Martin G. Kocher; Odile Poulsen; Daniel J. Zizzo:

Social preferences, accountability, and wage bargaining

Munich Discussion Paper No. 2012-22

Department of Economics
University of Munich

Volkswirtschaftliche Fakultät
Ludwig-Maximilians-Universität München

Social preferences, accountability, and wage bargaining*

Martin G. Kocher[#], Odile Poulsen[+], and Daniel J. Zizzo[§]

Abstract: We assess the extent of preferences for employment in a collective wage bargaining situation with heterogeneous workers. We vary the size of the union and introduce a treatment mechanism transforming the voting game into an individual allocation task. Our results show that highly productive workers do not take employment of low productive workers into account when making wage proposals, regardless of whether insiders determine the wage or all workers. The level of pro-social preferences is small in the voting game, while it increases as the game is transformed into an individual allocation task. We interpret this as an accountability effect.

Keywords: social preferences, wage bargaining, accountability, collective decision making.
JEL classification: C91, C92, D71, J51, J52.

This version: 10 September 2012

* We would like to thank Nadja Furtner, Jana Jarecki and Julius Pahlke for excellent research assistance and Anders Poulsen for very helpful comments. The usual disclaimer applies. Financial support from CBESS at the University of East Anglia is gratefully acknowledged.
# University of Munich, University of Gothenburg and CESifo Munich. e-mail: martin.kocher@lrz.uni-muenchen.de.
+ CBESS and School of Economics, University of East Anglia. e-mail: o.poulsen@uea.ac.uk.
§ CBESS and School of Economics, University of East Anglia. e-mail: d.zizzo@uea.ac.uk.

1. Introduction

Models of wage bargaining often assume that unions have an objective function with two elements: wages and employment (Farber, 1978; MacDonald and Solow, 1981; Grossman, 1983; Blair and Crawford, 1984). Hence, they implicitly adopt the conjecture that union members or the union leadership have other-regarding or social preferences (Rabin, 1993; Fehr and Schmidt, 1999, Bolton and Ockenfels, 2000; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006) for those who are non-employed or those who would have to fear unemployment in case of rising wages. On the other hand, insider-outsider models of wage bargaining (Linbeck and Snower, 1989) are based on the premise of discrimination between insiders (union members) and outsiders (not members of the union).

In this paper, we assess the extent of preferences for employment in a collective wage bargaining situation with heterogeneous workers. A laboratory experiment allows inferring underlying preferences better than data from the field that may be contaminated by factors that are very hard to control for, such as the organization and decision making procedures within a union, inter-temporal aspects of wage setting, unobserved incentives or objectives of union members and so on. Nonetheless, we view our results as complementary to findings based on field data of union wage bargaining behavior. We are not aware of any other laboratory or field experiment that addresses the question of to what extent employment is taken into account in collective wage bargaining.

In our experiment, we set up a stylized labor market with five heterogeneously productive workers, and we vary the number of union members exogenously. In one treatment, all workers are union members that decide on the joint wage level, and in another treatment three out of five (the three most productive workers) are union members. We choose the three most productive workers to be union members to maximize the potential conflict among workers in our setup, without implicating that such a union membership is most realistic. Workers face a (fictitious) firm that bases its employment decision deterministically on the wage rate, and the employment schedule contingent on the wage is common knowledge. The decision making process within the union is captured by a median voting system, i.e. the median wage proposal of the workers who are eligible to vote (five or three) determines the actual wage and, consequently, the employment level. In order to make wage proposals of all union members fully incentive compatible, and not only the proposal of the median voter, we introduce a probability *q* with which the median proposal would become implemented instead of the individual proposal. The probability will be an important treatment variable in our experiment that gradually transforms the voting game into an *individual allocation task*. Specifically, with $q = 0$ the problem reduces to an individual allocation task akin to a dictator game (Kahneman et al., 1986; Forsythe et al., 1994)[1] but still with a well-defined job market frame.

Our results indicate that proposals in the main treatments with a low level of *q* are very close to the selfish benchmark. Highly productive workers do not take employment of low productive workers into account when they make their wage proposals. Interestingly, there is no significant difference between the *insider-outsider treatment* (with three voters) and the *all-workers treatment* (with all five workers voting).

Several explanations for the low level of social preferences – when compared to results from more general allocation games (Charness and Rabin, 2002; Engelmann and Strobel, 2004) and to results from the dictator game (Kahneman et al., 1986; Forsythe et al., 1994; Eckel and Grossman, 1996; List, 2007; Bardsley, 2008) – are conceivable.

One possible explanation is the framing of our decision making situation as the decision making problem of a union. However, most research on social distance (Hoffman et al., 1996; Bohnet and Frey, 1999) and social identity (Tajfel et al., 1971; Charness et al., 2007; Chen and Li, 2009; Hargreaves-Heap and Zizzo, 2009; Sutter, 2009) in the realm of other-regarding preferences would indicate that our framing should, if anything, discriminate in favor of the in-group (union) members, e.g. by amplifying other-regarding behavior towards other union members. In other words, the minimal group paradigm could be applicable in our setup when union members perceive themselves as part of a group. The social distance between union members would be decreased. As a consequence, union members should tend to take other union members' employment into account in the wage setting, and one would expect a treatment difference between the insider-outsider and the all-workers treatments. Even if in-group favoritism were not to work in the direction of positive discrimination towards in-group members, but rather in terms of negative discrimination, we should observe a difference in

---

[1] The standard dictator "game" is a two-person allocation task in which one person (the "dictator") receives a positive endowment and can transfer any amount between zero and the endowment to a powerless recipient.

behavior between these two treatments. However, such reasoning is not borne out by the data from our experiment.

A second explanation coming from research on group decision making in economics and social psychology could also be plausible in our context. Group membership leads individuals to more selfish decisions if they cannot be held accountable[2] individually for their choices (Bornstein and Yaniv, 1998; Kugler et al., 2007; Luhan et al., 2009). Group members have the possibility to “hide” behind others because they are non-identifiable (e.g., Insko et al., 1987, 1988; Güth et al., 1996; Abbink and Herrman, 2011). The social demands or moral costs of the decision problem are therefore reduced (Ellingsen and Johannesson, 2008; Zizzo, 2010; Abbink and Herrman, 2011). Whereas the majority of research has been conducted with groups in which group members can interact directly (through a real-time chat or face-to-face communication), our setup does not allow for a group interaction beyond the voting mechanism that determines final wages.[3]

In order to test whether accountability of single group members influences the extent of other-regarding preferences, i.e. the concern for overall employment, we vary the probability q exogenously. A decreased q should increase other-regarding preferences, and this hypothesis is indeed borne out by the data. However, the sensitivity of other-regarding preferences to q is not very large. It is important to stress the methodological contribution that comes in passing with our variation in q. In a between-subject design we gradually transform a voting game into an individual allocation task, presumably increasing the perceived accountability of participants in the laboratory. This is done without changing the basic setup and instructions of the decision making problem at hand.

Our study provides evidence for the extent to which productive workers take the employment decision of firms and, consequently, the outcome of less productive workers into account. Our stylized setting abstracts from several important features of collective wage bargaining in the real world, but it shows that collective decisions might do a poorer job in

---

[2] For accountability research in the context of risky decision making see Pahlke et al. (2011) and Vieider (2011). The term “moral wiggle room” has also been used to describe decisions in which one finds an easy excuse for a selfish decision (Dana et al., 2007).

[3] This might itself have an effect on behavior, but we are not aware of any study that alters the level of interaction within a group systematically (see also Kocher and Sutter, 2007).

taking the least productive into account than individual (dictator) decisions. Put differently, our results indicate that there is what we may label an accountability effect: increasing the level of individual accountability in allocation decisions has the potential to increase the importance of other-regarding concerns.

The rest of the paper is organized as follows. Section 2 introduces the details of our experimental design and provides theoretical hypothesis. In Section 3 we present the experimental results, first on an aggregate level, focusing on treatment differences, and then on the basis of a regression analysis. Section 4 discusses our findings and concludes the paper.

