 shows, for each treatment, the relative number of effort choices that are equal to, above, or below workers’ (selfish) best replies to actual wage offers as well as the numbers of rejections. (In case of a wage offer that let the worker be indifferent, i.e. 10, 20, or 30, we counted any of the efforts in the set of best replies as equal to the best reply.)

As Table 6 shows, in all treatments most effort choices (60%) are best replies. More effort choices are below (22%) the best reply than are above (10%). Since the best reply is always in

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wage Offer</th>
<th>Effort</th>
<th>Effort - Best Reply Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>31.38 (8.390)**</td>
<td>1.789 (21.664)**</td>
<td>-0.068 (-1.196)</td>
</tr>
<tr>
<td>High</td>
<td>2.329 (0.265)</td>
<td>-0.258 (-1.331)</td>
<td>-0.161 (-1.202)</td>
</tr>
<tr>
<td>EW Frame</td>
<td>-0.991 (-0.168)</td>
<td>-0.130 (-0.994)</td>
<td>-0.090 (-1.005)</td>
</tr>
<tr>
<td>High x EW</td>
<td>14.963 (1.706)+</td>
<td>0.300 (1.548)</td>
<td>0.142 (1.066)</td>
</tr>
<tr>
<td>Corner-Point</td>
<td>-8.449 (-1.429)</td>
<td>-0.465 (-3.497)**</td>
<td>0.194 (2.099)*</td>
</tr>
<tr>
<td>Zurich</td>
<td>3.722 (0.575)</td>
<td>0.142 (0.995)</td>
<td>0.083 (0.843)</td>
</tr>
</tbody>
</table>

Table 6: Absolut and relative numbers of effort choices below (column 2), at (column 3), or above the worker’s best reply (column 4) and of rejections (column 5)
the lower half of the range of possible efforts, random errors should produce deviations towards choices above the best reply rather than below.

In line with the literature, we define positive reciprocity as relying on two conditions: first, in response to a kind action of the first mover, the second mover chooses an action that comes at a cost to him and benefits the first mover. Second, this benefit has to be large enough to make the first mover better offer than in the (canonical) subgame perfect equilibrium.\textsuperscript{13} In the context of our gift-exchange game a necessary, but not sufficient, condition is that second movers choose an effort above their (selfish) best reply. Only 10\% of second movers’ actions in our data satisfy this condition, in spite of the majority of wage offers being above the equilibrium in all treatments.\textsuperscript{14} Negative reciprocity, in turn, we define as the second mover incurring a cost for lowering the first mover’s payoff in response to the first mover’s unkind action. In the context of our gift-exchange game, this means effort below the (selfish) best response or rejection of the wage offer.

Figure 3 shows the average deviation of effort from the best reply dependent on workers’ payoff implied by the best-reply effort for the given wage offer. As can be seen from Figure 3 there is a positive relation between the effort – best reply difference and workers’ payoff (at best-reply effort). This supports positive and negative reciprocity, as efforts below best response are triggered by low wages and efforts above best response by high wages. Since the difference is, however, rarely positive, our result are in line with negative rather than positive reciprocity.\textsuperscript{15}

\textsuperscript{13}For example, in the trust game, if the first mover sends part of his initial endowment, the second mover may return more or less than this investment. Any positive return satisfies our first condition, but only returns larger than the original investment satisfy the second and would hence qualify as positive reciprocity in the way we use the term here. A positive return that fails to satisfy the second condition does not merit the name positive reciprocity, if positive reciprocity is understood as a mutually beneficial exchange, as it arguably should.

\textsuperscript{14}To determine with certainty that a second mover considers a first mover’s action kind, we would need to know the second mover’s beliefs regarding the first mover’s expectations about the second mover’s behavior. For the present purpose, it is sufficient to point out that even considering all efforts above the best response as potentially positively reciprocal, we find few choices that could qualify as such compared to selfish actions and negatively reciprocal ones.

\textsuperscript{15}Note that in the interior equilibrium treatments negative reciprocity is relatively cheap at low wages (where only it applies). For example, for wages 11, 21, and 31, choosing an effort of 1.0 instead of the best reply effort (1.4, 1.8, or 2.0, respectively) costs the worker 0.2, 2.4, or 6.5, respectively, but the employer loses 17.8, 31.6, or 34.5, respectively, in the treatments with low efficiency gains, and even 29.8, 55.6, or 64.5, in the treatments with high efficiency gains. The relative costs of negative reciprocity by rejections (instead of best-reply effort) are, for non-trivial wages, higher, e.g. at wages 11 or 21 the costs for the worker are 11.2 or 23.4 and the loss for the employer (i.e. the punishment) is 56.8 or 60.6 (low efficiency gains treatment) and 98.8 or 114.6 (high efficiency
In fact, Figure 3 underestimates the role of negative reciprocity since rejections of low wage offers are a form of negative reciprocity. The last column of Table 6 shows the number of rejections per treatment and Table 3 compares the average wage offers that are accepted with those that are rejected. In all treatments, average rejected offers are less than half of the average accepted wage offers, indicating that rejections are indeed a negatively reciprocal reaction to low wage offers. Only in treatment C-A are the positive differences between effort and best reply more substantial than the negative differences. This, however, is the result of the best reply being bounded by 1.2 in this treatment. Negative reciprocity could (almost) only be exercised by rejections in this treatment and the number of rejections is by far the highest in C-A (22% compared to 6% in the other treatments).16,17

Table 7 shows the coefficients for a random-effects regression model for the dependence of the excess effort (i.e. the difference between effort and best reply) on the wage offer, the suggested effort as well as treatment dummies. In each cell the top line refers to all treatments, the bottom line to an analysis excluding the corner-point equilibrium treatment. The left column refers to the complete data, the middle column to the data restricted to wage offers below or equal to 30 (because up to 30 the best reply is increasing in the wage offer) and the right column to wage gains treatment). Positive reciprocity at high wages is somewhat more expensive than negative reciprocity (just because we did not allow dramatic efficiency gains). Since the transfer is independent of the effort for $e \geq 2.0$, the costs and benefits of positive reciprocity are independent of the wage for $w > 30$. For $e \geq 2.0$, in the low efficiency gains treatments, increasing the effort by 0.2 always yields a benefit of 10 for the employer. The marginal costs for the worker increase from 3 (when choosing 2.2) to 4 (when increasing the effort to 2.4 or 2.6) and eventually to 5. In the high efficiency gains treatment, the marginal benefit for the employer is 16, and the marginal costs for the worker do not exceed 4.

16The relative costs for negative reciprocity by choosing an effort 1.0 instead of the best reply effort (which is generally 1.2) is much higher than in the interior equilibrium treatments (for wages of 3, 11, or 21, the costs for the worker are 0.5, 4.5, or 9.5, respectively and the loss for the employer 8.5, 4.5 or even -0.5). Rejections, in comparison, are more efficient as punishment. For the same wages, the costs for the worker are 3.5, 15.5, or 30.5, and the loss for the employer 55.5, 43.5, or 28.5. Due to lower marginal effort costs for lower effort, positive reciprocity is cheaper in that range than in the interior equilibrium treatments. Hence it is consistent with traditional economic reasoning that compared to the interior equilibrium treatments, we see slightly more positive reciprocity in the corner treatment and negative reciprocity exhibited by rejections instead of lower effort.

