Can Gender Stereotypes Mitigate Gender Differences? An Experiment on Bargaining with Asymmetric Information *

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Abstract

We conduct an experiment on gender differences in bargaining environments with asymmetric information. Based on the bargaining model in Abreu and Gul (2000), we induce asymmetric information about subjects' commitments to their bargaining positions. This allows subjects to adopt a strategic posture, where they mimic "committed types" to provoke a concession from their partner, generating a conflict that can lead to inefficiencies and unequal outcomes. We find that bargaining behavior in this environment depends crucially on whether genders are revealed or not. The difference across our conditions can be attributed to a strategic gender effect that arises because strategic posturing depends on signaling a credible commitment to one's bargaining position, and women can exploit gender-stereotypes that provide them with greater signaling power than men.

Keywords: Bargaining, gender, asymmetric information, strategic posture, stereotype.

JEL-Codes: J16, C78, D82.

1 Introduction

Bargaining behavior affects the economic outcomes people achieve in a wide variety of wage and price negotiations. While most people encounter bilateral bargaining problems infrequently, the outcomes can have significant long-term implications. For instance, it has been posited that differences in the bargaining behavior of men and women could be an important factor in explaining a persistent gender wage gap (see, e.g., Card et al., 2016). Similarly, gender

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differences in bargaining behavior can affect *inter alia* the surplus that men and women acquire through intra-marital family planning, divorce settlements, house or car price negotiations, and legal plea-bargains.

As a result, there is significant interest in understanding gender differences in bargaining behavior. This is challenging, however, because bargaining outcomes (e.g., wages) can depend on many factors (e.g., productivity, sorting or discrimination) that are not directly related to bargaining behavior. Laboratory experiments provide a setting where bargaining behavior can be isolated from such confounds (see, e.g., Azmat and Petrongolo, 2014). Accordingly, an experimental literature has studied gender differences in a variety of stylized bargaining problems, including dictator (Eckel and Grossman, 1998; Andreoni and Vesterlund, 2001), ultimatum (Eckel and Grossman, 2001; Solnick, 2001), and alternate-offer (Dittrich et al., 2014) games. However, this prior literature has focused on environments with complete information. Outside of the laboratory, on the other hand, asymmetric information is a common feature of bargaining problems. A large theoretical literature has shown that information asymmetries can affect bargaining outcomes, because they generate bargaining strategies that are not available (or sub-optimal) in complete information environments (see, e.g., Ausubel et al., 2002). Moreover, it is in asymmetric information environments—where parties are uncertain about their opponent's type—that one might expect gender-stereotyping and statistical discrimination to have the greatest impact on bargaining behavior and outcomes (Fang and Moro, 2011).

In this paper, we study gender differences in *strategic posturing*, a bargaining strategy that is especially relevant in asymmetric information environments. To illustrate, consider two parties, Ann and Bob, bargaining about the division of a pie. In a symmetric, complete information environment, it seems natural for Ann and Bob to propose (and accept) an equal division of the pie, because following this 50:50 norm leads to a fair and efficient allocation. But what should Bob do if, instead, Ann initially demands a disproportionate share of the pie for herself? If Ann is truly committed to her demand—and is either unable or unwilling to deviate—then Bob should concede in order to avoid costly bargaining delays. If, on the other hand, Ann is as concerned about bargaining delays as Bob, then there is no reason why Bob should be the one to concede. The problem for Bob is that he may not be able to distinguish whether Ann is truly committed or not, especially because Ann has every reason to convince Bob of her commitment. In a bargaining environment with such information asymmetries, Abreu and Gul (2000) show that strategic posturing is an equilibrium strategy: uncommitted agents mimic the behavior of committed types, generating conflicts that can lead to significant bargaining delays and a highly unequal division of the surplus.

While the prior literature has identified various differences in the bargaining behavior of men and women, not much is known about their propensity for strategic posturing. Gender differences on this dimension are important, however, because effectively exploiting asymmetric information can have far reaching implications: if Ann and Bob differ in their posturing behavior, this can have significant consequences for the resources they acquire, and the inefficiencies they generate, in a wide-range of bargaining problems. In addition, there are several reasons to believe *a priori* that there may be systematic gender differences.

On the one hand, previous research suggests women may be less inclined to strategic posturing than men. First, while men often behave more in their own self-interests, women tend to be more other-regarding (Eckel and Grossman, 1998), a gender difference that may impact their willingness to adopt a strategic postures where they demand favorable terms for themselves. Second, women are less likely than men to deceive for financial gain (Dreber and Johannesson, 2008), and since strategic posturing depends on feigning commitment to a favorable bargaining outcome, women may be less inclined towards this deceptive behavior. Third, there is evidence that women are less competitive than men (Niederle and Vesterlund, 2007), and may thus be more reluctant to engage in strategic behavior that results in a drawn out competitive bargaining process.

On the other hand, the common perception (or stereotype) that women pursue their self-interests less aggressively than men may actually provide favorable conditions for women to succeed with strategic postures. To illustrate, suppose that Charlie believes that men are generally selfish, likely to deceive for financial gain, and willing to engage in competitive interactions. In a bilateral bargaining problem, Charlie therefore anticipates that Bob will initially demand a disproportionate share of the pie; not because Bob is truly committed to receiving favorable terms, but simply because men are generally aggressive in pursuing their self-interests. As a result, a strategic posture does not provide a credible signal of Bob's commitment. By contrast, if Charlie believes that women are generally other-regarding, honest, and averse to competition, he must infer that Ann is truly committed to her bargaining position when—counter to his prior expectations—Ann demands a disproportionate share of the pie for herself. A strategic posture therefore sends a more credible signal of Ann's commitment to her bargaining position, and is more likely to provoke a concession from Charlie.