2. Experimental design and theoretical predictions

2.1. Experimental design of the main part

The main part of the experiment introduced groups consisting of five randomly assembled participants that we referred to as *workers* in the experimental instructions (see the online appendix for a specimen). Workers are heterogeneous with regard to their productivity; in the experiment we told participants that there were different types (*type 1* to *type 5*, with type 1 being most productive) for which different wage ranges would allow the firm to employ them. Type 1 would be employed for every permissible wage, type 2 for a smaller wage range starting below the maximum wage, and so on. Details are given in Table 1.

Depending on the treatment, either all five (all-workers treatment; denomination INS in the following) or only the three most productive workers (insider-outsider treatment; INSOUT) were eligible to determine the wage level. In the former case there are no outsiders on the market, in the latter case there are two outsiders, and our design assigns the roles exogenously. More specifically, always the more productive workers are insiders in our experiment to maximize the potential conflict among workers. The wage level determines the number of employed workers (see Table 1). All employed workers earn the wage, and unemployed worker earn zero.

(Insert Table 1 about here.)

The voting procedure to determine the wage is as simple as possible: the median wage proposal of the eligible workers out of the permissible wage range, $w \in [1,100]$, was implemented. As the second treatment variable we vary the probability q with which the median proposal out of the proposals of the union members would become implemented instead of a randomly selected individual proposal from the set of the union members (with probability $1 - q$). The variable q is intended to adjust the level of accountability, and it makes sure that, with $q < 1$, not only the proposal of the median proposer is fully incentive-compatible. The variable q is set at 0.8, 0.2 and 0 in different treatments of our experiment. The uncertainty coming from q is resolved *after* making a wage proposal in the treatments with $q = 0.8$ and $q = 0.2$. In the treatments with $q = 0$, we implement one treatment in which participants in the experiment learn only ex post whether one is the “dictator” in determining the wage (denoted EX-POST), and one in which the “dictator” knows it already before determining the wage (EX-ANTE). The latter treatment further increases accountability. Table 2 summarizes the conditions applied in our experiment, and Figure 1 gives a graphical overview. The treatment variation is implemented between experimental subjects.

(Insert Table 2 and Figure 1 about here.)

The determination of the wage is repeated ten times. Types and groups of workers remain constant over these ten periods.[4] At the end of each period, the common wage is announced and everybody sees whether he or she is employed or not. Workers of type 4 and type 5 in the THREE treatments also receive this information, but they cannot submit a wage proposal. Individual proposals are not revealed, but workers learn whether it was the median proposal that was implemented or a randomly chosen proposal of the eligible workers (if applicable). In the EX-ANTE treatments, we asked those workers who knew that they were not going to determine the actual wage level to provide us with the wage level that they would have chosen, had they been selected as the dictator. These choices are of course not incentivized.

[4] For reasons of comparability to experiments planned in the future, we decided to frame the ten decisions as five periods, each consisting of two identical stages, in the experimental instructions.

2.2. Theoretical framework and hypotheses

Following McDonald and Solow (1981), we describe a model of wage bargaining with non-linear preferences for union members. We assume that there are five workers, each indexed by subscript i, $i = 1,2,3,4,5$. Workers are ranked in terms of their productivity level, Q_i, as follows: $Q_1 > Q_2 > Q_3 > Q_4 > Q_5$. There are no costs associated with effort. A worker is employed if $Q_i \geq w$, the wage offered by the firm. In the first version of our model, only the three most productive workers vote. In the second version, all five workers vote. The voting procedure is identical to the one outlined in Section 2.1, but to make the exposition simpler and more compact, we only consider one value of q, namely, $q = 0.8$. In other words, in our theoretical setting the median wage proposal out of the permissible wage range, $w \in [1,100]$, is implemented with an eighty percent probability. For the remaining twenty percent of the time, one of the wages submitted by workers 1, 2, or 3 in treatment INSOUT or 1, 2, 3, 4, or 5 in treatment INS is randomly chosen as the relevant wage.

2.2.1. Insider-outsider model: Only workers 1, 2, and 3 can vote

In the first version of our model, to capture the features of a simple insider-outsider model, we assume that the three most productive workers form a union and vote for the uniform wage that each employed worker receives. Once the wage has been chosen, each worker receives the chosen wage. Non-employment occurs if $w > Q_i$.

Assume that preferences over employment and wages for each union member are given by:

$$U_i = \begin{cases} wL^{\lambda}, \text{if } w \leq Q_i \\ L^{\lambda}, \text{if } w > Q_i \end{cases} \quad 0 \leq \lambda \leq 1$$

where λ represents the utility weight that each worker puts on the aggregate employment level, L. We assume that λ is the same for all workers; allowing for individual differences in the parameter is a straightforward extension of our analysis.

The productivities (we often refer to them as “outputs”) used in the lab experiment are $Q_1 = 100$, $Q_2 = 50$, $Q_3 = 33$, $Q_4 = 25$, and $Q_5 = 20$.[5]

[5] In order to simplify the analysis we assume that all employment and wages levels in the utility function are multiple of 100. Hence, we set $Q_3 = 100/3$ (instead of 33). This assumption seems justifiable, since it is

Proposition 1: *For each value of $\lambda \geq 0$, there is a unique Nash equilibrium:*

- *If $0 \leq \lambda \leq 1$, the unique Nash equilibrium is $(w_1,w_2,w_3) = (Q_1,Q_2,Q_3)$.*
- *If $\lambda > 1$, the unique Nash equilibrium is $(w_1,w_2,w_3) = (Q_5,Q_5,Q_5)$.*

Proof: See the Appendix.

The result shows that when λ is low ($\lambda < 1$), i.e. when workers put a lower weight on employment levels than they put on the wage levels, workers vote for the highest possible wage that would maximize their earnings. As a result, the employment level is low. When $\lambda > 1$, workers put more weight on employment levels than they put on their wage levels. As a result all workers are willing to accept a wage cut to help other workers get a job. All workers vote for the lowest feasible wage. There is full employment.

2.2.2. All five workers can vote

We now consider the case where all five workers submit a wage proposal. This turns out to be a straightforward generalization of the analysis in the previous section.

Proposition 2: *For each value of $\lambda \geq 0$, there is a unique Nash equilibrium:*

- *If $0 \leq \lambda \leq 1$, the unique Nash equilibrium is $(w_1,w_2,w_3,w_4,w_5) = (Q_1,Q_2,Q_3,Q_4,Q_5)$.*
- *If $\lambda > 1$, the unique Nash equilibrium is $(w_1,w_2,w_3,w_4,w_5) = (Q_5, Q_5, Q_5, Q_5, Q_5)$.*

Proof: See the Appendix

The result extends the result in Proposition 1 to the case where five workers (instead of three) vote on the wage level. Again when λ is low ($\lambda < 1$), i.e. when workers put a lower weight on employment levels than they put on the wage levels, the employment level is low as workers vote for a high wage, and vice versa.

---

unlikely that the experimentally observed behavior would be significantly different for $Q_3 = 100/3$ instead of $Q_3 = 33$. In the experiment it was easier to use integers.

2.2.3. Discussion of the theoretical results

The conditions on λ in Propositions 1 and 2 are relatively straightforward to interpret. Let us assume that $\lambda = 1$. In this case the utility for worker 1, under different employment and wage level combinations, are (100)·(1), (50)·(2), (33.3)·(3), (25)·(4), and (20)·(5), where the first number in the bracket is the wage level, and the second number indicates the employment level. We see that in this case, worker 1 is indifferent between any of those cases and would be willing to go all the way down to w = 20, where the employment level is 5, or accept any other wage-employment combination. The same applies for workers 2, 3, 4, and 5.

