Efficiency and behavioral considerations in labor negotiations

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Abstract

Experimental literature has shown that social preferences influence how individuals bargain and make sharing decisions. It usually considers situations in which individuals negotiate on a single issue. This paper explores a different environment and reports on an experiment based on a non-cooperative game in which the choice of the bargaining agenda is endogenous. We fnd that firms reveal a strong preference for single-issue bargaining although the subgame perfect equilibrium predicts the choice of the multi-issue bargaining. In multi-issue bargaining unions offer smaller relative payoff shares to firms than in single-issue bargaining and this leads to a higher conflict rate than in a single-issue bargaining. Social preferences and a concern for relative payoffs support this preference for a restricted bargaining agenda but they induce a loss of efficiency.

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1. INTRODUCTION

A huge economic literature on the ultimatum bargaining game (Güth *et al*., 1982; Güth, 1995; Roth, 1995; Oosterbeek *et al*., 2004; Murnighan, 2008) has shown that the first mover in this game exploits his strategic advantage to some degree but that the distribution of payoffs between the two parties is on average less asymmetric than theory predicts. It has also been found that the probability for disagreement increases in the relative payoff share demanded by the first mover. Theories of social preferences explain these findings by the individuals' concern for fairness and their degree of inequity aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Interestingly, Charness and Rabin (2002) provides an alternative theory of social preferences in which people care about efficiency (see also experimental evidence in Engelmann and Strobel, 2004). We explore the hypothesis that social preferences may play a role not only in the bargaining behavior of the players but also in the choice of the bargaining agenda, i.e. the issues on which players have to bargain. We study whether social preferences are aligned with a search for higher efficiency in the determination of this bargaining agenda. Labor negotiations offer a natural setting for studying this question.

The canonical models of labor negotiations typically oppose two main approaches of the bargaining agenda (Booth, 1995): the "right-to-manage" model in which the firm bargains with its union about wage but retains the right to determine employment (Nickell and Andrews, 1983) and the "efficient bargaining" model that assumes that both, wage and employment, are bargained simultaneously (McDonald and Solow, 1981). The larger bargaining agenda reaches higher efficiency through a higher employment level. In a more general context, early experiments on bilateral monopoly have tested alternative bargaining models and concluded that the outcome of the joint negotiation is very close to the Pareto optimal solution whereas bargaining under price leadership leads to outcomes that are no longer efficient because of a tendency toward a contract providing an equal share of maximum joint profits (Siegel and Fouraker, 1960; Fouraker *et al.*, 1962; Fouraker and Siegel, 1963). This literature did not intend, however, to endogenize the choice of the bargaining agenda. A more recent strand in economic theory has developed bargaining agenda games (see Fershtman, 2000). In these games the agenda may be determined endogenously for example through a prior bargaining over the agenda (Conlin and Furusawa, 2000; Inderst, 2000). Games with endogenous agendas oppose issue-by-issue vs. bundle-bargaining (Lang and Rosenthal, 2001; Younghwan and Serrano, 2004). These models have not been empirically tested, as far as we know.

The aim of this paper is to investigate some of the reasons explaining the preference of firms for either a bundle-bargaining agenda or a restricted bargaining agenda in labor negotiations with their union by means of a controlled laboratory experiment. To do this we introduce a non-cooperative bargaining model that we test experimentally in the laboratory.

In our game, firms select the bargaining agenda and bargain with unions according to one of two rules: a single-issue agenda (SIA) or a multi-issue agenda (MIA) in which two issues are negotiated simultaneously and which corresponds to the efficient bargaining model. The firm has full discretion over the agenda and the union has the whole bargaining power. The game may be seen as a non-cooperative implementation of the classical "efficient bargaining versus right-to-manage" framework. A chance move determines the profitability of the bargain for the firm. In SIA the firm may choose employment upon realization of the chance move. While this may seem advantageous, rational and risk-neutral players should still prefer MIA. By varying the probabilities of the bad state of nature in two experimental treatments, we vary the implicit cost of choosing SIA in order to investigate how agenda choice varies with this cost. The game theoretic solution – which assumes rational and selfish behavior – states that the firm should choose the multi-issue bargaining agenda in both treatments. While the multi-issue bargaining agenda is more efficient and profitable for the firm, it also provides the firm with a lower relative share of joint profits than the single-issue agenda. Though this should not matter from a purely rational and selfish perspective, we know from the huge literature on ultimatum bargaining experiments that people have social preferences that lead them to deviate from the theoretical predictions.

Our experimental results show that firms choose the single-issue bargaining agenda in 70% of the cases although employment, profit and efficiency are larger under multi-issue bargaining than under single-issue bargaining. This preference for a restricted bargaining agenda is in contrast with the theoretical prediction. The choice of bargaining agenda reacts to the fact that unions demand a larger relative payoff share in MIA than in SIA although they claim for a lower level of employment (but a higher wage) than predicted. Since at the same time unions demand lower wages than predicted in single-issue bargaining, SIA is actually more attractive to firms relative to MIA than predicted. Indeed, SIA increases significantly both the firms' absolute payoffs and their relative share of joint payoffs and therefore, disagreement is less frequent. Eventually, the efficiency gains in MIA are smaller than theoretically predicted. Our findings support the importance of social preferences in the choice of the bargaining agenda and do not support a strong concern for efficiency.

The remainder of this paper is organized as follows. Section 2 presents the theoretical model underlying the experimental design. Section 3 provides details on the experimental procedures. Section 4 reports the data and statistical analyses. Section 5 discusses the results and concludes.