17Rejections in C-A are a common form of negative reciprocity as they are not concentrated in a small number of subjects. Among the twelve workers in this treatment, only five never reject an offer, while one does so once, five do so twice and one actually rejects in five of the six periods.
<table>
<thead>
<tr>
<th>Treatments</th>
<th>All Wage Offers</th>
<th>Wage Offers ≤ 30</th>
<th>Wage Offer &gt; 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>-0.457 (-6.832)**</td>
<td>-0.095 (-0.775)</td>
<td>-0.425 (-3.201)**</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>-0.471 (-6.341)**</td>
<td>-0.109 (-0.748)</td>
<td>-0.412 (-3.515)**</td>
</tr>
<tr>
<td>Wage Offer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>0.007 (6.145)**</td>
<td>-0.009 (-2.140)*</td>
<td>0.009 (4.555)**</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>0.007 (5.559)**</td>
<td>-0.010 (-1.977)*</td>
<td>0.009 (5.028)**</td>
</tr>
<tr>
<td>Suggested Effort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>0.071 (2.143)*</td>
<td>0.074 (1.639)</td>
<td>0.040 (0.682)</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>0.083 (2.341)*</td>
<td>0.093 (1.671)+</td>
<td>0.040 (0.773)</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>-0.172 (-2.242)*</td>
<td>-0.036 (-0.304)</td>
<td>-0.342 (-2.614)**</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>-0.169 (-2.053)*</td>
<td>-0.044 (-0.372)</td>
<td>-0.338 (-3.092)**</td>
</tr>
<tr>
<td>EW Frame</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>-0.075 (-1.478)</td>
<td>-0.039 (-0.521)</td>
<td>-0.132 (-1.500)</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>-0.075 (-1.370)</td>
<td>-0.038 (-0.522)</td>
<td>-0.133 (-1.791)+</td>
</tr>
<tr>
<td>High × EW Frame</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>0.028 (0.359)</td>
<td>0.003 (0.019)</td>
<td>0.078 (0.634)</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>0.030 (0.363)</td>
<td>-0.010 (-0.061)</td>
<td>0.080 (0.774)</td>
</tr>
<tr>
<td>Corner-Point</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>0.246 (4.510)**</td>
<td>0.123 (1.465)</td>
<td>0.190 (1.727)+</td>
</tr>
<tr>
<td>Zurich</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>0.034 (0.608)</td>
<td>-0.091 (-1.041)</td>
<td>0.136 (1.463)</td>
</tr>
<tr>
<td>exclud. C-A</td>
<td>0.033 (0.540)</td>
<td>-0.089 (-1.017)</td>
<td>0.136 (1.759)+</td>
</tr>
</tbody>
</table>

Table 7: Random-effects regression for the difference between effort and best-reply effort. The rows list coefficients for impact of the wage offer, the suggested effort and dummy variables for high efficiency gains (High), employer-worker frame (E-W Frame), the interaction effect of high efficiency gains and employer-worker frame (High × E-W), corner-point equilibrium (Corner), and Zurich sessions (Zurich). In each cell the top row refers to regressions including all treatments, the bottom row to those excluding the corner-point equilibrium treatment. z-statistics are given in parantheses. + = significant at $p = 0.1$, * = significant at $p = 0.05$, ** = significant at $p = 0.01$. 

offers larger than 30.$^{18}$ Table 8 shows the coefficients for Wage Offer and Suggested Effort in the corresponding analysis for the individual treatments.

Note that Wage Offer has a significant but small positive impact on excess efforts in all treatments. To increase the excess effort by one step (i.e. 0.2) requires to increase the wage offer by about 20. Interestingly, the impact is negative (or essentially zero) for wage offers below 30 in all treatments which implies that the increase in effort is smaller than (or roughly equal to) the

$^{18}$ Dropping the Zurich dummy has no substantial effects. For all wage offers (left column), High is then significant at $p = 0.01$ instead of $p = 0.05$, but for wage offers $> 30$, it is only significant at $p = 0.05$ instead of $p = 0.01$. Furthermore, without the Zurich dummy, suggested effort is not significant any more at $p = 0.1$ for wage offers $≤ 30$, and E-W Frame is not significant any more at $p = 0.1$ for wage offers $> 30$. There are no other changes with respect to the significance thresholds.
increase in best-reply efforts. This negative impact might look surprising at first, but note that for very low wage offers, the best-reply effort is equal or close to the minimum possible effort. Hence there is little or no room for negative reciprocity through below best-reply efforts (and only rejections remain as a means of negative reciprocity). As wages increase, best-reply efforts increase and hence it becomes possible to deviate below the best-reply effort. For wages below 30, workers are apparently not satisfied and increase their efforts less than the best-reply efforts. Increasing the suggested effort has a slight positive effect, which does not, however, show a consistent pattern across treatments.

To summarize our results on worker behavior, we observe that there is a partial reciprocal relation since efforts increase in wage offers at least for parts of the wage range. In contrast to almost all previous studies, however, negative reciprocity appears to dominate positive reciprocity. Indeed, even wage offers above the equilibrium wage are followed by efforts larger than the best reply in only 11%, but in 64% by efforts equal to best response, in 21% by efforts below the best reply and in 4% by rejections. What might contribute to this result is that at equilibrium wage-effort combinations, employers receive substantially higher payoffs than workers, and hence even for wages slightly above the equilibrium they are better off. If workers are driven by payoff

<table>
<thead>
<tr>
<th>Treatment</th>
<th>All Wage Offers</th>
<th>Wage Offers &lt;= 30</th>
<th>Wage Offer &gt; 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-L</td>
<td>0.012 (4.443)**</td>
<td>0.0001 (0.007)</td>
<td>0.012 (3.926)**</td>
</tr>
<tr>
<td>A-H</td>
<td>0.005 (1.902)†</td>
<td>-0.027 (-1.969)*</td>
<td>0.012 (2.408)*</td>
</tr>
<tr>
<td>EW-L</td>
<td>0.011 (3.526)**</td>
<td>-0.002 (-0.247)</td>
<td>0.012 (2.538)*</td>
</tr>
<tr>
<td>EW-H</td>
<td>0.005 (2.465)*</td>
<td>-0.038 (-2.825)*</td>
<td>0.007 (2.507)*</td>
</tr>
<tr>
<td>C-A</td>
<td>0.010 (2.545)*</td>
<td>-0.001 (-0.359)</td>
<td>0.047 (1.054)</td>
</tr>
</tbody>
</table>

Table 8: Random-effects regression for the difference between effort and best-reply effort. The rows list the coefficient for the variables wage offer (upper part) and suggested effort (lower part) for the various treatments. First row: Abstract-low, second row: Abstract-high, third row: Employer-worker-low, fourth row: Employer-worker-high, fifth row: Corner-point. z-statistics are given in parentheses. † = significant at $p = 0.1$, * = significant at $p = 0.05$, ** = significant at $p = 0.01$. 


comparisons as, for example, the model by Fehr and Schmidt (1999) suggests, they will reciprocate high wages with high efforts only when no disadvantageous inequality results.

So can the Fehr-Schmidt model rationalize our data? We consider the low-efficiency gains, high-efficiency gains and corner-point treatments in turn and look at wage ranges where the Fehr-Schmidt model makes clear predictions without reverting to specific assumptions about the joint distribution of the parameters of the model. For the low-efficiency gains treatments, for $w > 40$ efforts above the (selfish) best reply do not lead to disadvantageous inequality.\textsuperscript{19} In particular, the Fehr-Schmidt model predicts that in this wage range efforts should never be below the best reply, offers should never be rejected and for $\beta > \frac{4}{13}$ workers would choose $e > BR$. According to the rough parameter estimates that Fehr and Schmidt (1999) present, $\beta > \frac{4}{13}$ would hold for 70% of workers.\textsuperscript{20} In our data, we find 42% of effort choices above the best reply and 4% below the best reply. Looking at the other side of the wage range, for $w < 36$ the Fehr-Schmidt model predicts that efforts are never above the best reply and $e < BR$ for $\alpha \geq \frac{1}{4}$, which should hold according to the Fehr-Schmidt estimates for 70% of workers.\textsuperscript{21} We indeed find no efforts above the best reply and 35% of choices below the best reply. Hence the Fehr-Schmidt model is broadly consistent with the fact that efforts are above the best reply only when workers are advantaged and below the best reply (almost) only when they are disadvantaged. We do, however, find both less positive and less negative reciprocity than the Fehr-Schmidt estimates suggest.