Given these countervailing forces, we conduct an experiment to investigate gender differences in strategic posturing. Our basic design is based on Embrey et al. (2015)'s implementation of the bargaining with reputation model in Abreu and Gul (2000). The underlying bilateral bargaining game has two stages. In the first stage, bargaining parties simultaneously announce what share of a pie they demand for themselves. If the demanded shares are compatible (i.e., do not exceed the total), then the pie is divided accordingly and the bilateral interaction ends. If demands are incompatible, the subjects enter a second stage continuous-time concession game, where they continually decide whether to remain committed to their initial bargaining position or concede to the demand of their counterpart.

An important aspect of the design is the presence of "committed types", who are coded to demand a disproportionate share of the pie in the first stage and never concede in the second stage. Subjects know the likelihood of encountering one of these committed types, but do not not know whether their partner is committed or not. Hence, the coded types introduce asymmetric information about each party's commitment. Such uncertainty arises in many situations outside of the laboratory since there are several reasons why bargaining parties may be committed to a pre-specified outcome. First, it could be the case that Ann is committed because she has been delegated to bargaining on someone else's behalf, and has a contractual or fiduciary obligation to pursue a pre-specified outcome (see, e.g., Fershtman and Kalai, 1997; Schotter et al., 2000; Fershtman and Gneezy, 2001). Secondly, financial or institutional constraints could mean that, even if she wanted to, Ann is unable to deviate from a pre-specified outcome. For instance, there is evidence from the housing market that liquidity constraints force sellers to set higher ask prices and remain in the market significantly longer (Genesove and Mayer, 1997). Finally, as first proposed by Myerson (1991), Ann could be boundedly rational, follows a simple rule-of-thumb, or adheres to some bargaining convention, which makes her able but unwilling to concede. Importantly, strategic posturing is a rational bargaining strategy for uncommitted agents even when there is only a small chance that a bargaining party is committed. Inducing committed types in a laboratory provides a way to replicate such uncertainty in a controlled environment, and study how asymmetric information impacts bargaining behavior and outcomes.

In line with the theoretical predictions in Abreu and Gul (2000), Embrey et al. (2015) find that a significant number of subjects *do* adopt strategic postures when some subjects are coded as committed types. Since we are interested in the extent to which men and women differ in their propensity for strategic posturing, we build on their design by introducing two alternative conditions. In our control condition, the gender of both bargaining partners is unknown; in our treatment condition, genders are revealed. Similar to Bordalo et al. (2016), we reveal gender in the treatment by providing subjects with a brief opportunity to hear their bargaining partner's voice before each round of play. This approach allows subjects to ascertain their partner's gender while providing limited additional information about the bargaining parties.

Randomly assigning subjects to the control and treatment conditions allows us to disentangle "intrinsic" gender differences from a strategic gender effect. Since the gender of bargaining parties is not known in the control, gender differences in this condition can mainly be attributed to differences in intrinsic personal characteristics (e.g., selfishness, deception, or competitiveness), social norms, or other environmental factors that differ across genders. In the treatment, however, such intrinsic differences are conflated with strategic considerations that arise when the gender of bargaining parties is known, and subjects can exploit gender-stereotypes that make strategic posturing more or less effective.

Overall, our data indicates that the strategic gender effect is significant. In our control condition, female subjects are significantly more likely to propose an equal division of the surplus in the first stage, while male subjects are significantly more likely to adopt a strategic posture that mimics the induced committed types. As a result, female subjects tend to acquire both a smaller share of the surplus and acquire less resources overall.

In contrast, in the treatment condition, female subjects are as likely as male subjects to adopt a strategic posture in the first stage. Moreover, data from the second stage suggests that female subjects are more likely to succeed with a strategic posture. In particular, partners (both male and female) are significantly more likely to concede quickly when a female subject adopts a strategic posture than when a male subject does. Moreover, pairs where one partner adopts a strategic posture experience significantly shorter delays when one of the partners is female than when both partners are male. As a result, female subjects receive an equal share of the surplus as male subjects, but—because they experience significantly shorter delays when they adopt a strategic posture—female subjects on average realize higher earnings.

These results provide new insights regarding the bargaining behavior of men and women. There is by now substantial evidence that men and women behave differently in a variety of economic environments. Most of this evidence supports a predominant view that men are likely to be more aggressive—and possibly more successful—in pursuing their self-interests in bargaining. By contrast, empirical evidence on the bargaining outcomes achieved by men and women is mixed, and numerous studies have found no discernible gender differences (see Section 2). Our experimental findings seem consistent with both of these opposing conclusions. In our treatment condition there are no significant differences in the share of the surplus that female subjects demand and receive relative to male subjects. However, the comparison with our control condition suggests that this is not because there are no intrinsic behavioral gender-differences, but rather that intrinsic behavioral differences are offset by the signaling power that women inherit from gender-stereotyping in an asymmetric information environment. While these findings are obtained in a stylized experimental setting, the idea that gender-revelation has a signaling component seems potentially relevant for understanding gender-differences in variety of face-to-face bargaining environments, where gender is observable and information asymmetries are commonplace.

The paper is organized as follows. Section 2 discusses related literature. Section 3 presents the design. Section 4 describes how we analyze our data and measure posturing behavior, and presents our main findings. Section 5 concludes. An appendix provides some additional details on the design and experimental data.

2 Related literature

Our paper contributes to a growing literature studying gender difference in bargaining behavior. In empirical contexts, asymmetric information is commonplace, but the effect of asymmetric information on bargaining behavior is difficult to identify. By contrast, most prior experimental work has focused on complete information environments, which precludes strategic posturing as an effective bargaining strategy. The design in Embrey et al. (2015) provides a framework to replicate asymmetric information in a bargaining experiment. By introducing alternative gender-revelation conditions in their design, our experimental findings help to shed light on gender differences in posturing behavior, which may be an important determinant of bargaining outcomes in asymmetric information environments.