2. MODEL AND EXPERIMENTAL DESIGN

2.1. A stochastic model of the firm-union bargaining

In this section we describe the basic structure of the bargaining game, our experimental design and the theoretical predictions. Consider a firm and a union with N members of which $n \leq N$ may be employed. Firm and union care about wage w and employment n, which may be determined according to one of two possible agendas to be chosen by the firm: the single-issue bargaining agenda ("SIA") or the multi-issue bargaining agenda ("MIA"). In case of SIA, firm and union bargain about w. After a wage settlement, the firm freely chooses n. In case of MIA, firm and union bargain about the bundle (w and n) at the same time. Suppose that the union's utility function $u(w,n)$ and the firm's profit function $\pi(w,n)$ are as follows:

$$u(w,n) = nw^{\beta} + (N - n)\overline{u} \tag{1}$$

$$\pi(w,n) = pn^{\alpha} - wn \tag{2}$$

with $w > 0$, $0 \leq n \leq N$ as defined above. The term $(N - n)$ represents the number of unemployed members, $\bar{u}$ is the status-quo utility of unemployment, and $p > 0$ is the output price received by the firm. The parameters α and β (with $0 < \alpha, \beta < 1$) imply decreasing marginal returns of labor for the firm, respectively decreasing marginal utility of money for the union. The union has utilitarian preferences; it cares about the utility of all its members, either employed or unemployed. Output price p is stochastic:

$$p \in \{p_l, p_h\}, \quad \text{with} \quad prob(p_l) = \theta \quad \text{and} \quad prob(p_h) = 1-\theta \tag{3}$$

where p_l (p_h) represents a low (high) output price. Both parties know the possible realizations of the random price and the probability θ . In MIA the random price is drawn after w and n have been chosen. In SIA w is determined before p is drawn, but n is chosen afterwards with the firm being informed about the realization of p. This information structure captures the idea that in SIA employers may react to changes in business conditions via adjusting employment. Indeed, the literature assumes that shocks to productivity or to the firms' output price do not affect the wage level but lead to employment adjustments (see for example Cahuc and Zylberberg, 2004). The parameter θ influences the profitability of MIA relative to SIA.

To conclude the model we assume that bargaining outcomes are determined via an ultimatum game in which the union states a wage (in SIA and MIA) and an employment level (only in MIA) which may be accepted or rejected by the firm. If the union's offer is accepted by the firm, payoffs are determined according to (1), (2) and (3). In case of a disagreement, the parties earn disagreement payoffs $v=v^D$ and $u=u^D$, respectively.

System (1), (2) and (3) is a simple description of a firm-union conflict. Our experimental game, which we introduce below, relies on this structure. The ultimatum game gives a strong strategic advantage to the first mover, the union. This can be viewed as a non-cooperative implementation of the so-called monopoly union case, which is usually modelled as a cooperative Nash Bargaining game where the union has all bargaining power (see Booth, 1995; Muthoo, 1999).

2.2. Experimental design

For the experiment we fixed numerical values for the parameters of the game. To facilitate the decision process of our subjects, the choice sets of wage and employment levels have been restricted to five different wage levels and seven different employment levels. The firm's and union's payoffs associated with each wage and employment levels for each random price are represented by the matrix shown in Appendix 1. Wages are displayed in rows and employment levels in columns. Each cell of the matrix displays three payoffs: the firm's payoff if the price is low (top entry) or high (middle entry), and the union's payoff (bottom entry). The numbers were computed according to the stochastic model of the employer-union conflict as described in the previous sub-section, except for multiplying the payoffs by 100 and rounding off. They rely on the following specifications: α =0.3, β =0.9, p_h = 2.4, p_l = 1.4, N = 15, $\bar{u} = 0.08$, $w \in \{0.1, 0.2, ..., 0.5\}$ and $n \in \left\{\frac{3}{2}, \frac{6}{2}, ..., \frac{21}{2}\right\}$, $\pi^D = 1.25$ and $u^D = 0.80$. Since entries in the payoff matrix result from multiplying the theoretical values by 100, the disagreement payoffs were multiplied by 100 as well to yield 125 for the firm and 80 for the union. We manipulated the probability for the low price, θ, across sessions. This probability was 50% in the “50-50” treatment and 60% in the “60-40” treatment. While this manipulation influences the relative cost of SIA compared with MIA and the equilibrium payoffs, it leaves the equilibrium decisions of both players unchanged.

The timing of decisions is the following. In stage 1, the firm chooses the bargaining agenda (MIA or SIA). In stage 2, the union chooses w whatever the bargaining agenda, and n if the firm has chosen MIA. In stage 3, the firm accepts or rejects the union’s proposal. In case of a rejection, the round is over and the subjects receive their disagreement payoffs. In case of an agreement, the random price is drawn in stage 4, and the firm chooses n in stage 5 if the bargaining agenda is SIA. Then, the players receive their payoffs.

2.3 Predictions

To determine the subgame perfect equilibrium (Selten, 1975) of this game, let us assume that players are risk-neutral and selfish, and that rationality is common knowledge. In the payoff matrix, if the firm chooses the multi-issue bargaining agenda, the union should demand $w = 2$ (in row) and $n = 7$ (in column) and this proposal should be accepted by the firm. Indeed, choosing (w=2, n=7) is payoff maximizing for the union subject to the firm’s participation constraint (i.e. the firm receives an expected payoff which is at least as large as the disagreement payoff of 125).

If the firm chooses the single-issue bargaining agenda, one has to determine, first, the firm’s best reply choices of employment for each possible wage and each realization of the random price. In the payoff matrix in Appendix 1, the best reply function is indicated by the grey cells. Then, if one considers each possible wage level together with the best reply employment levels, one can easily verify that the choice w=4 maximizes the union’s expected payoff subject to the participation constraint that the firm's expected payoff is at least 125. This proposal should be accepted by the firm who should subsequently choose n=1 (n=2) if the random price turns out low (high).

Taking into account the subgame perfect equilibrium in each agenda, we now determine the agenda choice. In the 50-50 treatment, the firm's expected payoffs are 174.50 under MIA and 156 under SIA (the corresponding values for the union are 283 and 201, respectively); in the 60-40 treatment, the firm's expected payoffs are 154.20 under MIA and 144.40 under SIA (the corresponding values for the union are 283 and 195.60, respectively). Therefore, the choice of the multi-issue bargaining agenda with (w=2 and n=7) is the subgame perfect equilibrium of this game. Note that the choice of the efficient bargaining rule is not influenced by the treatment. Indeed, the treatments only vary the profitability of MIA compared to SIA (the expected payoff in SIA represents 89.40% of the expected payoff in MIA in the 50-50 treatment and raises to 93.64% in the 60-40 treatment). Thus, under standard assumptions relying on behavior along the equilibrium path as well as off the equilibrium path, our model predicts the following:

- Firms choose MIA rather than SIA and this choice is unaffected by the treatment.