If $\lambda < 1$, the weight that each worker assigns to the employment level relative to the wage is lower. Higher wages combined with lower employment levels result in higher utilities for every worker. Hence it would be more costly for every worker to vote for a lower wage and thereby ensure that less productive workers get a job. If $\lambda > 1$, the reverse is true: higher employment levels result in higher utilities for every workers, and it is therefore less costly for workers to accept a wage cut and thereby ensure that the less productive workers get employed.

Our results are a combination of the choice of the specific form of nonlinear preferences and productivities chosen for the experiment. With different preferences, and the same productivities, or the same utility and different productivities, there would be different Nash equilibria. However the qualitative conclusions for a high (low) λ would be the same: a high λ implies that workers care more about other workers and would be more willing to accept wage cuts in order to help workers that are less productive than themselves.

2.2.4. Empirical implications from the theoretical results

The *first prediction* from our model is that wage proposals are the same when union membership is restricted to three workers and when all five workers vote. In both cases, a low λ implies that workers vote for the highest feasible wage and low employment, whereas a high λ guarantees that workers are willing to accept wage cuts in order to help other workers get a job. Naturally, the resulting wages are expected to be different because of the median voter scheme.

The *second prediction* comes from a simple fact: it is more expensive for more productive types to help workers who are less productive. Worker 1 must accept a wage cut of 50 points in order to help worker 2 get a job, whereas worker 4 must only accept a wage cut of 5 points to help worker 5 get a job. Although our model predicts bang-bang solutions with either full selfishness or full employment, our behavioral expectation is that more productive workers are less likely to go down to the next wage level that increases employment. Our theoretical result is implied by the specific functional form of the utility function and the assumption of uniform λ across workers, and other assumptions would yield different predictions.

The *third prediction* is that more pro-social workers, i.e. workers with higher λ in our model, perhaps because of altruism or inequality aversion, are more likely to propose lower wages.

Finally, we can note that, because votes in our model reveal the worker's true preferences, it would not make a difference to their proposals whether, instead of having the setup considered in this model, we had a unilateral determination of the wage by one of the workers. It will be handy to refer to this observation as a *fourth prediction*, though of course not one explicitly made within the model itself. The accountability effect referred to in the introduction would, of course, imply a direct violation of this fourth prediction.

2.3. Experimental procedure

The computer-based experiment was conducted at the experimental laboratory MELESSA of the University of Munich in 2011, using the experimental software z-Tree (Fischbacher, 2007) and the organizational software Orsee (Greiner, 2004). 440 students from all disciplines participated in 22 sessions, each with 20 participants. Approximately 61% of participants were female. Sessions lasted a bit more than an hour, and the average payoff was 15.64 euro, including a show-up fee of 4 euro.

Upon arrival, experimental participants were seated in separate cubicles. Each session started with instructions for the main part of the experiment (described in detail in Section 2.1). At this stage it was made clear that there would be additional parts of the experiments, but that the instructions for these parts would only be handed out after the completion of the current part. It was also stressed to participants that decisions in one part would be completely unrelated to those in the other parts. Participants received written instructions (see the online appendix), which were read aloud to ensure common knowledge. Everybody had the opportunity to ask questions in private.

We implemented a random lottery mechanism (e.g., Starmer and Sugden, 1991), paying only one out of the ten periods in the first part of the experiment. Such a payment scheme avoids monetary complementarities (e.g., wealth effects) between periods that are supposed theoretically to be completely independent. The payoff-relevant period was randomly selected at the end of the experiment. The conversion rate for experimental points into euro (1 experimental point equals 0.25 euro) was clearly stated in the instructions. At the end of each period, every worker was informed about the chosen wage level within the group of five workers (and whether it was the median or a randomly chosen proposal) and about the income of all workers in his or her group. Individual proposals of other workers were never revealed.

Upon completion of the main part of the experiment participants received instructions for the second part that were again read aloud. Remaining questions were only allowed to be asked privately, and also answered privately. The second part was a *social preference elicitation task* providing an independent test for social preferences taken from Kerschbamer (2012; see the appendix). This was closest in design to the individual allocation task, and more distant in design, as q increases from 0, to the other treatments with median voting. Subjects are randomly matched with another participant in each of ten binary decisions that allocate a certain payoff to oneself and to the matched participant. One of the ten allocation decisions is paid out for real to the decision maker and the matched participant, where the payoff-relevant allocation decision is randomly determined at the end of the experiment. The ten decisions allow identifying different distributional preferences non-parametrically. Details on the procedure are provided in the appendix.

After this, additional individual tasks followed in the third and final part of the experiment: specifically, incentivized measurements of individual risk and ambiguity preferences using a standard choice list procedure (Holt and Laury, 2002; Engle-Warnick and Laszlo, 2006; see online appendix for details), two psychological inventories (Stöber's, 2001, social desirability scale and Cacioppo et al.'s, 1984, need for cognition test),[6] and a couple of questions regarding socio-demographics and individual background. The final stage of the experiment included feedback on the randomly selected payoff-relevant decisions in parts 1, 2

[6] The first is a control for experimenter demand (Zizzo, 2010); the second is a control for intellectual curiosity.

and 3 of the experiment as well as on consequent individual earnings. Payments to subjects were made privately and in cash.

3. Results

3.1. Overview of choices

We start by giving an overview of the average chosen wage levels in the eight treatments. Remember that the wage can be determined by the median vote of the eligible workers or by a randomly chosen individual worker. Thus, it makes sense to distinguish between a total average (TOT) and an average including only those cases in which the median was decisive (MED) and not an according-to-probability-*q* randomly selected group member. Only for MED, the median voter prediction based on selfish decision makers holds. For TOT-predictions based on selfish decision makers one has to take the probabilities that a single member can be decisive into account. Table 3 provides the results.

(Insert Table 3 about here.)

One can see that the actual figures in Table 3 are close to the predictions based on the assumptions for rational and selfish decision makers (see the numbers in parentheses in the eight cells). Obviously, it is more informative to look at averages contingent on types, and we thus refrain from running non-parametric tests on the differences in Table 3. We provide averages, contingent on types, in Table 4.

(Insert Table 4 about here.)

There are several ways to slice the data in Table 4. We start by comparing wage proposals in the insider-outsider treatments (three voters) with proposals in the all-workers treatments (five voters), contingent on the type of worker. There is no significant difference between the two treatments for types 1 and types 2 (Mann-Whitney-U-tests on the individual level (average over the ten periods); $p > 0.56$ in both cases; q-regimes are collapsed, i.e. N =

88).[7] Only for types 3, wage proposals in the insider-outsider treatments (three voters) are weakly significantly lower than in the all-workers treatments (five voters) (Mann-Whitney-U-test; $p = 0.07$; q-regimes are collapsed, i.e. $N = 88$). However, remember that types 3 are only pivotal in the Nash equilibrium with $\lambda < 1$ in the all-workers treatments. Therefore, if anything, we would expect a lower average wage proposal for them in the all-workers treatments, whereas the opposite is the case. Hence, one can conclude that there does not seem to be a significant treatment effect in support of union models that take employment into account. In other words, insiders do not seem to lower their wage proposals in order to increase employment compared to the all-workers case. This is in line with our first prediction.

Obviously, a deviation from the selfish prediction in $q = 0.8$ and $q = 0.2$ makes only sense if one deviates to a wage level that ensures employment for at least one other worker. This is especially important for type-2 workers in the insider-outsider treatments (potentially going from a wage of 50 to a wage of 33 or lower) and for type-3 workers in the all-workers treatments (potentially going from a wage of 33 to a wage of 25 or lower) with $q = 0.8$.[8]

An alternative way of slicing the data is provided by comparing across the four q-regimes, holding the number of voters (three or five) constant, contingent on worker types. The hypothesis would be that there is a significant decline of wage proposals with declining q and from ex ante to ex post for types 1 to 3. Although we will have a closer look at the influence of q on wage proposals in the subsequent section, a first impression is given by two-sided Kruskal-Wallis tests. Interestingly, most tests are not significant non-parametrically. The only two comparisons that come close to significant differences across the four q-regimes are for types 1 in all-workers treatments ($p = 0.04$) and types 4 in all-workers treatments ($p = 0.09$). Whereas the wage proposals for types 1 are decreasing with decreasing q (in line with other-regarding preferences extended to uncertainty or with a relatively high λ), they are, on average, increasing for types 4 (clearly contradicting preferences for the worst-off worker, i.e. type 5, but potentially in line with general other-regarding preferences).