Empirical evidence on gender differences in bargaining behavior and outcomes is mixed. Babcock and Laschever (2003) find that 57% of male graduate business students negotiate their starting salaries compared to 7 % of women, and that male starting salaries are 7.6% higher. Ayres and Siegelman (1995) find men pay lower prices for new cars using data from tester audits, while Goldberg (1996) finds no gender difference in prices paid for new cars using consumer expenditure survey data, and Harless and Hoffer (2002) find no gender difference using transaction price data. Castillo et al. (2013) find women are quoted lower prices and are less likely to be rejected by drivers in a field experiment involving taxi drivers in a competitive taxi market. Moreover, while Harding et al. (2003) find some evidence that women have less bargaining power in the housing market, the evidence on gender differences in bargaining skills using data from real estate agents is inconclusive (See, e.g., Seagraves and Gallimore, 2013).

The difficulty of empirically isolating bargaining behavior from confounding factors has also motivated an experimental literature. Eckel and Grossman (2001) and Solnick (2001) study differences in the bargaining behavior of men and women in an ultimatum game with gender revelation treatments. Both papers find that men and women make similar offers when they are the proposer, but that offers made to male responders are higher than offers to female responders. Eckel and Grossman (2001) find that women are more likely to accept lower offers, while Solnick (2001) find the opposite. As a result, Eckel and Grossman (2001) find women receive higher earnings on average, whereas Solnick (2001) find men earn more. These differences in results may be a function of different designs used by the authors, combined with a higher context sensitivity for female subjects (Croson and Gneezy, 2009). Dittrich et al. (2014) look at gender differences in an alternate-offer wage bargaining experiment *à la* Rubinstein (1982), with face-to-face interactions. They find better wage outcomes for male subjects but only when in the role of employees. The gender differences are driven by differences in initial offers and counteroffers, and are not due to behavior later in the bargaining process.

We study gender differences using a different bargaining protocol. While the two-stage bargaining procedure is stylized, it has the advantage that it treats both bargaining parties symmetrically, removing the "first-mover" advantage as a potential confound to bargaining behavior, and creating a tension between a simple 50:50 bargaining norm and strategic postures that mimic the induced committed types (see also Embrey et al., 2015). Moreover, the bargaining protocol can be viewed as the limit of an alternate-offer game as the time period between offers vanishes, and Abreu and Gul (2000) show that equilibrium predictions are robust to the specific details of the bargaining procedure. The key difference in our design from the previous experimental literature is the presence of induced committed types, which change the strategic environment in two ways. First, subjects have an opportunity to adopt a strategic posture, which mimic the committed type, and can generate bargaining delays and unequal outcomes. Second, revealing gender in our setting has informational content because the credibility of a strategic posture depends on prior expectations (or stereotypes) about the likelihood that women and men are willing to adopt strategic postures.

3 Experimental design

The experiment consists of two parts and employs a between subject design. Part 1 of the experiment sets up the gender revelation; part 2 is a bilateral bargaining problem with two stages. There are two conditions that differ in whether the gender of bargaining partners is revealed (treatment) or not (control). We first provide an overview of the experimental design, and then discuss some of the key features in more detail.[1]

In each experimental session, 16 subjects are first randomly assigned to separate booths in the lab and given a sealed envelope. The instructions for part 1 are then read aloud. Subjects are asked to first open their envelopes to find a unique pseudonym written on a slip of paper. The pseudonym takes the form "player [City]" where the city is the capital of a European country such as Amsterdam, Oslo, Copenhagen. In the control, subjects are asked to type the pseudonym into a box on their computer screens. In the treatment, subjects are asked to put on headsets and say the pseudonym into the microphone to record it as an audio file. Once part 1 of the experiment is concluded the instructions to part 2 are handed out and read aloud.

Part 2 of the experiment has 15 rounds. In each round, subjects are matched to partners using perfect stranger matching, and the pairs engage in a two-stage bilateral bargaining game. Before stage 1, the pseudonym of the partners is revealed. In the control, subjects see a screen for 15 seconds on which the pseudonym is displayed (not revealing gender). In the treatment, subjects see a blank screen and hear the pseudonym via the recording of the partner from part 1 (revealing gender). The revelation of gender is the only difference between the two conditions.

In the first stage, subjects simultaneously demand a share out of 30 points for themselves.

[1]Instructions and screen shots, translated from German, are provide in the Appendix.

If the sum of the two demands is less than or equal to 30, then the demands are compatible and the round ends. Subjects then receive their demands, with any remaining amount split equally. If the sum of the two demands exceed 30, then the demands are not compatible and the pair proceeds to the second stage.

The second stage is a continuous time concession game. Each second t the demanded share from the first stage is discounted by $\exp(-0.001t)$. Either of the subjects in the pair can end the game at anytime by pressing a concession button. The subject that does not concede receives his or her demand, discounted by $\exp(-0.001t)$. The subject that does concede receives the amount left over, i.e., the total amount after discounting and subtracting the discounted demand of the non-conceding partner. To aid the bargaining pairs in the second stage, a 2×2 matrix is displayed with both the subject's own and their partner's payoffs discounted in real time for the scenario where the subject concedes and the scenario where the partner concedes. When the second stage of the experiment is concluded, each subject is shown their payoff from the round and is then randomly assigned to a new partner.

Once all 15 rounds are complete, subjects receive their payoffs for part 2 of the experiment. To induce risk neutrality, the payoffs are provided as the outcome of a lottery in which the probability of winning 20 euro is determined by the payoffs subjects received in each round. An additional show up fee of 10 euro is paid to all subjects.