- Employment n is larger in MIA than in SIA.

- Wage is smaller in MIA than in SIA.

- There are no disagreements in bargaining.

- Therefore, MIA allows for a higher efficiency, as measured either by the level of employment or by the joint payoffs of the union and the firm.

We know however from the huge experimental literature on ultimatum bargaining games that the distribution of payoffs between the two parties is on average less asymmetric than theory predicts and that the probability of a disagreement increases in the relative payoff share demanded by the first mover. Theories of social preferences explain these findings by the players' strong concern for equity (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Therefore in addition to standard game-theoretic predictions we consider predictions based on alternative behavioral concepts.

In our game, we have seen that while MIA reaches the highest efficiency, it gives the firm a lower relative share of the joint profits (38.14% in the 50-50 treatment and 35.27% in the 60-40 treatment) than SIA in equilibrium (43.70% and 42.47%, respectively). Therefore, inequity aversion may motivate firms to choose SIA rather than MIA. As predicted by theories of social preferences, firms may also be willing to reject unequal proposals if judged as unfair, independent of the chosen agenda, although they respect the firm's participation constraint. A strong concern for efficiency as in Charness and Rabin (2002) or Engelmann and Strobel (2004) could however mitigate the impact of inequity aversion on the choice of the agenda.

SIA may also be preferred to MIA because the timing of the resolution of price uncertainty with this agenda is such that the firm can adjust the level of employment after being informed on the actual price. In addition, the strategic uncertainty is reduced with SIA. The parameters of the game have been chosen such that the gains from responding to changing business terms do not offset losses for foregoing MIA, provided that the players are risk-neutral and behave according to the expected utility theory. Risk aversion and loss aversion may however favor the choice of the single-issue bargaining agenda since a deterministic environment will be preferred to a stochastic one. For example, loss aversion has been suspected to influence the choice of contracts in principal-agent games (Keser and Willinger, 2000). In our game, choosing SIA may diminish the risk that firms earn less than their outside option in case of a bad state of nature.

3. EXPERIMENTAL PROCEDURES

The experiment was performed at the experimental laboratory of GATE (Groupe d'Analyse et de Theorie Economique, Lyon, France) using the Regate software (Zeiliger, 2000). Five experimental sessions were organized, each involving 16 volunteer participants. All 80 participants were drawn from the undergraduate population of the local business and engineering schools. No subject participated in more than one session. The 50-50 treatment was implemented in two sessions and the 60-40 treatment in three sessions.

Upon arrival, participants were randomly assigned to a computer. They received instructions (see Appendix 2) that were read aloud by the experimenter. The instructions were phrased in neutral terms; the choices of wage and employment were presented as choices of a row and a column of the game matrix. Questions were answered in private. To check for understanding of the decision rules and payoff matrix, the participants had to fill out a questionnaire and answers were checked individually.

Then, each participant was randomly assigned the role of union ("X-participant") or firm ("Y-participant") and kept the same role during the twelve periods of the game without being informed on the number of periods to be played.[1] In each period, pairs were randomly rematched. To increase the number of independent observations, we used two terminal servers, with each managing a group of eight subjects (four unions, four firms). Subjects were unaware of this partitioning of the group. At the end of each period, the participants were informed about their respective payoff for the current period and a feedback table displayed their choices and payoffs in all previous periods.

On average, a session lasted 45 minutes, excluding the time needed to answer a post-experimental questionnaire and the payment of participants. All transactions were conducted in points and were converted at the end of the session into Euros at 300 points = € 1. At the beginning of the session, each participant received an initial endowment of 1000 points, corresponding to a show-up fee, available for covering possible – though unlikely – losses. Each period the participant's account increased (or decreased in case of a loss) by the payoff obtained in that period. At the end of the session each participant was privately paid in cash in a separate room. On average, participants earned € 12.

4. EXPERIMENTAL RESULTS

4.1. Summary statistics

Table 1 provides descriptive statistics by different experimental treatments.

[1] In fact, each session consisted of 15 periods. At the end of the first part of 12 periods, we informed subjects that a second part would follow and we distributed new instructions. In the sessions where the 50-50 (60-40) treatment was played in the first part, the 60-40 (50-50) treatment was implemented in the second part. The data from the second part were collected for explorative reasons and the analysis will be based only on between-subject comparisons; i.e., the data of periods 1 to 12.

Table 1. Summary statistics by treatment

Treatment	*50-50*		*60-40*		*Total*	
Bargaining agenda						
Multi-Issue Agenda (MIA)	58	30.21%	86	29.86%	144	30.00%
Single-Issue Agenda (SIA)	134	69.79%	202	70.14%	336	70.00%
	192	100%	288	100%	480	100%
Average wage demand						
MIA	2.14 (0.40)		2.27 (0.52)		2.22 (0.48)	
SIA	2.64 (0.90)		2.49 (0.88)		2.55 (0.89)	
Average employment demand (MIA)	4.43 (1.51)		3.87 (1.31)		4.10 (1.42)	
Frequency of agreement						
MIA	46/58	79.31%	66/86	76.74%	112/144	77.78%
SIA	117/134	87.31%	168/202	83.17%	285/336	84.82%
Average actual wage						
MIA	2.09 (0.35)		2.18 (0.43)		2.14 (0.40)	
SIA	2.46 (0.79)		2.23 (0.66)		2.33 (0.72)	
Average actual employment						
MIA	4.28 (1.46)		3.70 (1.29)		3.94 (1.38)	
SIA	2.40 (1.25)		2.77 (1.44)		2.62 (1.37)	
Average firm payoffs						
MIA	175.64 (89.48)		171.79 (76.90)		173.34 (81.92)	
SIA	178.09 (73.45)		180.84 (75.22)		179.74 (74.42)	
Average joint payoffs						
MIA	411.59 (90.57)		398.77 (85.98)		404.04 (87.72)	
SIA	368.97 (94.75)		376.42 (96.74)		373.36 (95.83)	
Average firms' share						
MIA	43.40 (14.68)		44.68 (11.66)		44.16 (12.94)	
SIA	48.60 (7.51)		49.26 (8.15)		48.99 (7.89)	

Note: Standard deviations in parentheses. The table displays average joint payoffs and firms' share only in case of an agreement. Average firm payoffs include all situations. Remember that the subgame perfect equilibrium is to choose MIA and to offer a wage of 2 and an employment level of 7; in SIA, the best reply values are a wage of 4 and an employment level of 1 or 2.