Similar patterns hold in the high-efficiency gains and corner point treatments. In the high-efficiency gains treatment, $w > 62$ should never lead to $e < BR$ or rejections and to $e > BR$ if $\beta > \frac{3}{19}$. Consistent with this prediction, offers are never rejected and efforts never below the best reply, but only 21% are above the best reply in contrast to the 70% to be expected according to Fehr and Schmidt. Similarly, for $w < 55$ we should never see $e > BR$ and $e < BR$ or rejections for $\alpha > \frac{1}{3}$, so in 70%. While 38% of $e < BR$ and 10% rejections are broadly consistent with this prediction, we also find 8% $e > BR$, suggesting that payoff inequalities are not necessarily the

\textsuperscript{19}To be more precise, there is some effort level larger than the (selfish) best reply that does not imply disadvantageous inequality, while even higher efforts might still lead to disadvantageous inequality. The crucial observation is that the Fehr-Schmidt model predicts for inequality averse subjects efforts somewhat above the (selfish) best reply.

\textsuperscript{20}Blanco et al. (2007) provide (nearly) point estimates for the parameters of the Fehr and Schmidt model and also find about 70% among their participants with $\beta > \frac{4}{13}$.

\textsuperscript{21}The estimates by Blanco et al. (2007) of the $\alpha$ parameter are in line with those by Fehr and Schmidt. However, since they do not collapse the distribution to a few mass points as Fehr and Schmidt do (in particular, all with $\alpha < \frac{1}{4}$ are assigned $\alpha = 0$ in Fehr and Schmidt), in Blanco et al. (2007) the number of participants with estimated $\alpha \geq \frac{1}{4}$ is even larger than 70%.
standard which workers use to determine a “fair wage” that they reciprocate by efforts above the best reply. In the corner-point treatment, for \( w > 23 \) Fehr-Schmidt predicts no efforts below best reply or rejection and \( e > BR \) for \( \beta > \frac{1}{3} \). Our data indeed shows no case of \( e < BR \) or rejection, but only 29% \( e > BR \). For \( w < 11 \), Fehr-Schmidt predicts no effort above the best reply and \( e < BR \) or rejections for \( \alpha \geq \frac{1}{2} \). Results are relatively close to this prediction with 55% rejections and only 4% \( e > BR \).

To summarize, the Fehr-Schmidt model appears to capture some of the essence of the reciprocity we observe, but we find substantially less reciprocity (both positive and negative) than their estimates based on previous experiments suggests. How can we explain that the Fehr-Schmidt model appears to rationalize much of our worker data, but predicts substantially more reciprocity? The possible explanations are first, that we clearly implemented one-shot interactions between specific employer-worker pairs which eliminated any strategic reciprocal actions, and second, that the provision of the profit calculator promoted payoff maximization (although it also dramatically facilitated payoff comparisons).

While the above analysis suggests that the Fehr-Schmidt model captures quite well that equal payoffs are a benchmark for reciprocity, it is not that clear that aversion towards inequality is really what drives the reciprocal actions. First, as seen above, wage offers that imply disadvantageous payoff inequalities even at best reply are still followed by \( e > BR \) in 8% in the high-efficiency gains treatments. More importantly, among the 46 efforts choices above the best reply observed in all treatments, more than a quarter (12) are substantially higher than the inequality minimizing level, causing disadvantageous inequalities between 27 and 177. Another 14 reduce the advantegous

---

22Equal payoffs appear, however, to be a better standard than equilibrium wages as a benchmark for reciprocity.

23More precisely, since rejections reduce inequality more effectively, for \( w > 3 \) we should only see rejections, as indeed we do.

24Careful readers might have observed that the estimates of parameter distributions that Fehr and Schmidt present are meant as distributions across subjects whereas here we look at the shares of decisions that conform with certain predictions. This, however, would only be a problem, if the distribution of certain wage offers was biased in such a way that the reciprocal subjects got fewer wage offers in the relevant ranges. With our matching scheme, it is hard to conceive how this could have occurred and indeed we have confirmed that the crucial wage offers are rather evenly spread across subjects. If anything, there is a bias in favor of reciprocity as workers who got relatively frequently high or low offers tended to reciprocate more than the average subject.

25More precisely, these are eight choices by six different workers. There are 24 workers in total in the high-efficiency-gains treatments.
inequality but do not minimize it subject to a constraint of not causing disadvantageous inequality.26 Thus, payoff equality seems to play some role as a standard to evaluate the fairness of wages and as the aim of reciprocal actions, but not necessarily the dominant one in either case.27,28 Finally, note that the average payoffs are relatively equal for workers and employers in three treatments and also differ substantially less than the equilibrium payoffs in the remaining treatments (see Table 4 above). This could be seen as evidence in favor of inequality aversion. Note, however, that most wage-effort combinations result in rather large payoff differences.29 The relative equality in average payoffs results from two counter-balancing effects: general wage-effort combinations close to the equilibrium that advantage employers and partial exploitation of high wage offers, that substantially advantage workers.30

A related question is how well models of reciprocity such as Dufwenberg and Kirchsteiger (2004) or Falk and Fischbacher (2006) capture the behavior of our subjects. We first note that since effort choices below best response are Pareto-dominated, even efforts somewhat above the (selfish) best response are to be considered unkind according to Dufwenberg and Kirchsteiger (2004). Similarly, most wages that we observe would be unkind. Thus, the observed behavior could potentially be consistent with a reciprocity equilibrium where reciprocity is primarily of the negative kind. Since the model crucially depends on first-order and second-order beliefs, it is, however, difficult to assess how well the model captures underlying motivation. Occasional

26In nine of these cases the marginal cost curve is constant at the effort choice and hence the results are not consistent with any possible Fehr-Schmidt parameters since given the linear utility function, if subjects want to pay for reducing inequality, they should minimize it as long as their cost is linear as well.

27Note again, that this is in spite of the provision of a profit calculator that eliminated all problems of calculating payoff equalizing effort.

28In a more direct way, without reverting to inequality aversion, which does not find much support in pure distribution games (see Engelmann and Strobel, 2004), the model by Cox et al. (2007) captures that reciprocity can be triggered by deviations from payoff equality. This model is based on agents that are basically altruistic, but also reciprocal. Reciprocity is triggered by deviations from a benchmark payoff, which could, e.g., be the equilibrium payoff or the equal payoff. Our data suggest that in the low-efficiency games treatment the equal payoff is the appropriate standard, while in the high-efficiency gains treatments it might be lower.

29The average absolute payoff difference is 25.2, the absolute payoff difference is smaller than 10 in 162 cases (this includes the 39 rejections that result in equal (0) payoffs), but ≥ 10 in 306 cases and even ≥ 20 or ≥ 40 in 194 and 108 cases, respectively.

30One might be tempted to conclude that hence this exploitation of occasional high wage offers can be explained by a desire to equalize total payoffs. This conclusion, however, does not survive closer scrutiny, as total payoffs within some sessions differed quite substantially.
high wage offers seem to be indicative of some players holding wrong beliefs, inconsistent with equilibrium. Moreover, we have clear, albeit indirect, evidence against the relevance of these reciprocity models. Assessing the opponent’s kindness crucially depends on the alternative options that were available to the opponent. The data on the use of the profit calculator does not indicate that players were thoroughly investigating these counter-factuals. Specifically, while 68 of the 78 workers use the calculator in all six periods, only 8 workers ever enter a wage other than that chosen by the employer, 7 among them only one other wage, and 6 of these only in one period. Indeed, some of these computations appear to result from typos. Only one worker uses the calculator to extensively explore the realm of outcomes that would have been possible if the employer had chosen another wage. Ignoring counterfactual wages is consistent with standard game theory, whereas this observation casts doubts on the validity of reciprocity models like those of Dufwenberg and Kirchsteiger (2004) and Falk and Fischbacher (2006) in this context. While it is possible that workers might have evaluated the outcome of counter-factual wages without the use of the calculator, this seems very unlikely because workers use the calculator quite extensively for the given wage. Thus while reciprocity models might capture some aspects of our choice data, the evidence we have on subjects’ decision process is inconsistent with that suggested by the reciprocity models.