In the experiment, subjects can be one of two types, spade or diamond. Subjects are informed of their type at the start of part 2, but never learn the type of any of their partners. Types are fixed throughout the 15 rounds. The diamond types are free to play the game however they wish. The spade types, however, are *committed* in that they are forced to play a fixed strategy: they demand 20 in the first stage and cannot concede in the second stage. Out of the 16 subjects, 14 are diamond players and 2 are spade players. While the type is private information, all subjects are informed about what each type is required to do and the proportion of each type in the session.

The experiment was carried out at the MaxLab in Magdeburg, Germany, and was computerized using z-Tree (Fischbacher, 2007). Recruitment was carried out using hroot (Bock et al., 2014). The table below provides a summary of the sessions. In total 160 subjects participated, where 83 subjects were male and 77 female. In total 64 (35 male and 29 female) and 96 (48 male and 48 female) subjects were randomly assigned to the the control and treatment conditions, respectively. Average earnings were €17.88, and the average session time was ≈ 90 minutes.

Summary Table

	Sessions	Males	Females	Committed	Observations	
					w Committed	**w/o Committed**
Control	4	35	29	8	960	840
Treatment	6	48	48	12	1440	1260
Total	10	83	77	20	2400	2100

Gender revelation

An important aspect of our design is that subjects in the treatment condition know the gender of their partner. The most direct way of achieving this objective is to directly inform the subjects about their partner's gender. However, this approach can potentially induce experimenter demand effects. The experimenter demand effect is likely to be particularly pronounced in our setting because subjects are matched 15 times, and being informed each time about their partner's gender may then affect behavior. Alternatively, one can provide subjects with the first name of the partner, but this provides information to the subjects that is commonly kept confidential for reasons of anonymity.

An approach used by Coffman (2014) is to provide the subjects with pictures of their partners. However, Bordalo et al. (2016) point out that pictures potentially have the unintended consequence of reducing social distance, or reveal additional information other than the partner's gender. Bordalo et al. (2016) therefore devise a novel approach to gender revelation by giving subjects a brief opportunity to hear their partner's voice, which should reveal gender but not much else. We implement this approach using the brief recording of the pseudonym in our design in order to isolate the effect of gender in our treatment condition. Reports from subjects in a survey carried out after the experiment suggest that the partner's gender was identified from the recording in 97.45% of interactions.

Risk aversion

As in Embrey et al. (2015), we use the lottery method to induce risk neutrality (Roth and Malouf, 1979). Rather than providing the payoffs from each round in monetary amounts, the payoffs are provided as probability points that affect the chance of winning a fixed prize in a lottery. Inducing risk neutrality means that we can interpret our results in terms of gender differences in the willingness to engage and commit to strategic postures, free from the confounds of differences in risk attitudes. This feature is important because it is well established that there are gender differences in attitudes to risk, and this could affect bargaining behavior in a design with monetary payoffs (Croson and Gneezy, 2009).

Committed types

The last key feature of our design is the presence of committed types. Part 2 of our experiment is comparable to the second treatment condition of Embrey et al. (2015), where two computer players are coded to demand 20 in the first stage of the bargaining game and never concede in the second stage. Embrey et al. (2015) use computers to introduce the committed types, whereas we use real subjects to facilitate gender revelation in our treatment condition. Embrey et al. (2015) also use random matching of subjects to make pairs, while our matching protocol is to create unique pairs such that each subject is paired only once with each other subject. This matching protocol is required given that our subjects learn the pseudonym of the other subject, which is not a feature of the design in Embrey et al. (2015).

We induce committed types for three reasons. First, as discussed in Section 1, there are many reasons why, in real-world bargaining environments, people may be uncertain about the veracity of their partner's claimed commitment to a bargaining position (including uncertainty about fiduciary obligations, financial constraints, or bounded rationality). As Abreu and Gul (2000) show, even residual uncertainty is often sufficient to change the strategic structure of the bargaining environment substantially, and inducing a specific committed type in the laboratory allows us to replicate uncertainty about types in a simple and controlled setting. Second, in line with the theoretical predictions in Abreu and Gul (2000), Embrey et al. (2015) find that a significant number of subjects do mimic the behavior of induced committed types. Since we are interested in the extent to which men and women differ in both the propensity and success of such strategic mimicking, it is useful for us to build on a design that has already established that such behavior occurs. Third, forcing the committed types to always choose 20 in our experimental sessions generates a tension with the ostensibly fair 50:50 norm, which is natural in the symmetric bargaining environment.

4 Results

We present results for three sets of dependent variables. The first set of dependent variables measure the posturing behavior of subjects. Here, our main finding is that the posturing behavior of male and female subjects depends, in a systematic way, on whether gender is revealed (treatment) or not (control).

The second set of dependent variables measure the signaling power of a strategic posture: how likely is a subject who mimics a committed type to provoke a quick concession from their partner. In the control, we find no significant effects, but in the treatment, we find that female subjects are significantly more likely to succeed with a strategic posture than male subjects.

The third set of dependent variables measure how gender differences in bargaining behavior affect the aggregate bargaining outcomes of male and female subjects. We find that, in the treatment where gender is known, the ability for female subjects to send a more powerful signal does improve their bargaining outcomes, primarily because they generate less inefficiency in the bargaining process.

We first describe the statistical models we use for our analysis.[2] We then present our results for each set of dependent variables: (i) strategic posturing, (ii) signaling power, and (iii) bargaining outcomes. Finally, we offer an interpretation consistent with our results in terms of a strategic gender effect.

4.1 Statistical analysis

We present unconditional data in figures, and provide regression analysis to estimate conditional marginal effects and standard errors. For regressions, we use the random effects model with robust standard errors clustered at the subject level. We remove all observations for subjects coded as committed types in the first stage, and subjects whose partner was a committed type in the second stage.