However, it is much easier to control for several determinants of wage proposals in a parametric regression analysis, following in the next section. In the regression, we shall also

[7] All p values reported in this paper are two-sided.

[8] An online appendix shows the distribution of wage proposals, split up according to treatments and types.

control for the development over the ten periods. Furthermore, the regression allows controlling for individual measures of other-regarding preferences and uncertainty preferences.

3.2. Econometric analysis

We continue with a regression analysis of our data. Table 5 contains a multiple level random effects regression model on the wage proposal.

(Insert Table 5 about here.)

It simultaneously controls for the non-independence of observations at the level of subjects (since each subject makes ten choices) and at the level of the group (since a common history is established in each group after the first period). *Type 1*, *Type 2*, *Type 3* and *Type 4* are dummy variables for workers of the respective type (e.g., *Type 1* = 1 with a type 1 worker, else 0). *Treatment Group* is our *q*-varying accountability effect variable. It is equal to 1 with the treatments with only a 20% chance that one worker is chosen ex post as a dictatorial wage setter based on his or her proposal; to 2 with the treatments with a 80% chance that one worker is chosen ex post as a dictatorial wage setter; to 3 with the treatments where one worker is always chosen ex post as a dictatorial wage setter; and to 4 with the treatments where one worker is chosen ex ante to be the dictatorial wage setter. *Incentivized* enables us to control for whether a decision is incentivized, as most are, or not; specifically, it is a dummy equal to 1 if a decision is incentivized, which is always the case with Treatment Groups 1-3 and with the ex-ante dictator of Treatment Group 4. *INS* is the treatment dummy for whether everyone is an insider to the trade union (= 1) or whether only three workers are (= 0). *Period* captures the period, between 1 and 10, and hence within-experiment experience. *Prior Experience* (= 1 for subjects with experience in previous, albeit unrelated, experiments) is a dummy capturing between-experiments as opposed to within-experiment experience. *Inequality Averse* and *Altruist* are dummies for whether a subject has been respectively classified as inequality averse or altruist using our independent social preference elicitation task (see the appendix), a standard incentivized measurement of social preferences following Kerschbamer (2012).

Finally, we include some interaction variables involving the type dummies with (a) *Treatment Group*, to enable us to verify the sensitivity of type dummies effects to changes in q and how close the decision environment is to that of a unionized labor market, or (b) *Inequality Averse*, as behavior of subjects classified as inequality averse *by* the preference elicitation task may change depending on where they stand in terms of type, or (c) Altruist, for similar reasons in relation to subjects classified as altruists.[9]

A potential limitation of the regression in Table 5 is that it does not control for the fact that wage proposals are bounded between 1 and 100. Table 6 presents random effects Tobit regressions on the wage proposal controlling for the non-independence of observations at the level of subjects; we solve the problem of non-independence of observation at the level of groups, as separate from the non-independence of observations at the level of subjects, by running regressions partitioned by subject type: for example, the regression by type 1 includes only wage proposals made by type 1 in the experiment.

(Insert Table 6 about here.)

One of the results from the descriptive analysis of Section 3.1 is that, in line with the first empirical prediction of our model, full or partial union membership do not affect wage proposals for the worker types that make proposals in both cases (types 1, 2 and 3); this remains the case in the regression analysis (e.g., in relation to Table 5, $p = 0.88$). Another result from the descriptive analysis is that wage proposals are sensitive to the worker type. Table 6 corroborates this finding, with the highest wage proposals observed for type 1 workers ($p < 0.001$), followed at a distance by type 2 ($p < 0.001$), followed by type 3 ($p < 0.02$), with no significant difference observed between type 4 and type 5 workers. These observations are in line with the second empirical prediction of our model.

[9] An online appendix presents regressions that control for a number of other individual characteristics, namely risk attitude, ambiguity attitude, inconsistency of choices, sensitivity to social pressure (social desirability), age, gender and economics study. All the qualitative results of this section are replicated, though the evidence for an effect of *Treatment Group* on *Type 1* wage proposals, referred to below, is stronger ($p = 0.044$) in the equivalent of Table 6.

In relation to type 1 workers, this result has to be seen however in combination in Table 5 with the statistical significance of the negative coefficient on *Type 1* × *Treatment Group* (p = 0.001), or equivalently of *Treatment Group* in the type 1 Tobit regression of Table 6 (p = 0.06). Put it differently, Type 1 workers make lower wage proposals, i.e. behave more kindly, when the decision environment is closer to that of the individual allocation task and the preference elicitation task; but, as the decision environment becomes closer to that of a trade union setting (i.e., *Treatment Group* is lower), this effect disappears. This is consistent with an accountability effect as discussed in the introduction, but inconsistent with the fourth prediction of our model: whether the decision environment mirrors an individual allocation task or a voting game should not matter.

Result 1. Having a full membership or partial membership trade union does not affect wage proposals. This fits the first prediction of our model.

Result 2. Wage proposals are differentiated by worker type and in the direction predicted by our model. This fits our second prediction.

Result 3. Type 1 workers behave less kindly the more the decision environment is closer to that which one would expect from a trade union wage setting as opposed to an individual allocation task. This is consistent with an accountability effect but inconsistent with the fourth prediction of our model.

Being classified as inequality averse in the preference elicitation task does partially compensate for the strategic incentive for a high wage proposal for type 1 workers ($p < 0.001$ in Table 5 and $p < 0.01$ in Table 6), but only partially so: e.g., the marginal effect for the wage proposal of being type 1 in the union wage environment (Treatment Group = 1) is still of the order of around + 62 experimental points even for inequality averse subjects based on Table 5. Table 5 also shows some evidence of an effect of being classified as altruist in the preference elicitation task on lower wage proposals (p = 0.07), but the coefficient is less than half as large as that for inequality averse, and is not robust enough to achieve statistical significance in the Table 6 Tobit regression for type 1 (p = 0.47). For type 1 workers, a lower wage proposal can unequivocally be interpreted as leading to lower inequality, and so the predictive power of inequality aversion for type 1 workers is consistent with the third prediction of our model, though obviously our model is silent on the differential predictive power of our proxies for altruistic and inequality averse preferences. We are not able to find other evidence of the predictive power of the social preference elicitation task except insofar as inequality averse type 5 workers tend to offer higher wage proposals than if they are not inequality averse according to Table 6 (p = 0.01).

> *Result 4. Being classified as inequality averse in the preference elicitation task predicts kind behavior for type 1 workers, which is consistent with the third prediction of our model. It is a better predictor of kinder behavior by type 1 workers than being classified as altruist.*

The coefficient on *Period* is only marginally significant in Table 5 (p = 0.08); based on Table 6, within-experiment experience does appear to bring higher wage proposals for type 1 workers (p < 0.05) and type 2 workers (p < 0.02), though the effect is quantitatively small. Experience in prior but unrelated experiments instead predicts higher wage proposals (p < 0.001 in Table 5), an effect that appears largely driven by and is large for type 1 workers (p < 0.01, Table 6), for which such experience predicts a higher wage proposals by around 60 points. This, of course, may be due not to learning but rather to sample selection: e.g., more self-interested subjects may be more likely to participate in experiments to make money, implying lower λ and therefore higher wage proposals in our model. Motivation clearly matters in at least another sense, in that, unsurprisingly, incentivized choices lead to higher wage proposals (p < 0.001 in Table 5; robust for type 1, 2 and 4 workers in Table 6).