Table 1 indicates that although the subgame perfect equilibrium predicts the choice of the multi-issue bargaining in both treatments, a large majority of firms restrain the bargaining agenda: MIA is only chosen 30.21% of the time in the 50-50 treatment and 29.86% of the time in the 60-40 treatment. The agreement rates range between 76.74% in MIA in the 60-40 treatment and 87.31% in SIA in the 50-50 treatment. In SIA, we find that the average wage is 2.14 and the average employment is 3.94 in MIA and the corresponding values are

2.33 and 2.62 in SIA. Table A in Appendix 3 displays the detailed distribution of wages and employment levels. As a consequence, the average joint payoffs conditional on an agreement are 411.59 in MIA and 368.97 in SIA in the 50-50 treatment and 398.77 and 376.42, respectively in the 60-40 treatment. The predicted values under standard assumptions were 457.50 and 357 in the 50-50 treatment and 437.20 and 340 in the 60-40 treatment. Table 1 also shows that the average firm's relative share is higher in SIA (48.99%) than in MIA (44.16%) and this holds in both treatments.

Table 2 describes the unions' proposals and displays the details of the agreement rate for each level of wage demand (SIA and MIA) and employment demand (MIA).

Table 2. Distribution of union demands and agreement rates

SIA			
Wage Demand	# agreements/ # demands	Relative frequency of demands	% agreements
1	14/14	4.17%	100.00
2	189/191	56.84%	98.95
3	61/74	22.02%	82.43
4	*17/47*	*13.99%*	*36.17*
5	4/10	2.98%	40.00
Sum	285/336	100%	84.82

MIA										
	# agreements/ # demands by employment demand							# agreements/ # demands	Relative frequency of demands	% agreements
Wage Demand	1	2	3	4	5	6	*7*			
1	-	-	-	-	-	-	1/ 1	1/1	0.69%	100.00
2	2/2	-	36/36	25/32	14/18	14/17	*4/9*	95/114	79.17%	83.33
3	1/1	7/9	6/9	0/4	1/3	-	-	15/26	18.06%	57.69
4	-	-	-	1/2	0/1	-	-	1/3	2.08%	33.33
5	-	-	-	-	-	-	-	-	-	-
Sum	3/3	7/9	42/45	26/38	15/22	14/17	5/10	112/144	100%	77.78
% agreements	100	77.78	93.33	68.42	68.18	82.35	50.00	77.78		

Note: The equilibrium values are in italics.

Table 2 indicates that in SIA, the unions' demands of w=4 represent only 13.99% of the observations; the mode and the median of demands are w=2. Firms accept only 36.17% of the equilibrium wage demands. In MIA, only 6.25% of the observations correspond to the predicted wage-employment combination (*w*=2, *n*=7) and they are rejected half of the time. The mode and the median of wage demand are *w*=2 and they correspond to the equilibrium (this demand is accepted in 79.17% of the cases). In contrast, the mode (=3) and the median (=4) of the employment demand are considerably lower than predicted (*n*=7).

These descriptive statistics indicate that the actual behavior of both firms and unions deviate strongly from the predictions based on standard assumptions. The next subsection aims at analyzing the reasons for these deviations.

4.2 Data analysis

<u>The bargaining agenda</u>

The choice of SIA is considerably more frequent than predicted. We first test whether this could be explained by errors. “Rationality plus noise” (if one assumes naturally that noise is an unbiased error) predicts a frequency of SIA equal to or below 50%. We test this hypothesis versus the alternative that the frequency of SIA is larger than 50%. According to binomial tests based on first period data, in which all observations are independent, we can reject the null-hypothesis in favor of the alternative for both treatments (*p*=0.038, N=16 for 50-50 treatment and *p*=0.011, N=24 for 60-40 treatment for one-tailed, exact tests). A *t*-test on the 10 independent observations for periods 1 to 12 indicates that the mean proportion of

SIA is also significantly higher than 50% (p<0.001, N=10).[2] Therefore, we conclude that firms have a preference for SIA.

This choice is stable over time. Indeed, we have estimated a Probit model of the choice of SIA with robust standard errors and clustering at the group level to correct for a potential lack of independence of observations (not reported here but they are available upon request; N=480). The independent variables include the treatment, a time trend, and demographic variables for the firms, specifically gender and being a student at the business school. None of the coefficients are significant. The non-significance of the gender variable (p=0.870) is interesting since gender is considered to be a strong predictor of risk attitude (Eckel and Grossman (2008); Croson and Gneezy (2009) for recent surveys). We take this as indirect evidence that risk attitude does not drive the choice of SIA. We investigate successively the efficiency of contracts, the frequency of agreements, and the distribution of payoffs.