For binary dependent variables we estimate a logisitic specification and report odds-ratios; for continuous dependent variables we report the OLS coefficients.[3] Regressions are based on the following underlying linear relationship between dependent variable and regressors:

$$y_i \big| z_i = \alpha + \beta' x_i + \gamma' c_i + \epsilon_i, \tag{1}$$

where y_i is the dependent variable; x_i is a vector of independent variables, which can include a treatment dummy T_i, a gender dummy $Male_i$, and a partner gender dummy $Male_j$; c_i is a vector of standard controls, which include age and major; and ϵ_i are random noise terms clustered at the subject level. The variables z_i denote data restrictions. For instance, $y_i \big| (T_i{=}1, Male_i{=}0)$ indicates a regression of the dependent variable y_i for the subset of female subjects ($Male_i{=}0$) in the treatment condition ($T_i{=}1$); by default y_i without $\big| z_i$ denotes an unrestricted regres-

[2]The construction of variables follows closely the analysis in Embrey et al. (2015). Our control condition is similar to the second treatment condition in Embrey et al. (2015), and we show in Appendix A.1 that our aggregate data replicate their findings with only small quantitative differences. In particular, we also find broad support for the theoretical predictions in Abreu and Gul (2000). The most significant difference is that, in our experiment, a larger share of subjects choose initial demands of 15 or 20.

[3]OLS coefficients give the effect on the dependent variable of a one unit change in the regressor. For logisitic regressions, the odds ratios give the change in log odds of the dependent variable being in category 1 by a one unit change in the regressor. The statistical significance for the ratio is against 1 instead of 0, and an estimated odds-ratio less than 1 indicates a decrease in the odds of the dependent variable being in category 1.

sion. Regression tables report the coefficients or odds-ratios for independent variables, with corresponding p-values, and omit the coefficients for controls.[4]

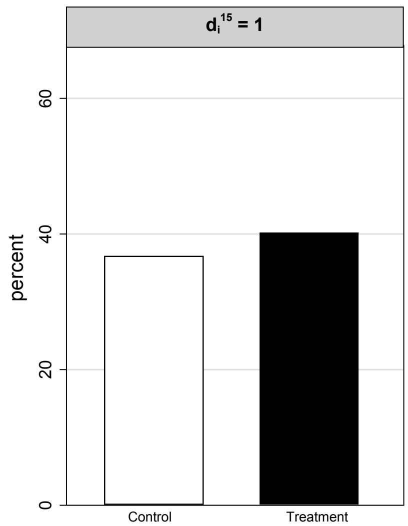
4.2 Strategic posturing

Our first set of dependent variables describe the posturing behavior of subject i in terms of their demand d_i in the first stage. Instead of analyzing this demand directly, we focus on whether a subject demands 15, 20, or other, by coding two binary variables, d_i^{15} and d_i^{20}, which take value 1 when d_i=15 or d_i=20, respectively. A subject demanding 15 is proposing a 50-50 split, and is therefore adopting a *fair posture*; a subject demanding 20 is adopting a *strategic posture*, which mimics the induced committed type. We focus on demands of 15 and 20 because of their direct economic interpretation. More than 80% of subjects in both control and treatment chose one of these initial demands. One could also consider the initial demand d_i directly as a continuous dependent variable. However, while an increase in the initial demand from 20 to 21 represents a more aggressive demand in principle, it also represents a departure from the behavior of the induced committed type and is therefore a potential deviation from the equilibrium prediction. As such, marginal effects for d_i are difficult to interpret, and we prefer to focus on the categorical variables d_i^{15} and d_i^{20}, which constitute the vast majority of our observations and have clearer economic interpretations.

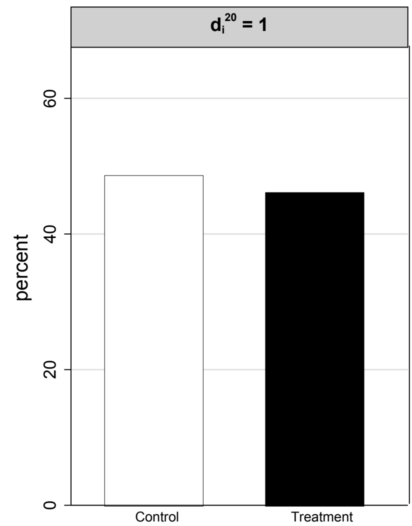
Figure 1 and Table 1 indicate that there is no significant treatment effect in the aggregate data: both for demand of 15 (panel A) and demand of 20 (panel B) the proportion of subjects who adopt this posture is similar in the two conditions. A slightly larger proportion of subjects adopt the strategic posture (demand of 20) in the control than in the treatment, but the difference is not statistically significant (column 2 in Table 1). However, the absence of an aggregate treatment effect conceals significant gender heterogeneity.

[4] Alternatively, we could estimate the same specification with interaction terms for T_i and $Male_i$ and/or $Male_j$, instead of estimating the conditional marginal effects. In the text, we prefer to present the conditional marginal effects as they facilitate direct interpretation of the coefficients. Moreover, qualitatively our results are not sensitive to the choice of specification or the unit of clustering (subject versus session level).