> *Result 5. Having participated in previous, albeit unrelated, experiments leads to higher wage proposals, whether due to learning or motivation leading to sample selection. Motivation, in the form of incentivized choices, leads to higher wage proposals. Learning, in the form of repeated play within the experiment, leads to higher wage proposals for type 1 workers.*

(Insert Table 7 about here.)

It may also be instructive to run a Tobit regression on wage proposals for period 1 only, as this enables us to use the wage proposals of each subject as an independent observation, due to the lack of a common history. We do this in Table 7. Results 1 through 4 are generally supported: there is no effect of *INS*, worker types' behavioral differences are large and along the lines of insider-outsider theories (e.g. $p < 0.001$ for type 1), and inequality aversion leads to lower wage proposals for type 1 workers ($p < 0.001$), though a smaller period 1 effect exists also for type 2 ($p < 0.05$) and type 3 workers ($p = 0.05$); we also confirm the lack of robustness on the results of *Altruist*, as being classified as altruist does not predict lower wage proposals. Whether choices are incentivized does not seem to matter in period 1 ($p = 0.53$), qualifying Result 5, but the significance of prior experimental experience in predicting higher wage proposals carries through ($p = 0.001$).

Result 6. Results 1 through 4 are robust if we focus only on period 1 wage proposals. In relation to Result 5, prior experimental experience matters for period 1 wage proposals.

4. Discussion and conclusion

We implemented a very stylized wage setting based on union members voting on their preferred wages and, consequently, implementing a certain employment level. Workers are heterogeneous in terms of their productivity, and there is thus a conflict among selfish workers with regard to the optimal wage. In line with our theoretical prediction, there is no difference in wage proposals between a setting in which all five workers vote on the wage level and a setting in which only the three most productive workers are allowed to vote. The more the voting system is transformed from a median voter scheme to an individual allocation task, the more employment levels are taken into account by workers. In other words, on average, wages go down to allow less productive workers being employed. Overall, the level of pro-social preferences we found is small; however, independent measures of pro-social preferences are still a good predictor for wage proposals of workers.

Our setup incorporates an allocation decision into a labor market setting and disentangles the effects from the individual allocation task and the median voter decision by union members. Both the union framing and the gradual transformation from a median voter scheme to a dictator scheme are unique in the behavioral economics literature. They allow for new insights and several potential extensions beyond this paper. Naturally, one has to exercise caution when generalizing the results from the experiment to real wage setting environments. It was not the aim of this experiment to capture the peculiarities of natural institutions and the behavior of unions. Nonetheless, there are a couple of findings from the experiment that provide important implications for the real world. First, voting systems in allocation tasks seem to have the tendency to reduce accountability and, thus, lead to more selfish outcomes than systems in which single decision makers, though still anonymous, can be held accountable. Second, the size of the union does not seem to play a large role in the allocative function through wage setting beyond the mechanic effect of the median voter scheme. Of course, it is possible that the size of the union is important in another dimension, namely in determining the power of a union, which we neglected here.

Extending our setup is a straightforward issue. Several dimensions seem worthwhile investigating. One could think of varying the parameters of our setup, especially the distribution and the exact choice of productivity levels of workers. One could also introduce uncertainties over certain aspects of the interaction. Finally, it seems interesting to analyze different forms of interaction among union members beyond the stylized voting game used here.

References

Abbink K, Herrmann B. The Moral Costs of Nastiness. Economic Inquiry 2011: 49; 631-633

Bardsley N. Dictator Game Giving: Altruism or Artefact? Experimental Economics 2008: 1; 122-133

Blair DH, Crawford DL. Labor Union Objectives and Collective Bargaining. Quarterly Journal of Economics 1984: 99; 547-566

Bohnet I, Frey B. The Sound of Silence in Prisoner's Dilemma and Dictator Games. Journal of Economic Behavior and Organization 1999: 38; 43-57

Bolton GE, Ockenfels A. ERC: A Theory of Equity, Reciprocity, and Competition. American Economic Review 2000: 90; 166-193

Bornstein G, Yaniv I. Individual and Group Behavior in the Ultimatum Game: Are Groups More “Rational” Players? Experimental Economics 1998: 1; 101-108

Cacioppo JT, Petty R, Feng Kao C. The Efficient Assessment of Need for Cognition. Journal of Personality Assessment 1984: 48; 306-307

Charness G, Rigotti L, Rustichini A. Individual Behavior and Group Membership. American Economic Review 2007: 97; 1340-1352

Charness G, Rabin M. Understanding Social Preferences with Simple Tests. Quarterly Journal of Economics 2002:117; 817-869

Chen Y, Li S. Group Identity and Social Preferences. American Economic Review 2009: 99; 431-457

Dana J, Weber R, Kuang J X. Exploiting Moral Wriggle Room: Behavior Inconsistent with a Preference for Fair Outcomes. Economic Theory 2007: 33; 67-80

Dufwenberg M, Kirchsteiger G. A Theory of Sequential Reciprocity. Games and Economic Behavior 200: 47; 268-298

Eckel C, Grossman P. Altruism in Anonymous Dictator Games. Games and Economic Behavior 1996: 16; 181-191

Ellingsen T, Johannesson M. Pride and Prejudice: The Human Side of Incentive Theory. American Economic Review 2008: 98; 990-1008

Engelmann D, Strobel M. Inequality Aversion, Efficiency, and Maximin Preferences in Simple Distribution Experiments. American Economic Review 2004: 94; 857-869

Engle-Warnick J, Laszlo S. Learning-by-Doing in an Ambiguous Environment. McGill University Department of Economics Working Paper, 2006s-29; 2006

Falk A, Fischbacher U. A Theory of Reciprocity. Games and Economic Behavior 2006: 54; 293-315

Farber H. Individual Preferences and Union Wage Determination: the Case of United Mine Workers. Journal of Political Economy 1978: 86; 932-942

Fehr E, Schmidt KM. A Theory of Fairness, Competition, and Cooperation. Quarterly Journal of Economics 1999: 114; 817-868

Fischbacher U. z-Tree: Zurich Toolbox for Ready-Made Economic Experiments. Experimental Economics 2007: 10; 171-178

Forsythe R, Horowitz JL, Savin, N E, Sefton, M. Fairness in Simple Bargaining Games. Games and Economic Behavior 1994: 6; 347-369

Greiner B. An Online Recruitment System for Economic Experiments. In: Kremer, K., Macho, V. (Eds.). Forschung und wissenschaftliches Rechnen 2003, GWDG Bericht 63. Göttingen 2004; 79-93

Grossman, G. Union Wages, Seniority and Employment. American Economic Review 1983: 73; 277-290

Güth, W, Huck, S, Ockenfels, P. Two-Level Ultimatum Bargaining with Incomplete Information: an Experimental Study. Economic Journal 1996: 106; 593-604

Hargreaves Heap SP, Zizzo DJ. The Value of Groups. American Economic Review 2009: 99; 295-323

Hoffman E, McCabe K, Shachat K, Smith V. Social Distance and Other-Regarding Behavior in Dictator Games. American Economic Review 1996: 86; 653-660

Holt CA, Laury SK. Risk Aversion and Incentive Effects. American Economic Review 2002: 92; 1644-1655

Insko C, Hoyle R, Pinkley R, Hong G, Slim R, Dalton G, Lin Y, Ruffin W, Dardis G, Bernthal P, Schopler J. Individual-Group Discontinuity: The Role of a Consensus Rule. Journal of Experimental Social Psychology 1988: 24; 505-519

Insko, C, Pinkley R, Hoyle R, Dalton B, Hong G, Slim R, Landry P, Holton B, Ruffin P, Thibaut J. Individual versus Group Discontinuity: The Role of Intergroup Contact. Journal of Experimental Social Psychology 1987: 23; 250-267

List JA. On the Interpretation of Giving in Dictator Games. Journal of Political Economy 2007: 115; 482-493