Efficiency

First, we compare actual and predicted efficiency. To do this, we have performed several tests comparing average joint payoffs obtained in the first period and in periods 1 to 12 under each bargaining agenda and in each treatment. All of them conclude that in MIA, the joint payoffs are significantly lower than predicted. Indeed, when all the proposals are considered, for period 1 the one-sided p-value is 0.076 (N=6), and for periods 1 to 12 the p-value is <0.001 for the 60-40 treatment (=0.002 when we only include the accepted contracts). In contrast, for SIA, the actual level of efficiency does not deviate significantly

[2] Each session provides two independent observations since we used two computer servers that allowed us to form two separate groups of firms and unions. We have six independent observations in the 60-40 treatment but only four in the 50-50 treatment. Therefore, we did not conduct tests on the sole 50-50 treatment. Most of the tests conducted on periods 1 to 12 are based on these 10 independent observations.

from the prediction when all proposals are taken into account (*p*>0.10, one-sided), whereas they are significantly higher than predicted if one only includes accepted contracts in the 60-40 treatment (*p*<0.001, N=6). The efficiency of MIA is less than expected because unions ask for lower employment levels than predicted, possibly due to the fear of rejection. *T*-tests indicate that the employment demand is significantly lower than 7 (period 1: *p*<0.001, N=10; periods 1 to 12: *p*<0.001, N=10, with all groups claiming for less than 7 on average). They also ask for higher wages than the predicted *w*=2 (period 1: *p*=0.026, N=10; periods 1 to 12: *p*=0.004, N=10, with 8 groups out of 10 asking for more than 2 on average). Furthermore, unions ask for lower wages than the predicted *w*=4 in SIA, possibly also due to the fear of rejection (period 1: *p*<0.001, N=30; periods 1 to 12: *p*<0.001, N=10, with all groups demanding less than 4 on average).

Next, we study whether the deviation between the theoretical predictions and the actual choice of the bargaining agenda could be driven by a lower efficiency of MIA than SIA in actual plays. The tests based on period 1 data accept the hypothesis of no difference in joint payoffs between bargaining agendas (*p*=0.581, N=40 if all proposals are considered; *p*=0.196, N=35 if we restrain the sample to accepted contracts, Mann-Whitney). T-tests on periods 1 to 12 reach the same conclusion if all interactions are included (*p*=0.673, N=10), but conclude to a significant higher efficiency of MIA than SIA if one only considers accepted contracts (*p*=0.001, N=10 for pooled treatments; *p*=0.007, N=6 for the 60-40 treatment). Similarly, a Mann-Whitney test conducted on pooled data in period 1 indicates that the actual average levels of employment significantly differ in MIA and SIA (*p*=0.066, N=35). A binomial test on periods 1 to 12 shows that the average employment is significantly higher under MIA than SIA (p=0.010, N=10, one-sided). The same tests state that the average wage levels are similar in MIA and SIA (p=0.849, p=0.623, resp.). A Kolmogorov-Smirnov test rejects the equality of distribution function of employment in MIA and SIA (p=0.041, N=35, exact) but accepts equality for the wage level (p=1.0).

We also provide a regression analysis in which we analyze the determinants of joint payoffs, employment, and wages in accepted contracts. Since subjects make repeated decisions, we estimate GLS models with robust standard errors and clustering at the group level. The independent variables include the treatment, a time trend, the bargaining agenda and demographic variables (gender and being a student in business). In the regression of joint payoffs, we include a dummy for the state of nature. In the regression of actual employment, we include the union's wage demand. Table 3 displays the regression results.

Table 3. Determinants of joint payoffs, actual employment and wages in accepted contracts

Dependent variables	Joint payoffs	Actual employment	Actual wage
60-40 Treatment	1.252 (4.148)	-0.117 (0.221)	-0.098 (0.087)
Period	0.638*** (0.230)	0.008 (0.016)	-0.024*** (0.008)
SIA	-25.233*** (6.203)	-1.169*** (0.254)	1.190* (0.109)
Wage demand	-	-1.269*** (0.130)	-
State of nature	180.256*** (3.394)	-	-
Demographic variables	*Yes*	*Yes*	*Yes*
Constant	323.643 *** (7.857)	6.803 *** (0.370)	2.220 *** (0.118)
Number of observations	397	397	397
Wald χ^2	4058.42	276.84	64.53
$p>\chi^2$	0.000	0.000	0.000
R^2	0.914	0.4461	0.091
ρ	0.057	0.076	0.017

Note: GLS models with robust standard errors (in parentheses) and clustering at the group level. *** *significant at the 0.01 level, ** at the 0.05 level, and * at the 0.1 level.*

Table 3 shows that when contracts are accepted, SIA has a large significant negative impact on joint payoffs and on employment and a marginally positive impact on wages. This is in accordance with the theory and therefore the majority choice of SIA cannot be explained by a higher efficiency of SIA compared with MIA. The treatment exerts no significant influence although joint payoff should be lower in the 60-40 treatment. The results are qualitatively unaffected if we omit the state of nature from this regression. Joint payoffs increase over time. The demographic variables are almost never significant, except that females and students in business ask for higher wages (p=0.046 and p=0.098, resp.).

The acceptance decisions

In this sub-section, we test whether SIA is preferred to MIA due to a higher agreement rate, and therefore a lower risk of getting only the conflict payoff. A Mann-Whitney test on period 1 data indicates that the average proportion of accepted proposals in MIA does not differ from SIA (p=0.414, N=40, exact, one-tailed); in contrast a one-sided t-test on periods 1 to 12 concludes to a significant higher average rate of agreement in SIA than in MIA (p=0.023, N=10). We have estimated a Probit model on pooled data with robust standard errors and clustering at the group level in which the dependent variable is the acceptance of a proposal. In addition to the independent variables of the previous regressions, we include both the expected absolute payoff and relative share of joint payoffs offered to the firm by the union.[3] Table 4 displays the results of the regressions and the marginal effects.

Table 4. Determinants of the acceptance decision

Dependent variable: Acceptance of the union's proposal	Coefficients (robust standard errors)	Marginal effects
60-40 treatment	0.035 (0.185)	0.005
Period	-0.036 (0.026)	-0.005*
SIA	0.021 (0.188)	0.003
Firm's expected payoff	0.030*** (0.006)	0.004***
Firm's expected share	6.799* (3.762)	0.971**

[3] In SIA the "expected" absolute payoffs and relative shares have been computed on the basis of the union's wage offer and assuming a sequentially rational employment decision by the firm. Indeed, employment was chosen sequentially rationally in the large majority of cases (in 84% of the accepted contracts).