The crucial question for the robustness of gift exchange is whether reciprocity is sufficiently strong to make high wage offers worthwhile. Figure 4 shows the profits of employers by wage brackets.

Figure 4 illustrates that the optimal wage in the low efficiency treatments is slightly above the equilibrium wage. In contrast, in the high efficiency treatments wages that are substantially above the equilibrium tend to be profitable. (The noise, especially of the EW-H data, is due to differences in the distribution of wage offers. Also contributing to the variance in payoffs at the lower end of the wage offers is the number of sessions per treatment.) Raising the wage to the equilibrium wage increases the profit more strongly than predicted because lower wages are sometimes answered by negative reciprocity. For the same reason, it pays to increase the wage even slightly above the equilibrium. This is confirmed by Table 9 which shows coefficients for Wage Offer in a random-effects regression for the employer’s payoff, by treatment and by wage bracket (top row: all wage offers; second row: offers smaller than 40, which is above the equilibrium wage but below 60, the wage required for equal payoffs at maximal effort; third row: offers above 20, the equilibrium wage in all treatments except for C-A; bottom row: offers between 20 and 40.) The employer’s payoff is significantly increasing in Wage Offer for low wage offers (except for EW-H) but decreasing for high wage offers. Note that the positive coefficient on Wage Offer for the range
20 - 40 suggest that it pays to raise offers somewhat above the equilibrium. Note also that for the corner-point equilibrium the optimal wage offers lie substantially above the equilibrium but below that for other treatments. Last but not least we note that in this treatment high wage offers lead to negative average payoffs for employers.

Apparently, employers learn that it is not profitable to offer very low or very high wages. Figure 5 shows the distribution of wage offers in the first two and the last two periods, aggregated for all interior equilibria treatments. It is clearly shown that the number of wage offers below the equilibrium and those above 50 decreases substantially towards later periods. The corresponding effect is even more striking in the corner-point treatment, as shown in Figure 6. While wage offers are quite spread out in the first two periods, they cluster between 10 and 19 (i.e. somewhat, but not substantially above the equilibrium) in the last two periods. Furthermore, if we include the period as independent variable in the analysis for wage offers, efforts, and excess efforts presented in Table 5, we see that it has a small but significant negative impact on all variables.\footnote{In particular, for wage offer: coefficient for variable “period”: $-0.0954$, $p = 0.029$; for effort: $-0.0294$, $p = 0.015$; for effort – best-reply effort: $-0.0257$, $p = 0.009$. The effects are slightly smaller, but still significant, if we exclude the corner-point treatment ($p = 0.051$ in regression for wage offer, $p < 0.05$ in the other two cases). Coefficients and levels of significance for the other variables are only minimally affected by including the variable “period”.
}

Hence there is no tendency towards gift-exchange, but rather a slight decrease of it over time. Gneezy and List (2006) find qualitatively the same effect, albeit much stronger.

5 Discussion

We interpret our results as follows: First, as summarized in Facts # 1 - 2 above, in both interior and corner point scenarios we see wage offers that are higher than predicted by canonical theory. Such wage offers could be interpreted as attempts at eliciting gift exchange on the part of employers. These offers typically are “small commitments” (Watson 2002).

Second, as evidenced by Facts # 7 - 10, Table 6, and Figure 3, in all treatments workers typically maximize their payoffs given wage offers. Contrary to what has been observed in many other experiments, our subjects typically choose the selfish best-reply actions. Particularly noteworthy is that workers show little positive reciprocity. They do exhibit some negative reciprocity towards comparatively low wage offers. We note that doing so is relatively cheap for them.

Third, the employers’ small commitments are therefore largely unsuccessful in eliciting efforts above the workers’ best reply but they are rational in that their absence increases negative
<table>
<thead>
<tr>
<th>Wage Offer</th>
<th>All Treatments</th>
<th>Excluding C-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>-0.205 (-2.908)**</td>
<td>-0.115 (-1.475)</td>
</tr>
<tr>
<td>(w &lt; 40)</td>
<td>0.926 (5.481)**</td>
<td>0.857 (4.495)**</td>
</tr>
<tr>
<td>(w &gt; 20)</td>
<td>-0.593 (-6.695)**</td>
<td>-0.541 (-6.224)**</td>
</tr>
<tr>
<td>(20 &lt; w &lt; 40)</td>
<td>0.434 (1.155)</td>
<td>0.397 (1.056)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wage Offer</th>
<th>EW-H</th>
<th>EW-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>-0.505 (-3.005)**</td>
<td>0.033 (0.317)</td>
</tr>
<tr>
<td>(w &lt; 40)</td>
<td>-0.414 (-0.404)</td>
<td>0.812 (4.502)**</td>
</tr>
<tr>
<td>(w &gt; 20)</td>
<td>-0.698 (-3.460)**</td>
<td>-0.386 (-3.079)**</td>
</tr>
<tr>
<td>(20 &lt; w &lt; 40)</td>
<td>2.317 (0.555)</td>
<td>0.501 (1.505)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wage Offer</th>
<th>A-H</th>
<th>A-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>-0.037 (-0.186)</td>
<td>-0.068 (-0.555)</td>
</tr>
<tr>
<td>(w &lt; 40)</td>
<td>1.779 (2.561)**</td>
<td>0.783 (4.202)**</td>
</tr>
<tr>
<td>(w &gt; 20)</td>
<td>-0.619 (-2.922)**</td>
<td>-0.586 (-4.705)**</td>
</tr>
<tr>
<td>(20 &lt; w &lt; 40)</td>
<td>0.577 (0.350)</td>
<td>0.150 (0.468)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wage Offer</th>
<th>C-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>-0.588 (-4.162)**</td>
</tr>
<tr>
<td>(w &lt; 40)</td>
<td>1.162 (2.859)**</td>
</tr>
<tr>
<td>(w &gt; 20)</td>
<td>-0.490 (-0.597)</td>
</tr>
<tr>
<td>(20 &lt; w &lt; 40)</td>
<td>(insufficient obs.)</td>
</tr>
</tbody>
</table>

Table 9: Coefficients for wage offer in random-effects regression for employer’s payoff. Coefficients for the variable wage offer are shown for regressions including all wage offers (first row in each cell), restricting to wage offers less than 40 (second row), wage offers larger than 20 (third row), wage offers between 20 and 40 (fourth row). The cells on top show results across all treatments (left) or all except the corner-point treatment (right), the lower part for the individual treatments. z-statistics are given in parentheses. + = significant at \(p = 0.1\), * = significant at \(p = 0.05\), ** = significant at \(p = 0.01\).
reciprocity. While the wages are somewhat above the equilibrium wage (20 or 21), they only marginally exceed the wage (30 or 31) necessary to induce the maximal best reply (2.0). As evidenced by Figure 3, larger commitments rarely increase the effort and are almost never profitable (Figure 4).

Regarding the corner-point equilibrium, we find, fourth, that attempts to elicit gift exchange are more pronounced than for the interior equilibria (Fact # 2); worker behavior, however, is hardly affected (Fact # 10). This causes the wage data to be more noisy in the corner point treatments than in the interior equilibrium treatment with low efficiency gains (Fact # 6). The added noise seems to result from both proposers and responders not being satisfied with the inefficient outcome of the corner-point equilibrium.