Kahneman D, Knetsch JL, Thaler R. Fairness and the Assumptions of Economics. Journal of Business 1986: 59; 285-300

Kerschbamer R. The geometry of distributional preferences and a nonparametric identification approach. Mimeo, Department of Economics, University of Innsbruck; 2012

Kocher MG, and Sutter M. Individual versus Group Behavior and the Role of the Decision Making Procedure in Gift-Exchange Experiments. Empirica 2007: 34; 63-88

Kugler T, Bornstein G, Kocher MG, Sutter M. Trust between Individuals and Groups: Groups are Less Trusting than Individuals but Just as Trustworthy. Journal of Economic Psychology 2007: 28; 646-657

Linbeck A, Snower D. The Insider-Outsider Theory of Employment and Unemployment, MIT Press, Cambridge, Massachusetts; 1988

Luhan, WJ, Kocher MG, Sutter, M. Group Polarization in the Team Dictator Game Reconsidered. Experimental Economics 2009: 12; 26-41

MacDonald I, Solow R. Wage Bargaining and Employment. American Economic Review 1981: 71; 896-908

Pahlke J, Strasser S, Vieider F. Risk-Taking for Others under Accountability. Economics Letters 2012: 114; 102-105

Rabin M. Incorporating Fairness into Game Theory and Economics. American Economic Review 1993: 83; 1281-1302

Starmer C, Sugden, R. Does the Random-Lottery Incentive System Elicit True Preferences? An Experimental Investigation. American Economic Review 1991: 81; 971-978

Stöber J, The Social Desirability Scale-17 (SDS-17). European Journal of Psychological Assessment 2001: 17; 222-232

Sutter M. Individual Behavior and Group Membership: Comment. American Economic Review 2009: 99; 2247-2257

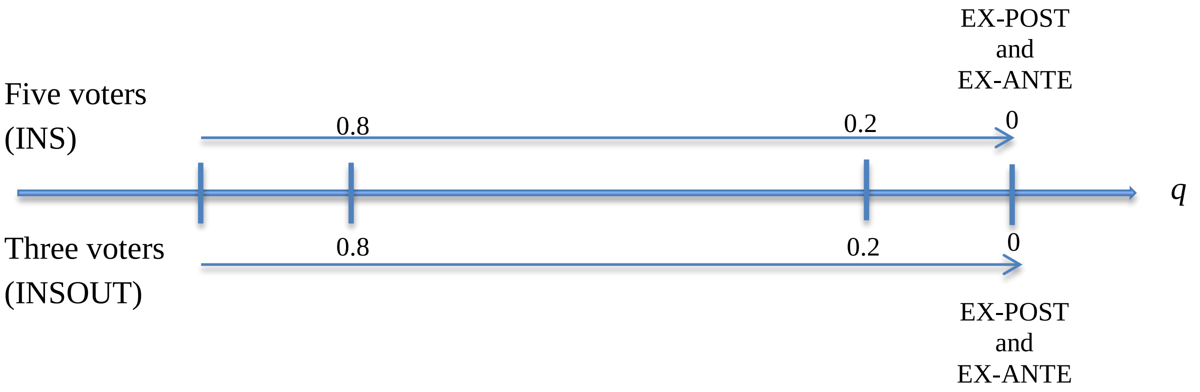
Tajfel H, Billig, MG, Bundy RP, Flament C. Social Categorization and Intergroup Behavior. European Journal of Social Psychology 1971: 1; 149-178

Vieider F. Moderate Stake Variations for Risk and Uncertainty, Gains and Losses: Methodological Implications for Comparative Studies. Economics Letters 2012, forthcoming

Zizzo DJ. Experimenter Demand Effects in Economic Experiments. Experimental Economics 2010: 13; 75-98

Figures

Figure 1: Graphical treatments overview



Tables

Table 1: Wages and employment

Wage level (in experimental points)	These worker types are employed
1 – 20	1, 2, 3, 4, 5
21 – 25	1, 2, 3, 4
26 – 33	1, 2, 3
34 – 50	1, 2
51 – 100	1

Table 2: Treatment overview

	***q* = 0.8**	***q* = 0.2**	***q* = 0 (EX-POST)**	***q* = 0 (EX-ANTE)**
Five voters	INS-0.8 *N* = 60	INS-0.2 *N* = 60	INS-0 (EX-POST) *N* = 60	INS-0 (EX-ANTE) *N* = 60
Three voters	INSOUT-0.8 *N* = 60	INSOUT-0.2 *N* = 60	INSOUT-0 (EX-POST) *N* = 40	INSOUT-0 (EX-ANTE) *N* = 40

Note: *N* denotes the number of participants in the respective treatment

Table 3: Average chosen wage levels (selfish prediction in parentheses)

	***q* = 0.8**	***q* = 0.2**	***q* = 0 (EX-POST)**	***q* = 0 (EX-ANTE)**
Five voters	MED: 30.73 TOT: 33.43 (*w* = 33 for MED)	MED: 34.52 TOT: 45.43 (*w* = 33 for MED)	MED: not applicable TOT: 41.62 (*w* = 45.6 for TOT)	MED: not applicable TOT: 45.58 (*w* = 45.6 for TOT)
Three voters	MED: 45.87 TOT: 50.82 (*w* = 50 for MED)	MED: 46.00 TOT: 64.68 (*w* = 50 for MED)	MED: not applicable TOT: 56.26 (*w* = 61 for TOT)	MED: not applicable TOT: 60.64 (*w* = 61 for TOT)

MED refers to periods in which the median was decisive; TOT refers to the total average, including all periods.
q = 0 (EX-ANTE) only includes incentivized choices.

Table 4: Average wage proposal by relevant types (selfish predictions in parentheses)

	***q* = 0.8**	***q* = 0.2**	***q* = 0 (EX-POST)**	***q* = 0 (EX-ANTE)**
Five voters	T1: 88.71 (100) T2: 50.25 (50) T3: 34.03 (33) T4: 20.13 (25) T5: 19.23 (20)	T1: 79.79 (100) T2: 43.84 (50) T3: 38.05 (33) T4: 28.04 (25) T5: 24.68 (20)	T1: 79.04 (100) T2: 47.83 (50) T3: 31.68 (33) T4: 24.91 (25) T5: 18.90 (20)	T1: 80.79 (100) T2: 44.40 (50) T3: 31.72 (33) T4: 24.32 (25) T5: 20.25 (20)
Three voters	T1: 87.10 (100) T2: 46.00 (50) T3: 32.31 (33)	T1: 89.64 (100) T2: 46.45 (50) T3: 30.42 (33)	T1: 72.16 (100) T2: 46.35 (50) T3: 30.59 (33)	T1: 80.29 (100) T2: 42.86 (50) T3: 28.26 (33)

Table 5: Random effects regression on wage proposals

	β	t	P
Type 1	88.539	12.19	0
Type 2	33.591	4.73	0
Type 3	17.243	2.44	0.015
Type 4	0.026	0	0.997
Treatment Group	2.158	1.17	0.243
Type 1 x Treatment Group	-7.489	-3.39	0.001
Type 2 x Treatment Group	-2.178	-1	0.316
Type 3 x Treatment Group	-1.301	-0.6	0.549
Type 4 x Treatment Group	1.815	0.73	0.464
Ins	0.266	0.16	0.875
Prior Experience	13.329	4.69	0
Incentivized	5.168	5.19	0
Inequality Averse	9.827	1.86	0.062
Altruist	4.062	0.9	0.368
Type 1 x Inequality Averse	-26.801	-4.36	0
Type 2 x Inequality Averse	-10.73	-1.74	0.081
Type 3 x Inequality Averse	-10.951	-1.8	0.071
Type 4 x Inequality Averse	-3.856	-0.56	0.573
Type 1 x Altruist	-10.791	-1.82	0.069
Type 2 x Altruist	-4.816	-0.85	0.395
Type 3 x Altruist	-1.18	-0.2	0.84
Type 4 x Altruist	-4.973	-0.74	0.461
Period	0.116	1.76	0.079
Constant	-4.671	-0.69	0.493
Log Likelihood	-14350.54		

n = 3600. The nested random effect regression simultaneously controls for both group level and subject level non-independence of observations.