Demographic variables	*Yes*	*Yes*
Constant	-7.390 *** (1.163)	-
Number of observations	474	
Wald χ^2	330.23	
$p>\chi^2$	0.000	
Pseudo R^2	0.345	
Log likelihood	-139.947	

*Note: Probit model with robust standard errors and clustering at the group level. *** significant at the 0.01 level, ** at the 0.05 level, and * at the 0.1 level. The six contracts that did not respect the firm's participation constraint have been excluded from the regression.*

Table 4 shows that neither the bargaining agenda nor the treatment determines directly the probability of an agreement once one controls for absolute and relative payoffs. In conformity with the standard results of bargaining experiments, the higher the expected absolute payoff and the higher the expected firm's relative share, the more likely is an agreement. This is all the more important as theory predicts that the firm's relative payoffs are lower in MIA than in SIA. The concern of players for both absolute and relative payoffs is further analyzed below.

Absolute and relative payoffs

We now examine more directly whether firms' absolute and relative payoffs influence their preference for SIA. First, we have estimated a random-effects GLS model with robust standard errors and clustering at the group level in which the dependent variable is the firm's expected absolute payoff offered by the union (not reported here, but available upon request). To compute this "expected" value, we have assumed that in SIA the firms make a sequential rational decision in response to the union's wage offer as in Table 4. The independent variables are the bargaining agenda, the treatment, and demographic variables. We find that, compared with MIA, SIA increases significantly the expected absolute payoffs by 10.05 points (p=0.058, N=480), whereas not surprisingly the 60-40 treatment decreases it significantly by 13.95 points (p=0.012).

Second, regarding relative payoffs, Figure 1 displays the distribution of the expected relative shares in joint payoffs offered by the unions conditional on the bargaining agenda, with pooled data from both treatments.

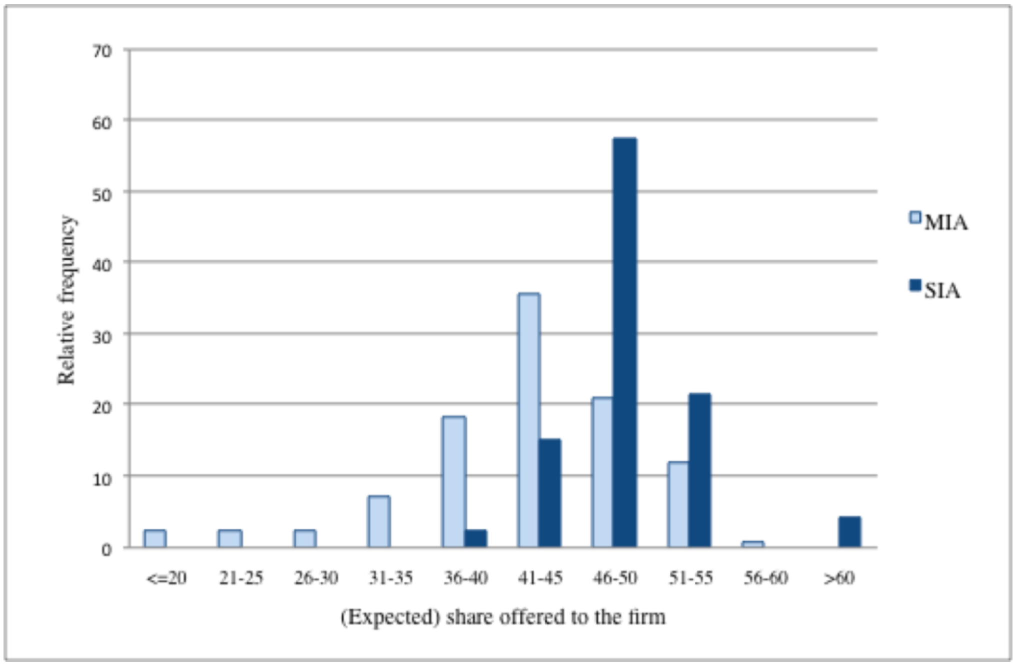

Fig.1. Distribution of average firms' expected relative shares of joint payoffs proposed by unions by bargaining agenda

Figure 1 reveals that the distribution of average firms' expected relative shares offered by the unions differs according to the bargaining agenda. In MIA the mode of offers lies in the category 41-45% of the joint payoffs whereas in SIA it lies in the category 46-50%. Mann-Whitney tests based on the first period data indicate that the unions offer significantly higher relative shares in SIA than in MIA (p=0.006, N=40, exact, one-tailed) and that there is no significant difference between the two treatments (p=0.160, N=40, exact, one-sided). T-tests deliver the same conclusion for periods 1 to 12 (p<0.001 for pooled data, N=10; p=0.002 if one considers the 60-40 treatment only, N=6). T-tests also show that the expected relative shares offered are less asymmetric than predicted by the theory in the 60-

40 treatment both in MIA (*p*=0.001, N=6) and in SIA (*p*<0.001, N=6). Thus, unions make more "generous" offers than predicted. While this is standard in ultimatum bargaining games and might be due to fear of rejection or because players are inequality averse, the usual findings in ultimatum games do not imply a difference between MIA and SIA.

Last, to test the respective influence of a concern for absolute and relative payoffs on the determination of the bargaining agenda, we consider specifically behavior in period 12, i.e. after subjects have gained experience under both MIA and SIA. Precisely, we run a Probit regression analysis with robust standard errors and clustering at the group level that estimates the probability for a firm to choose SIA in period 12. The independent variables include the absolute cost and the relative cost of MIA, in addition to a control for the treatment and the usual demographic variables. The absolute cost of MIA is computed as the difference in expected firm's payoffs between SIA and MIA based on average payoffs actually earned in periods 1 to 11 under each bargaining agenda. Specifically, we determined the average payoff per period under each agenda for each realization of the random price during periods 1 to 11 for each firm. Then we computed the expected absolute cost of MIA in period 12 as (average payoff SIA minus average payoff MIA) accounting for the different probabilities for low (high) price depending on the treatment. Similarly, the relative cost of MIA is based on the firm's average relative payoff share under each agenda and for each realization of the random price in periods 1 to 11. The regression is based only on the data of 34 firms since not all subjects experienced both bargaining agendas. Table 5 displays the results of this regression.