Fifth, we find that efficiency gains interact with framing in important ways (Fact # 5). As evidenced by Fact # 4, framing the situation as an employer-worker relationship does not have a substantial impact in low-efficiency-gains treatment but does for the high-efficiency-gains treatment. Similarly, as evidenced by Fact # 3, high efficiency gains have a small effect in the abstract frame but a substantial effect in the employer-worker frame. Interestingly, though, the preceding statements hold for wage offers only. Effort choices seem to be unaffected by both the extent of efficiency gains and framing, given wage offers. Of course, this result might not hold if potential efficiency gains were even more dramatic than they are in our parametrization right now (recall that in our design, the efficiency gains at the equilibrium effort vary between 233% and 433% between treatments, compared to 1100% in Fehr et al. 1993).

Our results suggest, in sum, that laboratory gift exchange is much less robust than the literature might lead one to believe (e.g., Fehr and Gächter 1998; Van der Heijden et al. 2001; Levitt and List 2007). Clearly, the subjects in our experiment did not engage in much reciprocal exchange. And they did, for the most part, not return favors (meaning little positive reciprocity). And while they punish more often, they apparently do so because it is not very costly to them. Gift exchange (or in the present case what we might call “insult” exchange) behavior, quite in line with economic intuition, thus appears rather price-sensitive.

Recall that we are concerned with first-degree robustness, i.e., the sensitivity to parametrization characteristics such as the nature of the equilibrium (corner versus interior), the degree of possible efficiency gains, the degree of asymmetry between the surplus that employers and workers

32We hasten to stress that the latter authors themselves have a more differentiated view of these issues. Specifically, Van der Heijden et al. (2001) explore the robustness of a repeated experimental gift exchange game with respect to matching (partners vs strangers) and game form (normal vs extensive). And List (2006) provides an intriguing study that compares (lack of) gift exchange in field settings with gift exchange in carefully calibrated lab settings.
can capture, the risk to the employer of being exploited when trusting, and the cost to the worker of reciprocating, as well as second-degree robustness, i.e., the stability of experimental results to variations in experimental procedures such as framing and subject pools.

Specifically, we developed our treatments along four dimensions: the nature of the equilibrium (first-degree robustness), efficiency gains (first-degree robustness), subject pools (second-degree robustness) and frames (second-degree robustness); we also chose a matching mechanism that has been shown to best preserve the one-shot nature of the strategic interaction between employers and workers. Our design and implementation thus aimed at important facets of first-degree and second-degree robustness. We focused on these laboratory gift-exchange characteristics because they seemed to be among the most important drivers of the results of laboratory gift exchange. We believe, and our belief seems to be confirmed by the interaction effects of efficiency gains and framing documented above, that testing for first- and second-degree robustness one at a time is potentially misleading.

That said, Charness and Kagel and their collaborators have, in parallel work, stress-tested second-degree robustness of laboratory gift exchange with intriguing results. Drawing on a standard corner-point design, Charness et al. (2004) find that the degree of gift exchange is “surprisingly sensitive to an apparently innocuous change - whether or not a comprehensive payoff table is provided in the instructions.” (p. 189) Specifically, they find that, for US undergraduate students, the presence of a payoff table reduces gift exchange sharply.33

Also drawing on a standard corner-point design, Hannan et al. (2002) find that US “undergraduates provide substantially less effort than MBAs” (p. 923). They interpret their finding as resulting from previous work experience (and hence different priors or understandings) that MBAs bring to the laboratory. A similar argument has been made more generally by Harrison and Rutström (2001; see also Ortmann and Gigerenzer 1997, or Samuelson 2005). It is interesting to note that the frames being used in these two studies were of the employer-worker kind. Hannan et al. also investigate first-degree robustness by studying the effects of different efficiency gains. For both undergraduates and MBAs they find higher wage offers for higher productivity firms but no difference in the wage-effort relation. This is roughly in line with our results.

33The authors correctly call for a similar study with European students to better understand that effect. While we did not provide such a payoff table (our experimental sessions were conducted during July 2000 - June 2001; theirs were conducted in May 2001), the Charness et al. results suggest that our provision of a payoff calculator may be partially responsible for the comparatively low degree of trust, and positive reciprocity, in our data. It is intriguing to speculate what such a payoff matrix would have done to the choice behavior of our subjects. Furthermore, we conjecture that, had we supplied a best-reply button, we would likely have seen choices even closer to equilibrium.
Brüggen and Strobel (2007) assess second-degree robustness by comparing chosen effort and real effort. They find gift exchange in both treatments. Also considering real effort, Gneezy and List (2006) study the effect of duration in two tasks (entering data in a library and raising funds for a research center). In their experiments, they find that gift exchange is a transitional phenomenon that lasts not much longer than a typical experimental session (i.e., for a couple of hours). An important methodological problem with these two studies – explicitly discussed by Gneezy and List (2006) – is that true effort costs are not known and hence the second-degree robustness issue of effort type is confounded with (unknown) first-degree parametric variation.

List (2006) tries hard to keep parametric variation at a minimum across all treatments in order to carefully calibrate laboratory experiments with field markets (trading cards and ticket stubs). He finds that in his replication of laboratory experiments gift exchange is alive and well even in the lab treatments calibrated to the field markets; he argues persuasively that the gift exchange he finds, both in the lab and the field treatments, is driven by reputational concerns rather than social preferences.

Relatedly, Healy (2007) tests experimentally the conjecture that selfish workers in lab experiments might have an incentive to pretend to be other-regarding initially since firms would take defection as a signal about the type of workers they are dealing with. This perceived type correlation would then make lower wage offers fall back also on the selfish types. By and far, Healy’s experiment supports this story. In a sense, our experiment provides even stronger evidence for his explanation of gift exchange because our matching does not allow for group reputation (and, for that matter, individual reputation) effects and we find little seemingly other-regarding behavior. In terms of our proposed categorization of types of robustness, Healy (2007) does find by and far second-degree robustness (i.e., there are differences in the respective treatments but gift exchange as such survives) but, as his model predicts, he does find clear violations of first-degree robustness (i.e., for some treatments gift exchange disappears.)

In another interesting laboratory gift-exchange study that addresses both first-degree and second-degree robustness, Rigdon (2002) explores what the effects are of nontrivial costs of effort and increased social distance (here, anonymity) between subject and experimenter. She points out that the costs of effort in classic studies such as Fehr et al. (1993) and Fehr et al. (1997), but also in Fehr and Gächter (2002) were trivial and that laboratory workers had to report their effort choices to the experimenters. Rigdon, within a corner-point equilibrium design, finds that nontrivial costs and increased social distance induce actual effort levels that are significantly below desired ones.
Brandts and Charness (2004) vary the competitive balance between workers and employers where the wage offers are made in a one-sided oral auction. As such their article is an example of a test of first-degree robustness. They find that the gift-exchange is indeed robust with respect to this variation as wages and the wage-effort relation is hardly affected by the competitive pressure. Furthermore, Brandts and Charness consider the effects of a minimum wage in a treatment with excess supply of workers. With a minimum wage, efforts conditional on wages are indeed somewhat lower, indicating limitations of first-degree robustness. Finally, Brandts and Charness conduct one-shot gift-exchange experiments with exogenous matching of an equal number of firms and workers. They find some remaining gift exchange, but lower wages and in particular lower efforts than in their repeated interaction treatments. This is consistent with an interpretation of the relatively low levels of gift exchange in our experiments as being partly driven by the matching we employ that implements a sequence of one-shot encounters without any scope of repetition.