Table 6: Tobit effects regression on wage proposals, partitioned by type

	Type 1			Type 2			Type 3		
	β	t	P	β	t	P	β	t	P
Treatment Group	-12.995	-1.87	0.061	-0.707	-0.79	0.43	-0.938	-1.03	0.304
Ins	-2.97	-0.2	0.838	1.578	0.83	0.407	3.03	1.72	0.086
Prior Experience	71.345	2.79	0.005	7.626	2.06	0.04	3.383	0.8	0.424
Incentivized	31.689	4.97	0	3.201	2.65	0.008	-0.143	-0.09	0.93
Inequality Averse	-50.102	-3.01	0.003	-1.323	-0.6	0.547	-1.776	-0.92	0.359
Altruist	-14.693	-0.72	0.471	-1.686	-0.7	0.485	1.892	0.77	0.443
Period	1.124	1.98	0.047	0.227	2.54	0.011	-0.044	-0.49	0.623
Constant	91.62	2.58	0.01	36.623	7.58	0	30.477	5.64	0
Log Likelihood	-1713.03			-3141.32			-3128.55		
Left censored obs.	2			0			3		
Right censored obs.	578			5			7		
	Type 4			Type 5					
	β	t	P	β	t	P			
Treatment Group	2.265	1.37	0.171	0.617	0.31	0.757			
Ins									
Prior Experience	0.35	0.04	0.966	11.743	2.38	0.017			
Incentivized	-5.432	-2.37	0.018	-0.391	-0.08	0.935			
Inequality Averse	5.375	1.37	0.17	9.679	2.56	0.01			
Altruist	-0.445	-0.1	0.92	3.684	1.13	0.257			
Period	0.063	0.35	0.729	-0.084	-0.52	0.601			
Constant	21.22	2.17	0.03	6.062	0.66	0.51			
Log Likelihood	-1807.12			-1758.40					
Left censored obs.	21			22					
Right censored obs.	14			10					

n = 880 (for each of Types 1, 2, 3 regressions); 480 (for each of Types 4 and 5 regressions). Note that by definition there are only Type 4 and Type 5 observations when everyone is an insider to the union and so only in treatments where Ins = 1; this variable therefore drops off from these regressions. These regressions control for subject level non-independence of observations and, since they are on wage proposals by worker type and there is only one worker type per group, simultaneously control for group level non-independence. Left censored obs. and right censored obs. are the numbers of wage proposals set at the minimum of 1 and the maximum of 100, respectively.

Table 7: Tobit effects regression on period 1 wage proposals

	β	t	P
Type 1	102.47	8.95	0
Type 2	30.072	2.82	0.005
Type 3	22.013	2.08	0.039
Type 4	7.548	0.62	0.534
Treatment Group	1.56	0.54	0.591
Type 1 x Treatment Group	-7.949	-2.32	0.021
Type 2 x Treatment Group	-0.298	-0.09	0.927
Type 3 x Treatment Group	-2.611	-0.8	0.426
Type 4 x Treatment Group	0.39	0.1	0.917
Ins	-2.265	-0.92	0.358
Prior Experience	13.542	3.27	0.001
Incentivized	2.022	0.56	0.574
Inequality Averse	12.976	1.67	0.095
Altruist	3.164	0.47	0.64
Type 1 x Inequality Averse	-41.586	-4.46	0
Type 2 x Inequality Averse	-19.437	-2.14	0.033
Type 3 x Inequality Averse	-17.391	-1.95	0.052
Type 4 x Inequality Averse	-16.475	-1.64	0.103
Type 1 x Altruist	2.094	0.21	0.832
Type 2 x Altruist	-9.255	-1.09	0.276
Type 3 x Altruist	-3.506	-0.4	0.692
Type 4 x Altruist	-9.442	-0.95	0.341
Constant	1.673	0.15	0.883
Log Likelihood	-1353.68		
Left censored obs.	0		
Right censored obs.	59		

n = 360. Left censored obs. and right censored obs. are the numbers of wage proposals set at the minimum of 1 and the maximum of 100, respectively.

Appendix A: Proofs of Propositions 1 and 2

Proof of Proposition 1:

We first prove that the strategy profiles described in the proposition are Nash equilibria under the stated conditions on λ, and we then prove uniqueness.

Consider the strategy profile $(w_1,w_2,w_3)=(Q_1,Q_2,Q_3)$. To prove that $w_i=Q_i$ is a unique best reply for worker i, we show that setting $w_i=Q_i$ is a unique best reply ex post when i is decisive, and a (possibly non-unique) best reply ex post under the median rule. This then implies that $w_i=Q_i$ is overall a unique best reply for worker i.

When worker 1 is decisive, $w_1=Q_1$ is optimal if

$100 \geq \max\{50(2)^{\lambda}, (100/3)(3)^{\lambda}, 25(4)^{\lambda}, 20(5)^{\lambda}\}$.

This holds when $\lambda\leq 1$. Under the median rule, the median is $w_2=Q_2$. There are no upwards profitable deviations from $w_1=Q_1$. The only potentially profitable downwards deviation for worker is to $w_1\leq w_3=Q_3$, such that the median is lowered to w_3. This deviation is suboptimal when $50(2)^{\lambda} \geq (100/3)(3)^{\lambda}$, or $\lambda\leq 1$.

Similarly, when worker 2 is decisive, $w_2=Q_2$ is optimal when

$50(2)^{\lambda} > \max\{(100/3)(3)^{\lambda}, 25(4)^{\lambda}, 20(5)^{\lambda}\}$. This again holds when $\lambda\leq 1$. Under the median rule, the median is w_2, and the only potentially optimal deviation for worker 2 is to set $w_2\leq w_3=Q_3$. As before, this is unprofitable when $50(2)^{\lambda} > (100/3)(3)^{\lambda}$, or $\lambda\leq 1$.

Finally, when worker 3 is decisive $w_3=Q_3$ is optimal when $(100/3)(3)^{\lambda} > \max\{25(4)^{\lambda}, 20(5)^{\lambda}\}$. Once more, this is satisfied when $\lambda\leq 1$. Under the median rule, worker 3 has no job at the median w_2, and cannot lower the median. The median can be raised to Q_1 by setting $w_3\geq w_1$, but worker 3 then remains unemployed and employment drops, so this deviation is unprofitable for worker 3. We thus conclude that $(w_1,w_2,w_3)=(Q_1,Q_2,Q_3)$ is a Nash equilibrium when $0\leq\lambda\leq 1$.

Consider then the strategy profile $(w_1,w_2,w_3)=(Q_5,Q_5,Q_5)$. When decisive, $w_1=Q_5$ is optimal for worker 1 when $20(5)^{\lambda} > \max\{100, 50(2)^{\lambda}, (100/3)(3)^{\lambda}, 25(4)^{\lambda}\}$. This holds when $\lambda>1$. Under the median rule, no deviation by worker 1 can change the median, so $w_1=Q_5$ is also optimal for worker 1 when the median worker is decisive.

When worker 2 is decisive, $w_2=Q_5$ is optimal when $20(5)^{\lambda} > \max\{50(2)^{\lambda}, (100/3)(3)^{\lambda}, 25(4)^{\lambda}\}$, and this again holds when $\lambda>1$. Under the median rule worker 2 again cannot affect the median, so $w_2=Q_5$ is optimal.

Finally, consider worker 3. When he is decisive, $w_3=Q_5$ is optimal when $20(5)^{\lambda} > \max\{(100/3)(3)^{\lambda}, 25(4)^{\lambda}\}$, and this again holds when $\lambda>1$. As before, any deviation leaves the median unchanged, so payoffs under the median rule are maximized at $w_3=Q_5$. We thus conclude that $(w_1,w_2,w_3)=(Q_5,Q_5,Q_5)$ is a Nash equilibrium when $\lambda>1$.