Table 5. Determinants of the agenda in period 12

Dependent variable: Choice of the agenda in period 12	Coefficients (robust standard errors)	Marginal effects
60-40 Treatment	-1.445 (1.074)	-0.246**
Absolute cost of MIA	0.016 ***(0.006)	0.003*
Relative cost of MIA	0.063** (0.031)	0.013**
Demographic variables	*Yes*	*Yes*
Constant	2.049* (1.061)	-
Number of observations	34	
Wald χ^2	13.69	
$p>\chi^2$	0.018	
Pseudo R^2	0.330	
Log likelihood	-13.801	

*Note: Probit model with robust standard errors and clustering at the group level. *** significant at the 0.01 level, ** at the 0.05 level, and * at the 0.1 level.*

The estimated influence of both cost terms is significant and positive. This confirms that the more costly MIA becomes in terms of foregone profit compared with SIA, the more likely firms decide for SIA, which is quite rational. Interestingly, this is true also in relative terms, which confirms that firms take also into account their relative share in joint payoffs when choosing the bargaining agenda, controlling for their absolute payoffs. In addition, being in a more hostile environment (the 60-40 treatment) exerts a significant marginal effect on the likelihood of choosing SIA in the last period. This regression also confirms that demographic variables exert no influence on the choice of the bargaining agenda.

5. DISCUSSION AND CONCLUSION

To investigate the role of social preferences and efficiency concerns in labor negotiations, we have experimentally tested a non-cooperative game in which firms are allowed to choose the bargaining agenda and that reproduces the efficiency gains associated with a multi-issue bargaining agenda (MIA) compared with a single-issue agenda (SIA). Our results are striking: although our model predicts that firms should prefer the multi-issue bargaining agenda, 70% of the firms choose the single-issue agenda. As predicted by our model, employment and thus efficiency are larger under MIA than under SIA. Indeed, with multi-issue bargaining unions accept to lower wages in order to increase the employment level in comparison with single-issue bargaining. In the experiment however, the efficiency gains and the level of employment under MIA are significantly lower than theory predicts. The unions claim for lower employment and higher wage in MIA and lower wage in SIA than predicted, probably because, like in ultimatum bargaining experiments, they fear a rejection of their proposal. If firms deviate from the subgame perfect equilibrium, it is because MIA is actually less attractive relative to SIA than predicted. The bargaining agenda does not determine directly the probability of an agreement, but the higher the expected absolute payoff and the higher the expected firm's relative share, the more likely is an agreement. We find that, compared with MIA, SIA increases significantly both the firms' absolute payoffs and relative share of joint payoffs. Indeed, the unions make less selfish claims than predicted and firms do care about their relative payoffs.

These results can be partly explained by the importance of social preferences and a concern for relative and not only absolute payoffs. This is consistent with models of inequality aversion such as Fehr and Schmidt (1999). Our findings also reveal a lack of concern for efficiency since joint payoffs are higher under MIA than SIA, as predicted; this is not in line with the model of social preferences proposed by Charness and Rabin (2002). Of course, if firms are strongly risk averse they might prefer SIA as well. We did not elicit our subjects' risk attitude but yet, we find that decisions are not affected by the subjects' gender that is a correlate of risk attitude. We acknowledge that a definitive conclusion on this issue would need further exploration but this can be taken as a preliminary indication that risk aversion is not a major driver of the choice of SIA. In sum, although one must be cautious before extrapolating experimental results to real work setting, our findings give clear indication that both rational and behavioral considerations drive the choice of the bargaining agenda and the determination of employment levels.

This concern of firms for absolute and relative payoffs does not exclude other potential behavioral explanations of the preference for single-issue bargaining. In particular, we speculate that the preference for a single-issue bargaining agenda may be associated with a preference for a larger freedom of choice. If, *ceteris paribus*, some people value having a larger choice space rather than a smaller one, they should naturally choose more frequently the single-issue bargaining. This idea can be related to reactance theory in social psychology according to which individuals attach positive value to the freedom of choice and strive to maintain this freedom (Brehm, 1966; Curhan *et al*., 2006). In economics, the intrinsic value of the freedom of choice has notably been explored by Sen (1988) and Puppe (1996), and more recently in experiments by Falk and Kosfeld (2006). Therefore, a natural extension of our work would be to identify how the value of freedom of choice interacts with concerns for relative payoffs when they are not aligned. Another direction would be to allow the players to bargain over the bargaining agenda itself before negotiating on wage only or wage and employment. It would allow us to see notably how it affects the way unions take into account the trade-off between several goals in negotiations. Another interesting extension of our paper would be to study to which extent union claims are affected by an endogenous bargaining agenda in comparison with an exogenous agenda.

Appendix 1. Payoff matrix according to employment and wage levels

w \ n	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	143 256 127	165 304 134	175 332 141	180 351 148	181 364 154	180 374 161	178 381 168
2	128 241 143	135 274 166	130 287 190	120 291 213	106 289 236	91 284 259	73 276 283
3	113 226 159	105 244 198	85 242 236	60 231 275	31 214 314	1 194 353	- 32 171 391
4	98 211 174	75 214 228	40 197 281	0 171 335	- 44 139 389	- 89 104 443	- 137 66 496
5	83 196 188	45 184 257	- 5 152 325	- 60 111 394	- 119 64 462	- 179 14 530	- 242 - 39 599

Each cell shows three payoffs: the firm's payoff if the price is low ($\pi_l = p_l n^{\alpha} - wn$, top entry) or high ($\pi_h = p_h n^{\alpha} - wn$, middle entry), and the union's payoff (bottom entry).

The dark frame indicates the subgame perfect equilibrium given SIA according to the business climate. The light grey cells and frame indicate the subgame perfect equilibrium given MIA.

This table was distributed to the participants during the experiment of course without any indication about the subgame perfect equilibria. No cell had a particular distinctive appearance.