Maximiano et al. (2007 a,b) provide tough and relatively clean tests of first-degree robustness, and – to their own surprise – do not manage to exorcise gift exchange. In Maximiano et al. (2007a), they compare bilateral (one worker per firm) and multilateral (four workers per firm) interaction and find gift exchange in both treatments. Moreover, the differences in treatments are not statistically significant. In Maximiano et al. (2007b), they compare a standard bilateral gift exchange game with two tri-lateral ones (with ownership and control of the firm being separated). Again they find gift exchange immune to this first-degree robustness test.

Fehr and Gächter (2002) have constructed an interior equilibrium by allowing employers to include bonuses and punishments into the contract. They find that, compared to a corner-point control treatment, excess effort (voluntary contribution in their terminology) is substantially reduced – a result which seems roughly in line with ours. They also find an interesting interaction with the framing because this effect is much stronger for the punishment treatment than the bonus treatment.

Pereira et al. (2006) address first-degree robustness by constructing both interior (in effort) and corner equilibria. In the former they too find nearly twice as many negatively reciprocal acts

34This, however, appears to be an interesting puzzle. Whereas gift-exchange is robust with respect to this variation, models that provide an explanation for gift-exchange in the first place predict that there should actually be a difference between treatments. Brandts and Charness (2004) conclude that outcome-based models are consistent with their results, but this is true only for the wage-effort relation, but not for the wages themselves. If we have gift-exchange and it pays for firms to offer high wages, then it pays to pay more if we have to compete for workers, unless every firm pays the maximum wage anyway.

30
than positively reciprocal acts, being in line with our results though they find more positive reciprocity than we do. They conclude that trust and reciprocity survive in their interior equilibrium treatment. Given that on balance they find more negative than positive reciprocity, this strikes us as a curious interpretation.

The preceding articles provide further evidence that both first-degree and second-degree robustness of gift exchange are more fragile than one might conclude from previous accounts. It is noteworthy that models such as Bolton and Ockenfels (2000), Fehr and Schmidt (1999), and Charness and Rabin (2002), which have been proposed to explain experimental results of gift exchange and related social dilemma scenarios within a game theoretic framework, are not insensitive to variations in parameterizations (e.g., differential efficiency gains\textsuperscript{35}). Hence, experimental results that establish limits to first-degree robustness can partially be rationalized by these models. They are, however, insensitive to issues of implementation and hence experimental results showing violations of second-degree robustness suggest that these models do not tell the complete story. In particular, they are unable to explain the important interaction effects that we identified above.

In summary then of this review, and recalling our initial categorization of robustness tests into those testing robustness to replication (third degree), robustness to implementation of the underlying game (second degree), and robustness to changes in the underlying game itself (first degree), we find that results are surprisingly mixed. For example, while Maximiano et al.’s (2007a,b) results find support for the first-degree robustness of gift exchange, the results by Healy (2007), Rigdon (2002) and ourselves illustrate its limits. Likewise, while Brüggen and Strobel (2007) find support for second-degree robustness, the results by Gneezy and List (2006) and List (2006) question it. Moreover, our results suggest interesting interaction effects between changes in the underlying game and the implementation of that game. To the extent that the general relevance of laboratory (and field) gift exchange seems to require robustness of all three degrees to a reasonable extent, the accumulating evidence suggests clear limits. This indeed then very squarely trains the spotlight on issues of generalizability (and calibration), a topic which – with one laudable exception (List 2006) – has been neglected in that literature.

Friedman (1998) has demonstrated for the Monty Hall problem how alleged choice anomalies can be systematically constructed and deconstructed. Our work and recent work by others suggest that laboratory gift exchange can be systematically affected by changing design and implementation characteristics. As there are conditions that make it more likely that experimental

\textsuperscript{35}Indeed, the evidence in Engelmann and Strobel (2004, 2007) suggest the importance of that key facet of first-degree robustness.
results confirm the existence of *homo reciprocans* (namely, (unattractive) corner point equilibria, dramatic potential efficiency gains, employer-worker frame, etc.), there are also conditions that make it more likely that experimental results are in line with *homo economicus*, in the sense that most of our second movers choose their selfish best responses, with deviations in the directions of “*homo reciprocans negativus*”. That sensitivity to the parameters and implementation of the game is not surprising. It is our belief, however, that it has obtained insufficient attention in the past and that giving it more attention will help in understanding the relevance of gift exchange for laboratory and field settings.

6 Concluding remarks

Much of the observed play of the participants in our gift-exchange experiments is at or close to equilibrium. This result is very likely not a subject pool effect as some of our sessions were conducted on a site which has produced many of the classic gift-exchange data. This result also stands in stark contrast to much of what has been reported in the literature, with few exceptions (Rigdon 2002; Gneezy and List 2006; List 2006). In particular, we find little evidence for positive but substantial evidence for negative reciprocity, which comes relatively cheap.

Our results (together with other recent studies) suggest that laboratory gift exchange is highly sensitive to changes in the underlying game (parametrization) as well as its implementation, namely the nature of the equilibrium, the degree of possible efficiency gains, the degree of asymmetry between the surplus that employers and workers can capture, the risk to the employer of being exploited when trusting, and the cost to the worker of reciprocating, as well as framing and anonymity.

Given that equilibrium profits in our game favor the employer, it is consistent with other-regarding preference models such as Fehr and Schmidt (1999) that even wages slightly above equilibrium sometimes trigger negative reciprocity in our experiment. Since such equilibria are arguably closer to reality than settings that favor the employee, our results alert us to the danger that relying on gift exchange to motivate workers might bring. While exclusive reliance on selfishness and the neglect of reciprocity motives may indeed lead to wrong predictions and to wrong normative inferences (as Fehr et al. 1997 argue), so will the belief that people trust, (positively) reciprocate, and are intrinsically motivated. We do find some evidence for reciprocity, but it is mostly negative. The existence of negative reciprocity equally challenges the canonical model of

---

36Offerman (2002) already finds stronger evidence for negative reciprocity than for positive reciprocity.
rational selfish payoff maximization. Given that the key element of both negative and positive reciprocity in a gift-exchange game is that efforts are increasing in wage offers, one might be tempted to conclude that it is largely irrelevant whether positive or negative reciprocity dominates: both provide the first mover with incentives to pay above-equilibrium wages even if the motivation might be different, in the first case being trust in positive reciprocity and in the second fear of negative reciprocity.\textsuperscript{37}

We note, however, that the presence of negative reciprocity has different implications for institutional design than the presence of positive reciprocity. As Tirole (2006) makes abundantly clear (for example in his discussion of micro-finance institutions), different assumptions about trust, reciprocity, and intrinsic motivation lead to very different desiderata for the internal organizations of institutions. Whereas in a given game, agents’ positive and negative reciprocity provide similar incentives for principals (i.e. first movers), if the latter have some control over the design of the contract the implications may be quite different. If positive reciprocity, in the sense of our definition, can be relied upon, the principal can be better off with an incomplete contract and a generous wage payment than with a complete contract that might prescribe wages and efforts at an intermediate level. The expectation of negative reciprocity, in contrast, implies that the principal should opt for a complete contract, if possible. To illustrate, in the investment game (Berg et al., 1995), the first mover has a reasonably profitable safe option of sending nothing, but might be better off not choosing it and might hence profit from entering a certain risk. In the ultimatum game, there is no safe option and positive offers serve to avoid risk. High offers are thus driven by fear rather than trust (where we understand trust as putting one’s outcome under somebody else’s control who has an incentive to exploit the trust). If a safe outside option was present in the ultimatum game, this might well be taken.

Recent evidence from the field (Cohn et al., 2009) suggests that workers’ fairness perceptions are key for whether they provide higher effort in response to higher wages. If workers perceive the base wage already as fair, a wage increase has little effect on effort. In contrast, if workers perceive the base wage as unfair a wage increase is associated with an increase in the perceived fairness of the wage and this in turn leads to a positive effort response. We interpret this as indicating, in line with our results, that paying higher wages might be profitable when it can prevent negative reciprocity rather than when it aims at initiating positive reciprocity. This stands in contrast to the classical gift-exchange literature, which suggests, at least according to our own reading, that positive reciprocity can be relied upon and hence incomplete contracts might be preferred.