Figure 1: First stage demands



(A) Fair Posture: Demand 15



(B) Strategic Posture: Demand 20

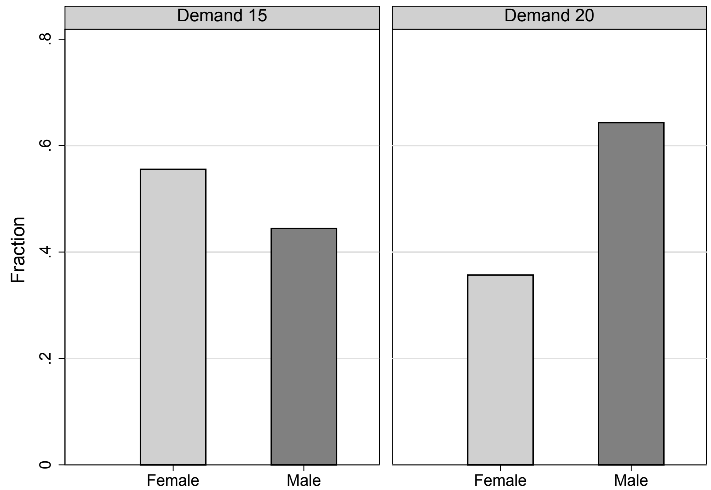
Table 1: Aggregate treatment effect

	Treatment Effect	
	(1)	(2)
	Fair Posture d_i^{15}	**Strategic Posture** d_i^{20}
T_i	1.061	0.570
	(0.877)	(0.155)
N	2100	2100

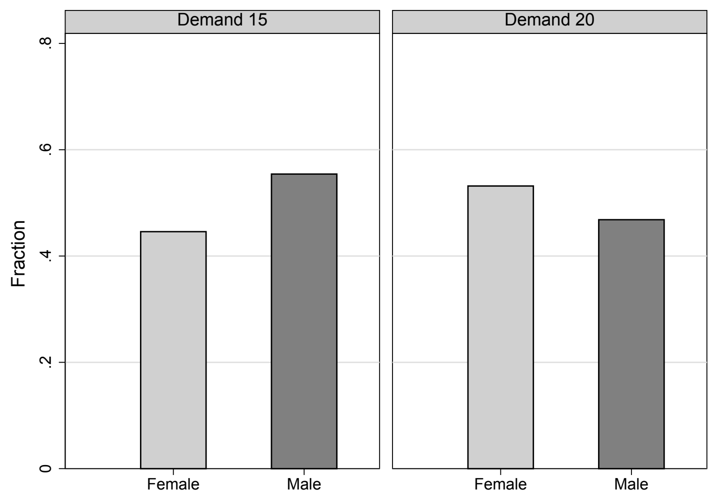
p-values in parentheses based on standard-errors clustered by subject.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 2 illustrates the proportion of subjects with initial demands of 15 and 20 in the control (panel A) and treatment (panel B), disaggregated by gender of the subject. The corresponding regression results are reported in panel 1 of Table 2, where we also condition on partner's gender.

Figure 2: Posturing behavior



(A) Control: Fair vs. Strategic Posture



(B) Treatment: Fair vs. Strategic Posture

The figure and table show that, when gender is not revealed, male subjects are significantly less likely to demand 15 than female subjects, and male subjects are significantly more likely to demand 20 than female subjects. From the regression results in Table 2, the odds that a male subject adopts a fair posture is three times less than the odds for a female subject (column 1), and the odds that a male subject adopts a strategic posture is more than three times the odds for a female subject (column 2). However, revealing gender leads to an equalization in the odds that male and female subjects adopt fair and strategic postures. The odds that a male subject demands 15 in the treatment are higher than for a female subject, and the odds that a male subject demands 20 in the treatment are lower, but the gender difference is not significant. Relative to the control, we therefore find that, in the treatment, male and female subjects respond in opposite directions, and the aggregate treatment effect conceals these differential gender responses. Moreover, partner's gender is not statistically significant in any of the regressions. This suggests that knowing your partners gender is not important, but knowing that your partner knows your gender matters for posturing behavior. The results therefore indicate that subjects anticipate that responses in the second stage will be different for males and females.

Table 2: Posturing behavior

	Control Versus Treatment			
Panel 1	(1)	(2)	(3)	(4)
	Fair Posture Control $d_i^{15}\|T_i = 0$	**Strategic Posture Control** $d_i^{20}\|T_i = 0$	**Fair Posture Treatment** $d_i^{15}\|T_i = 1$	**Strategic Posture Treatment** $d_i^{20}\|T_i = 1$
Male_i	0.344**	3.695***	1.961	0.550
	(0.025)	(0.006)	(0.234)	(0.320)
Male_j	1.155	1.067	0.798	1.118
	(0.426)	(0.739)	(0.118)	(0.502)
N	840	840	1260	1260
	Male versus Female			
Panel 2	(1)	(2)	(3)	(4)
	Fair Posture Male $d_i^{15}\|Male_i = 1$	**Strategic Posture Male** $d_i^{20}\|Male_i = 1$	**Fair Posture Female** $d_i^{15}\|Male_i = 0$	**Strategic Posture Female** $d_i^{20}\|Male_i = 0$
T_i	2.424	0.214**	0.494*	1.430
	(0.132)	(0.012)	(0.096)	(0.410)
Male_j	0.785	1.263	1.091	0.968
	(0.151)	(0.156)	(0.584)	(0.861)
N	1095	1095	1005	1005

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In panel 2 of Table 2 we present the differential responses to the treatment organized by gender. The first two columns present results for regression for demand of 15 (column 1) and demand of 20 (column 2) for male subjects on the treatment dummy and partner gender. The odds that a male subject adopts a strategic posture is significantly lower in the treatment than in the control (column 2); the odds of adopting a fair posture is higher in the treatment, but the effect is not significant (column 1). On the other hand, the odds that a female subject adopts a fair posture is higher in the control, significant at 10% (column 3), and the odds of adopting a strategic posture is higher in the treatment, but the effect is not significant. As a result, the equalization in posturing behavior in the treatment is driven by male subjects adopting strategic postures less often, and female subjects adopting fair postures less often.

We can summarize these results as follows: (i) when gender is not revealed (control), men are more likely than women to adopt a strategic posture that mimics the committed types, but (ii) when gender is revealed (treatment), there are no significant gender differences; if anything, women are more likely to adopt a strategic posture than men.