Proving Uniqueness

Consider an arbitrary strategy profile. The argument above shows that, if $\lambda\leq 1$, when worker *i* is decisive, then $w_i=Q_i$ is a unique best reply. We now show that under the median rule worker *i* receives a payoff of $w_i=Q_i$ that it at least as high as, or strictly higher than, the payoff from any other choice of w_i. In other words, setting $w_i=Q_i$ is a strictly dominant strategy for worker *i=1,2,3*, and this implies uniqueness. The fact that setting $w_i=Q_i$ under the median rule is optimal follows from the fact that, whatever the other workers' choices, worker i moves the median closest to her optimal value, which, when $\lambda\leq 1$, is Q_i, by setting $w_i=Q_i$ (other values of w_i may be equally optimal, but $w_i=Q_i$ is always among the set of optimal choices). To be more precise, suppose the median of the other workers' wages is below Q_i. Then setting $w_i=Q_i$ either increases the overall median and brings it closer to Q_i, or leaves it unchanged. In either case, $w_i=Q_i$ is better or at least as good as any choice $w_i<Q_i$ when $\lambda\leq 1$. Suppose next that the median of the other workers' wages is above Q_i. By setting $w_i=Q_i$ the overall median is either lowered towards Q_i or is the same as the median of the other workers' wages. In the first case worker i is more likely to be employed under the median rule and employment can only increase, so i's utility will also increase. In the second case i's utility is the same under the median rule no matter what i decides, so setting $w_i=Q_i$ is optimal. This shows that for each worker i setting $w_i=Q_i$ is optimal under the median rule. Combining this with the fact that $w_i=Q_i$ is uniquely optimal when worker i is decisive, shows that $(w_1,w_2,w_3)=(Q_1,Q_2,Q_2)$ is a unique Nash equilibrium when $0\leq\lambda\leq 1$.

Suppose then $\lambda>1$. We again prove that setting $w_i=Q_5$ is a strictly dominant strategy for each worker i. We already know that when worker i is decisive, $w_i=Q_5$ is a unique best reply. Under the median rule, when $\lambda>1$ worker i's best outcome is that the median wage is Q_5.

Thus, it again follows that, no matter the other workers' wage choices, worker i will want to bring the median as close to Q_5 as possible; setting $w_i=Q_5$ is always the wage that accomplishes this objective. This shows that setting $w_i=Q_5$ is a strictly dominant strategy for each worker i when $\lambda>1$. This, in turn implies that the Nash equilibrium $(w_1,w_2,w_3)=(Q_5, Q_5, Q_5)$ is unique when $\lambda>1$.

Proof of Proposition 2

We first show that when $\lambda\leq 1$ then the strategy profile where worker i sets $w_i=Q_i$, i=1,...,5, is a Nash equilibrium. A straightforward extension of the computations for the case where only workers 1, 2, and 3 could submit a wage shows that, when decisive, $w_i=Q_i$ is uniquely optimal for worker i when $\lambda\leq 1$. We next show that $w_i=Q_i$ is also optimal under the median rule. Given the profile $(w_1,...,w_5)=(Q_1,...,Q_5)$, the median is q_3. worker 1 can lower the median from Q_3 to Q_4 (but not by more) by setting $w_1\leq Q_4$. This deviation is unprofitable when $25(4)^{\lambda} \leq (100/3)(3)^{\lambda}$, which holds since $\lambda\leq 1$. Also, no upwards deviation from $w_i=Q_1$ is profitable since it can only lead to being unemployed onself and a decrease in overall employment. Similarly, worker 2 can lower the median to Q_4 by setting $w_2\leq Q_4$. As for worker 1, this is unprofitable whenever $\lambda\leq 1$. As for worker 1, no upwards deviation is profitable. Consider then worker 3. A deviation to $w_3\leq Q_4$ again lowers the median to Q_4, but, once more, $\lambda\leq 1$ implies that this, as well as any upwards deviation, is unprofitable. Both workers 4 and 5 are unemployed under the median rule; no downwards deviation can affect the median and hence their chance of getting a job, so payoffs are the same. Also, no upwards deviation is profitable since that keeps them unemployed and reduces overall employment. Thus $w_4=Q_4$ and $w_5=Q_5$ are optimal for workers 4 and 5 under the median rule. We thus conclude that when $\lambda\leq 1$ setting $w_i=Q_i$ is a unique best reply to the profile $(w_1,w_2,w_3,w_4,w_5)=(Q_1,Q_2,Q_3,Q_4,Q_5)$.

Consider next the profile $(w_1,w_2,w_3,w_4,w_5)=(Q_5,Q_5,Q_5,Q_5,Q_5)$. A straightforward generalization of the three-worker analysis shows that when $\lambda>1$ and worker i=1,2,3,4,5 is decisive, $w_i=Q_5$ is optimal. Next, consider payoffs under the median rule. Since the median is Q_5 and no worker can affect the median by a deviation, each worker earns the same regardless of her choice of wage, so setting $w_i=Q_5$ is optimal. This proves that $(w_1,w_2,w_3,w_4,w_5)=(Q_5,Q_5,Q_5,Q_5,Q_5)$ is a Nash equilibrium when $\lambda>1$.

Proving uniqueness

The proof of uniqueness for the three-worker case extends immediately to the case of five workers.

Appendix B: Social preference elicitation task (based on Kerschbamer, 2012)

Disadvantageous Inequality Block

LEFT		Your Choice (please mark)	RIGHT	
you get	passive agent gets		you get	passive agent gets
15 Points	30 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
19 Points	30 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
20 Points	30 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
21 Points	30 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
25 Points	30 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points

Advantageous Inequality Block

LEFT		Your Choice (please mark)	RIGHT	
you get	passive agent gets		you get	passive agent gets
15 Points	10 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
19 Points	10 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
20 Points	10 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
21 Points	10 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points
25 Points	10 Points	LEFT ◯ ◯ RIGHT	20 Points	20 Points

Translation of Choices in the Distributional-Preferences Elicitation Task into WTP

Disadvantageous Inequality Block (DIP)

in the DIB subject chooses LEFT for the first time in row	WTP^d				proxy for WTP^d used
1	+0.5	$\leq$	WTP^d		**+0.5**
2	+0.1	$\leq$	WTP^d <	+0.5	**+0.3**
3	+0.0	$\leq$	WTP^d <	+0.1	**+0.05**
4	-0.1	$\leq$	WTP^d <	-0.0	**-0.05**
5	-0.5	$\leq$	WTP^d <	-0.1	**-0.3**
never			WTP^d <	-0.5	**-0.5**

Advantageous Inequality Block (AIB)

in the AIB subject chooses LEFT for the first time in row	WTP^a				proxy for WTP^a used
1			$WTP^a \leq$	-0.5	**-0.5**
2	-0.5	<	$WTP^a \leq$	-0.1	**-0.3**
3	-0.1	<	$WTP^a \leq$	-0.0	**-0.05**
4	+0.0	<	$WTP^a \leq$	+0.1	**+0.05**
5	+0.1	<	$WTP^a \leq$	0.5	**+0.3**
never	+0.5	<	WTP^a		**+0.5**

WTP^d for $WPT^d > 0$: $|WTP^d|$ = amount of own material payoff the decision maker is willing to give up in the domain of disadvantageous inequality in order to *increase* the other's material payoff by one unit;

for $WPT^d < 0$: $|WTP^d|$ = amount of own material payoff the decision maker is willing to give up in the domain of disadvantageous inequality in order to *decrease* the other's material payoff by one unit (in this interpretation inequalities need to be reversed; for instance, subjects who never switch on the X-list reveal that they are willing to give up at least 50 Cents of their own income to decrease the income of the other player by 1 Euro);

WTP^a defined similarly for the domain of advantageous inequality.