\textsuperscript{37} Relatedly, Camerer (2003), amongs others, argues that much of ultimatum game proposer offers are driven by strategic behavior to avoid rejections.
Drawing on experimental results of gift exchange for the design of institutions crucially requires tests of its generalizability. To the extent that generalizability requires gift exchange to survive parametrizations corresponding to field scenarios as well as implementations of field settings, it requires both first-degree and second-degree robustness (and obviously third-degree robustness). Our own results as well as a number of those discussed above suggest that the necessary first-degree and second-degree robustness should not be taken for granted.

There are clearly scenarios – like ours – where the belief that people are motivated by trust, (positive) reciprocity, and intrinsic motivation is unwarranted, and where players tend to act selfishly and if they do not, they reciprocate negatively rather than positively. To our minds, our results prompt two related questions: First, what is the relative importance of the parametrization and implementation characteristics supporting trust and positive reciprocity, selfishness and negative reciprocity, respectively? Second, what constitutes a “realistic” parametrization and implementation? While we realize that this question is bound to be a contentious one, keeping in mind the “parallelism postulate” (Plott 1987) strikes us as imperative because of the policy implications of the laboratory gift-exchange research program.

References


34


[12] Cohn, Alain; Ernst Fehr and Lorenz Goette (2009). “Fairness and Effort – Evidence from a Randomized Field Experiment.” University of Zurich, IEW working paper.


36


A Instructions

All instructions were in German (for both the German and Swiss subjects). The complete set of instructions can be accessed at http://home.cerge-ei.cz/Ortmann/instructions.html. The following is a translation of the instructions of the employer-worker frame with low efficiency gains, with the German original inserted after each paragraph. The instructions for the other treatments were essentially the same. We only substituted a different multiplier for the treatments with high efficiency gains. For the abstract frame, words like employer, worker, and basic wage were substituted with participant X, participant Y, and payment component, respectively. The instructions for the corner point equilibrium treatment were identical to those in the abstract frame except for the different multiplier (and corresponding changes in the examples).

Instructions

Welcome to our experiment. Please read the following instructions carefully. Should you have trouble understanding something while we go over the instructions or during the
experiment, please raise your hand. Please do not engage in any form of communication with the other participants in this experiment from now on; we shall ask you to leave the experiment and not pay you if you don’t comply. [Willkommen zu unserem Experiment. Bitte lesen Sie die folgenden Instruktionen sorgfältig durch. Falls Sie etwas jetzt oder im Laufe des Experiments nicht verstehen, heben Sie bitte die Hand. Stellen Sie bitte von jetzt an die Kommunikation mit anderen Teilnehmern des Experiments ein; wir werden Sie andernfalls bitten, das Experiment zu verlassen und werden Sie außerdem von der Auszahlung ausschließen.]

You will participate in six rounds. In each round, you will be matched with another participant, i.e., you will never encounter anyone that you encountered in an earlier round. Likewise, you will not be able to indirectly influence participants in the experiments that you will encounter in later rounds. In addition, no participant will be informed about the choices of other participants in earlier rounds. Whatever you do in a round, will hence not have an effect on interactions in later rounds. [Das Experiment besteht aus sechs Runden. In jeder Runde treffen Sie auf einen anderen Teilnehmer, d.h. Sie werden niemals mit jemandem interagieren, mit dem Sie bereits in einer früheren Runde interagiert haben. Auch können Sie Teilnehmer des Experiments, mit denen Sie später interagieren werden, nicht indirekt beeinflussen, und außerdem erfährt kein Teilnehmer etwas über das Verhalten anderer Teilnehmer in vorhergehenden Runden. Was immer Sie in einer Runde tun, kann also spätere Interaktionen nicht beeinflussen.]

Participants will be assigned one of two roles, employer or employee. These roles will be assigned randomly and remain the same throughout the experiment, that is, in every round you are either an employer or employee. You will be informed about your role before the experiment proper starts. [Es gibt zwei verschiedene Rollen, Arbeitgeber und Arbeitnehmer. Die Rollen werden am Anfang zufällig zugeteilt und stehen für das ganze Experiment fest, d.h. Sie sind entweder in allen Runden ein Arbeitgeber oder in allen Runden ein Arbeitnehmer. Über Ihre Rolle werden Sie vor Beginn der ersten Runde informiert.]

In each round, each employer offers to the employee that has been assigned for that round a contract. The contract consists of a pair of numbers, namely a base wage w and a desired effort e. [In jeder Runde bietet zunächst jeder Arbeitgeber dem für die Runde zugeeilten Arbeitnehmer einen Arbeitsvertrag an. Dieser Vertrag besteht aus zwei Werten, einem Grundlohn g und einer gewünschten Arbeitsanstrengung a.]

Once the employer has offered a contract with base wage w and desired effort e, the employee that has been assigned for that round decides whether to accept or reject the contract. If the employee accepts the contract, then he will have to choose her or his actual effort. (In this decision he may ignore the desired effort.) If the employee rejects the contract, then both employer and employee receive a payoff of 0 ECU (Experimental Currency Unit). [Nachdem ein Arbeitgeber den Vertrag mit Grundlohn g und gewünschter Arbeitsanstrengung a angeboten hat, entscheidet der für die Runde zugeteilte Arbeitnehmer, ob er den Vertrag annimmt oder den Vertrag ablehnt. Nimmt der Arbeitnehmer den Vertrag an, so muss er im nächsten Schritt die tatsächliche Arbeitsanstrengung a wählen. (In dieser Entscheidung ist er nicht an den Vorschlag des Arbeitgebers gebunden.) Lehnt der Arbeitnehmer den Vorschlag ab, so erhalten sowohl Arbeitgeber als auch Arbeitnehmer für die jeweilige Runde eine Auszahlung von 0 ECU (Experimental Currency Unit).]

The two choices the employee has, and the consequences of a decision to go with one of the options, are illustrated on the attached SEQUENCING OF DECISIONS sheet. Please study this sheet carefully now. [Die zwei Optionen des Arbeitnehmers, und die Konsequenzen
der Entscheidung für eine dieser Optionen, sind auf dem beiliegenden VERLAUFSDIAGRAMM zusammengefasst. Bitte schauen Sie sich dies Verlaufsdiagramm jetzt genau an.

[Experimentierer wiederholt Paragraph 4 und 5.]

The actual effort $e$ (selected by the employee), and not necessarily the desired effort (proposed by the employer) determines the gross profit of the employer. (This gross payoff is $50*e$ ECUs.) The net payoff results from a multiplier $m$ that is dependent on $e$ and that transforms the base wage $w$ into the wage $l = w*m$. The wage $l = w*m$ is the amount that the employer has to pay to the employee. The net payoff of the employer is therefore $(50*e - l = 50*e - w*m)$ ECUs. [Die tatsächliche (vom Arbeitnehmer gewählte) Arbeitsanstrengung $a$, und nicht notwendigerweise die vom Arbeitgeber vorgeschlagene, bestimmt den Bruttogewinn des Arbeitgebers. (Dieser Bruttogewinn ist $50*a$ ECUs.) Der Nettogewinn ergibt sich aus einem von $a$ abhängigen Lohn-Multiplikator $m$, der den Grundlohn $g$ in den Lohn $l = g*m$ transformiert. Diesen Lohn $l = g*m$ ECUs muss der Arbeitgeber an den Arbeitnehmer zahlen. Der Nettogewinn des Arbeitgebers ist damit $(50*a - l = 50*a - g*m)$ ECUs.]