4.3 Signaling power

Following Abreu and Gul (2000), we can interpret a demand of 20 in the first stage as an attempt by a subject to mimic the committed type, thereby signaling that they are insensitive to the costs of a bargaining delay. Our second set of dependent variables tries to measure the effectiveness (or power) of such signals. For this, we restrict attention to subjects who move to the second stage, and consider two measures: (i) how likely a strategic posture is to provoke a quick concession from the partner, and (ii) the total delay experienced by a subject.

If the strategic posture is an effective signal, we would expect the partner to concede quickly in order to reduce inefficiencies from a delay. Following Embrey et al. (2015), we interpret a concession within the first two seconds as being quick, and code a corresponding binary variable $qcon_i$ that takes value 1 if a subject concedes in under two seconds.

For the treatment, Figure 3 illustrates the proportion of subjects who concede quickly when their partner demands 20, disaggregated by partner's gender. The corresponding regression results are reported in Table 3, where we also condition on the subject's gender and provide corresponding results for the control condition. The figure and table show that, in the treatment, a subject is significantly more likely to concede quickly when their partner is a female who adopted a strategic posture than when their partner is a male who adopted a strategic posture (column 2). Moreover, these responses do not depend on the subject's own gender.

In the control, the odds-ratios are not significant (column 1). This is expected as subjects cannot condition on their partner's gender. Columns 3 and 4 in Table 3 provide the corresponding regression results when partner's demand is not 20. Here, there are also no significant effects. As a result, we find that female subjects who adopt a strategic posture are more likely to provoke a quick concession from their partner than male subjects, but only when gender is revealed. This suggests that a strategic posture is a particularly powerful signal for female subjects when gender is revealed.

Figure 3: Quick concession

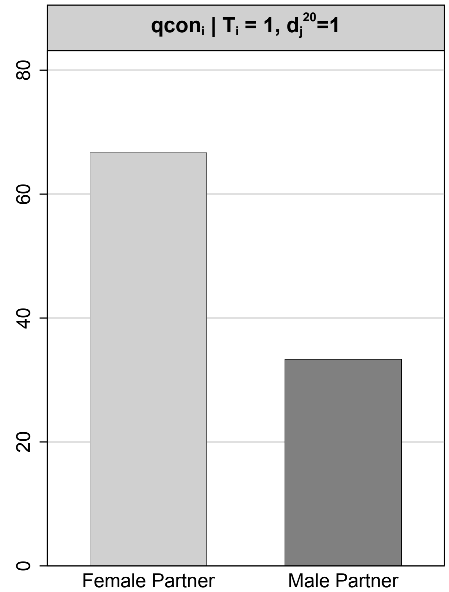


Table 3: Signaling Power

	Quick Concession to Partner's Strategic Posture			
	(1)	(2)	(3)	(4)
	Control	**Treatment**	**Control**	**Treatment**
	$\mathbf{qcon}_i \mid T_i{=}0,\ d_j^{20}{=}1,\ stage2{=}1$	$\mathbf{qcon}_i \mid T_i{=}1,\ d_j^{20}{=}1,\ stage2{=}1$	$\mathbf{qcon}_i \mid T_i{=}0,\ d_j^{20}{=}0,\ stage2{=}1$	$\mathbf{qcon}_i \mid T_i{=}1,\ d_j^{20}{=}0,\ stage2{=}1$
Male$_i$	0.766	1.391	0.483	2.485
	(0.745)	(0.526)	(0.430)	(0.323)
Male$_j$	0.928	0.374***	2.633	0.573
	(0.848)	(0.004)	(0.192)	(0.278)
N	178	226	85	138

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As an alternative measure of signaling power, we also look at the delays experienced by subjects in the second stage, coded as a continuous dependent variable del_i. We focus on the delays experienced when the partner demanded 20 in the first stage, to see how this strategic posture affects the delay experienced by a subject. Shorter delays are an indication that the strategic posture is an effective signal.