Appendix 2

Instructions for the 50-50 Treatment
(the instructions for treatment 60-40 are available upon request)

You are now taking part in an economic experiment. Depending on your decisions during the experiment and the decisions of other participants, you can earn money. During the experiment, your entire earnings will be calculated in points and booked onto an account. At the beginning, your account shows 1000 points, which you receive as initial payment. At the end of the experiment, the total amount of points shown in your account will be converted to Euros at the following rate:

300 points = € 1

The experiment is divided into several periods. In each period, you can loose or win points. But note that losses can be avoided surely by your decisions and that possible losses in some periods should be offset by your wins in other periods. If after the final period your account shows a negative amount (this is extremely unlikely), your cash earnings will be zero. At the end of the session, your earnings in points will be converted into Euros and will be paid to you in cash in a separate room, in order to preserve the anonymity of your earnings.

It is prohibited to communicate with the other participants during the experiment. Should you have any questions regarding the instructions, please raise your arm. An experimenter will answer your questions privately. If you violate this rule, we shall have to exclude you immediately from the experiment and from payments.

The group of participants will be subdivided into two categories of roles: X participants and Y participants. At the beginning of the experiment, you will discover on your computer screen which role you will play. Each participant keeps his/her role throughout the entire experiment.

In each period, all participants will be randomly matched in pairs (one X participant is matched with one Y participant) and take decision in their respective role. Interaction is anonymous. No participant will be informed about the name of the participants he/she interacted with.

First period

In this experiment, decisions are taken in considering the payoff table which has been distributed. This table shows rows 1 to 5 and columns 1 to 7. Each combination of a row and a column determines a cell. In each cell, you see three numbers which are shaded blue, yellow or white corresponding to different payoffs (in points) as explained below. Decisions are made as follows.

<table>
<tr><td colspan="2">STEP 1
Y participant chooses one of two decision rules: rule A or rule B.</td></tr>
<tr><td>RULE A
STEP 2
❑ X participant is informed about the chosen rule.
❑ X chooses one cell, i.e. one of the five rows and one of the seven columns.

STEP 3
❑ Y participant is informed about the chosen row and column.
❑ Y decides on whether to ”accept” or ”reject”.

• In case of ”accept”

✓ A chance move occurs which determines one of two possible outcomes: blue or yellow. The probability for blue is 50%, the probability for yellow is 50%. You may think of these probabilities, for example, as if one takes a single ball out of a basket with 5 blue balls and 5 yellow balls.

✓ Payoffs are determined by the chosen cell and the result of the chance move. The blue shaded number in the cell is the payoff of Y if the chance move turned out blue. The yellow shaded number is the payoff of Y if the chance move turned out yellow. The white shaded number is the payoff of X. X participant is informed about the decision of Y; X and Y participants are informed about the chance move.

• In case of ”reject”
X participant is informed about Y’s rejection. Payoffs are 80 points for X and 125 points for Y, for this period.</td>
<td>RULE B
STEP 2
❑ Participant X is informed about the chosen rule.
❑ X chooses one row among 5.

STEP 3
❑ Y participant is informed about the chosen row.
❑ Y decides on whether to ”accept” or ”reject”.

• In case of ”accept”

✓ A chance move occurs which determines one of two possible outcomes: blue or yellow. The probability for blue is 50%, the probability for yellow is 50%.

✓ Y Participant is informed about the chance move.

✓ Y chooses one column among 7. The chosen row (by X) and column (by Y) together determine the chosen cell.

✓ Payoffs are determined by the chosen cell and the result of the chance move. The blue shaded number in the cell is the payoff of Y if the chance move turned out blue. The yellow shaded number is the payoff of Y if the chance move turned out yellow. The white shaded number is the payoff of X. X participant is informed about the chosen column and the chance move.

• In case of ”reject”
X participant is informed about Y’s rejection. Payoffs are 80 points for X and 125 points for Y, for this period.</td></tr>
<tr><td colspan="2">STEP 4
End of the period. You are informed on your screen about the earnings of X and Y in this period.</td></tr>
</table>

Next periods

It is like the preceding period, except that you are randomly matched with a different participant.

Payoff table *[this is the payoff matrix presented in Appendix 1]*

The **blue shaded numbers** are the payoffs of **Y participant** if the chance move turned out **blue**.
The **yellow shaded numbers** are the payoffs of **Y participant** if the chance move turned out **yellow**.
The **white shaded numbers** are the payoffs of **X participant**.

New Periods [*these instructions, in use for periods 13 to 15 and corresponding to the 60-40 Treatment, were distributed only at the end of the first part of the experiment*]

The rules of the experiment are the same as in the previous periods, but the probability for blue is now 60%, the probability for yellow is now 40%. You may think of these probabilities, for example, as if one takes a single ball out of a basket with 6 blue balls and 4 yellow balls.

Appendix 3.

Table A. Actual wage and employment levels by bargaining agenda in accepted contracts

SIA Wage	Employment 1	2	3	4	5	6	7	Average employment
1	-	-	-	-	7	3	4	5.79 (0.89)
2	-	101	13	66	7	1	1	2.93 (1.08)
3	37	24	-	-	-	-	-	1.39 (0.49)
4	11	6	-	-	-	-	-	1.35 (0.49)
5	4	-	-	-	-	-	-	1.00 (0)
# observations								
Average wage	3.37 (0.63)	2.27 (0.54)	2.00 (0)	2.00 (0)	1.50 (0.52)	1.25 (0.50)	1.20 (0.45)	

MIA Wage	Employment 1	2	3	4	5	6	7	Average employment
1	-	-	-	-	-	-	1	7.00 (0)
2	2	-	36	25	14	14	4	4.13 (1.30)
3	1	7	6	-	1	-	-	2.53 (0.92)
4	-	-	-	1	-	-	-	4.00 (0)
5	-	-	-	-	-	-	-	-
# observations	3	7	42	26	15	14	5	
Average wage	2.33 (0.58)	3.00 (0)	2.14 (0.35)	2.08 (0.39)	2.07 (0.26)	2.00 (0)	1.80 (0.45)	

Note: Standard deviations in parentheses.

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