The actual effort $e$ (selected by him) causes the employee a disutility of $c$ and results in a net wage of $(l - k = w*m - c)$ ECUs. The relationship of effort, multiplier, and cost are illustrated for some values of $e$, $m$, and $c$ on the attached SEQUENCING OF DECISIONS sheet and for all values summarized in the Table on the bottom of this sheet. Please take another look at the SEQUENCING OF DECISIONS sheet now. [Die tatsächliche (von ihm gewählte) Arbeitsanstrengung $a$ verursacht dem Arbeitnehmer Kosten $k$ und damit einen Nettolohn von $(l - k = g*m - k)$ ECUs. Diese Zusammenhänge sind für einige wenige Werte auf dem beiliegenden VERLAUFSDIAGRAMM illustriert und für alle Werte von $a$, $m$, und $k$ in der Tabelle (im VERLAUFSDIAGRAMM unten) zusammengefasst. Bitte schauen Sie sich dieses VERLAUFSDIAGRAMM jetzt noch einmal an.]

[Experimentierer: “Any questions at this time?”][“Haben Sie im Moment Fragen?”]

Please note that decisions can lead to losses. However, both employers and employees can always decide in such a way that they are guaranteed not to make losses. [Bitte beachten Sie, dass Entscheidungen zu Verlusten führen können. Allerdings können Sie sowohl als Arbeitgeber als auch als Arbeitnehmer immer so entscheiden, dass Sie Verluste mit Sicherheit ausschließen.]

Some examples: [Einige Beispiele:]

1. Employer proposes: $w = 30, e = 3.0$. Employee rejects. Employer and employee both receive 0 ECU.

[Arbeitgeber bietet an: $g = 30, a = 3.0$. Arbeitnehmer lehnt ab. Arbeitgeber und Arbeitnehmer erhalten also beide 0 ECU.]


Employer hence receives $50*e - w*m = 50*1.6 - 20*1.3 = 80 - 26 = 54$ ECUs.

Employee receives $w*m - c = 20*1.3 - 4 = 26 - 4 = 22$ ECUs.

[Arbeitgeber bietet an: $g = 20, a = 1.6$. Arbeitnehmer nimmt an und wählt $a = 1.6$. Arbeitgeber erhält also $50*a - g*m = 50*1.6 - 20*1.3 = 80 - 26 = 54$ ECUs. Arbeitnehmer erhält $g*m - k = 20*1.3 - 4 = 26 - 4 = 22$ ECUs.]
3. Employer proposes: \( w = 55, e = 2.8 \). Employee accepts but selects \( e = 1.4 \).

Employer hence receives \( 50^*e - w^*m = 50^*1.4 - 55^*1.2 = 70 - 66 = 4 \) ECUs.

Employee receives \( w^*m - c = 55^*1.2 - 2 = 66 - 2 = 64 \) ECUs.

[Arbeitgeber bietet an: \( g = 55, a = 2.8 \). Arbeitnehmer nimmt an, wählt aber \( a = 1.4 \).
Arbeitgeber erhält also \( 50^*a - g^*m = 50^*1,4 - 55^*1,2 = 70 - 66 = 4 \) ECUs.
Arbeitnehmer erhält \( g^*m - k = 55^*1,2 - 2 = 66 - 2 = 64 \) ECUs.]

After each round, each employer is informed whether the employee assigned for that round has accepted the contract and, if so, which effort \( e \) he has chosen. Additionally, both employer and employee are informed privately about their payoffs. No participant will be informed about other employers’ or employees’ decisions. [Nach jeder Runde wird jeder Arbeitgeber darüber informiert, ob der ihm für die Runde zugeteilte Arbeitnehmer den Vertrag angenommen hat und, wenn ja, welche Arbeitsanstrengung \( a \) der Arbeitnehmer gewählt hat. Außerdem werden sowohl Arbeitgeber als auch Arbeitnehmer privat jeweils über ihre Auszahlungen informiert. Kein Teilnehmer wird Informationen über eine Entscheidung anderer Arbeitgeber oder Arbeitnehmer erhalten.]

At the end of the experiment the sum of your payoffs from all six rounds will be converted into DM and then paid. 1 ECU corresponds to 0.10 DM. [Am Ende des Experiments wird die Summe ihrer Auszahlungen aus allen sechs Runden von ECUs in DM umgerechnet und ausbezahlt. 1 ECU entspricht dabei 0,10 DM.]

To ensure that all participants of the experiment have understood these instructions correctly, please answer now the following questions: [Um sicherzugehen, dass alle Teilnehmer des Experiments die Instruktionen richtig verstanden haben, beantworten Sie uns nun bitte die folgenden Beispielfragen:]

1. The employer offers: \( w = 10, e = 3.0 \).

   Employee rejects.
   \[\Rightarrow\] Employer receives ... ?
   \[\Rightarrow\] Employee receives ... ?

   Employee accepts and selects \( e = 1.0 \).
   \[\Rightarrow\] Employer receives ... ?
   \[\Rightarrow\] Employee receives ... ?

[Arbeitgeber bietet an: \( g = 10, a = 3,0 \).
Arbeitnehmer lehnt ab.
\[\Rightarrow\] Der Nettogewinn des Arbeitgebers ist: ... ?
\[\Rightarrow\] Der Nettolohn des Arbeitnehmers ist: ... ?
Arbeitnehmer nimmt an und wählt \( a = 1,0 \).
\[\Rightarrow\] Der Nettogewinn des Arbeitgebers ist: ... ?
\[\Rightarrow\] Der Nettolohn des Arbeitnehmers ist: ... ?]
2. The employer offers: \( w = 10, e = 2.0 \).

Employee rejects.

\( \Rightarrow \) Employer receives ... ?

\( \Rightarrow \) Employee receives ... ?

Employee accepts and selects \( e = 1.0 \).

\( \Rightarrow \) Employer receives ... ?

\( \Rightarrow \) Employee receives ... ?

[Arbeitgeber bietet an: \( g = 10, a = 2.0 \).]

Arbeitnehmer lehnt ab.

\( \Rightarrow \) Der Nettogefühl des Arbeitgebers ist: ... ?

\( \Rightarrow \) Der Nettohohn des Arbeitnehmers ist: ... ?

Arbeitnehmer nimmt an und wählt \( a = 1.0 \).

\( \Rightarrow \) Der Nettogefühl des Arbeitgebers ist: ... ?

\( \Rightarrow \) Der Nettohohn des Arbeitnehmers ist: ... ?

3. The employer offers: \( w = 52, e = 3.0 \).

Employee rejects.

\( \Rightarrow \) Employer receives ... ?

\( \Rightarrow \) Employee receives ... ?

Employee accepts and selects \( e = 3.0 \).

\( \Rightarrow \) Employer receives ... ?

\( \Rightarrow \) Employee receives ... ?

[Arbeitgeber bietet an: \( g = 52, a = 3.0 \).]

Arbeitnehmer lehnt ab.

\( \Rightarrow \) Der Nettogefühl des Arbeitgebers ist: ... ?

\( \Rightarrow \) Der Nettohohn des Arbeitnehmers ist: ... ?

Arbeitnehmer nimmt an und wählt \( a = 3.0 \).

\( \Rightarrow \) Der Nettogefühl des Arbeitgebers ist: ... ?

\( \Rightarrow \) Der Nettohohn des Arbeitnehmers ist: ... ?]
Figure 1: Distribution of wage offers by treatment (in percent of proposed contracts).
Figure 2: Distribution of chosen efforts by treatment (in percent of accepted contracts).
Figure 3: Difference between chosen effort and best reply effort for the given wage offer by treatment and worker’s payoff at best reply effort.
Figure 4: Employer’s average profits by treatment and wage bracket.
Figure 5: Distribution of wage offers in the first two and the last two periods for all interior equilibrium treatments.
Figure 6: Distribution of wage offers in the first two and the last two periods for the corner-point equilibrium treatment.