Figure 4: Delay

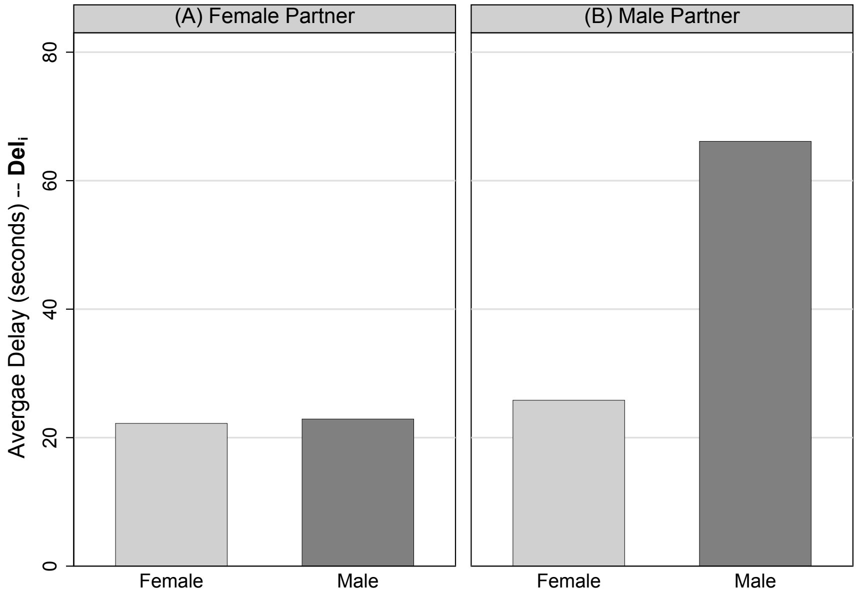


Table 4: Signaling Power

	Average Delays to Partner's Strategic Posture			
	(1)	(2)	(3)	(4)
	Control Female	**Control Male**	**Treatment Female**	**Treatment Male**
	$\mathbf{del}_i \,\Big\vert\, \begin{smallmatrix} T_i=0 \\ Male_i=0 \\ d_j^{20}=1 \\ stage2=1 \end{smallmatrix}$	$\mathbf{del}_i \,\Big\vert\, \begin{smallmatrix} T_i=0 \\ Male_i=1 \\ d_j^{20}=1 \\ stage2=1 \end{smallmatrix}$	$\mathbf{del}_i \,\Big\vert\, \begin{smallmatrix} T_i=1 \\ Male_i=0 \\ d_j^{20}=1 \\ stage2=1 \end{smallmatrix}$	$\mathbf{del}_i \,\Big\vert\, \begin{smallmatrix} T_i=1 \\ Male_i=1 \\ d_j^{20}=1 \\ stage2=1 \end{smallmatrix}$
Male$_j$	12.14	0.393	4.511	44.50***
	(0.380)	(0.977)	(0.642)	(0.000)
N	122	165	177	184

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For the treatment, Figure 4 illustrates the average delay when partner is female (panel A) or male (panel B). The corresponding regression results are reported in Table 4, including also results for the control. The figure and table show that, in the treatment, the delays are significantly longer when both partners are male, than when one of the partners is female, providing another indication that female subjects are more effective at signaling commitment with a strategic posture. In the control, there are no significant gender differences, as expected when subjects are unable to condition on partner's gender (columns 1 and 2).

We can summarize these findings as follows. When gender is revealed, a strategic posture is a more powerful signal for a woman than for a man because (i) it is more likely to provoke a quick concession, and (ii) it reduces the bargaining delay.

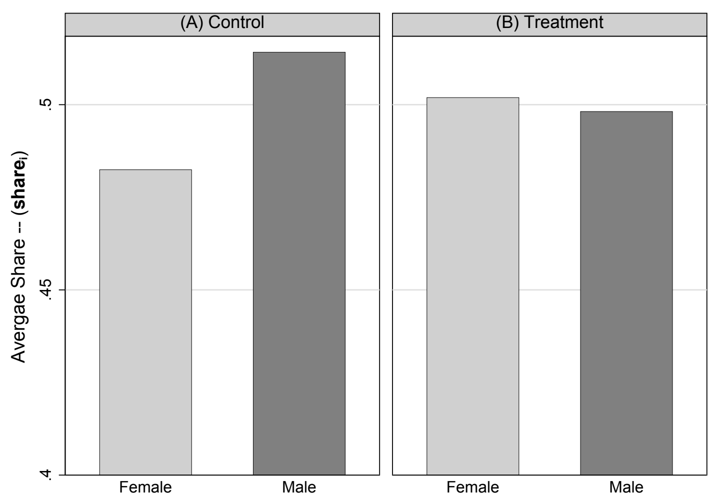
4.4 Bargaining outcomes

Finally, we look at whether the change in bargaining behavior in the treatment condition also translates into a change in the aggregate bargaining outcomes for male and female subjects. We consider three potential bargaining outcomes: (i) a measure of the share of resources, (ii) a measure of bargaining inefficiency, and (iii) a measure of total resources acquired.

We denote by $point_i$ the total number of points that subject i receives at the end of a bargaining interaction (i.e., at the end of the first stage when $d_i + d_j \leq 30$, and at the end of the second stage when $d_i + d_j > 30$).[5]

For a measure of the share of resources, we consider the share of points $share_i = \frac{point_i}{point_i + point_j}$ that subject i acquires in the bargaining interaction with partner j, as a continuous dependent variable. Figure 5 illustrates the average share of points subjects attain in the control (panel A) and treatment (panel B), disaggregated by gender. The corresponding regression results are reported in Table 5.

Figure 5: Shares

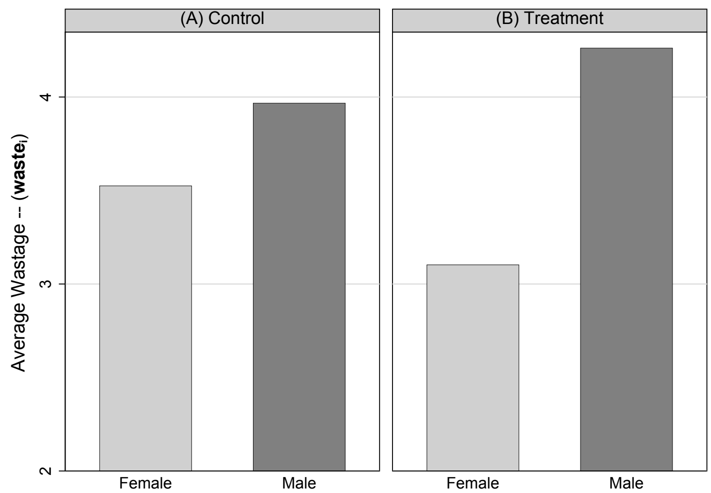


The figure and table show that, in the control, male subjects acquire a significantly higher share of points than female subjects but, in the treatment, there is no significant gender difference. When gender is revealed, female subjects acquire a higher share on average, but the difference is not statistically significant. Revealing gender therefore leads to an equalization in the share of points that male and female subjects acquire.

[5]Recall $point_i$ is calculated as: (i) $d_i + (30 - d_i - d_j)/2$ if $d_i + d_j \leq 30$, (ii) $(30 - d_j) * exp(-0.01 * del_i)$ if $d_i + d_j > 30$ & $concede_i = 1$, (iii) $d_i * exp(-0.01 * del_i)$ if $d_i + d_j > 30$ & $concede_i = 0$.

For a measure bargaining inefficiency, we consider the wasted points $waste_i = 30 - point_i - point_j$ from an interaction between subject i and their partner j, as a continuous dependent variable. Figure 6 illustrates the average wastage subjects generate in the control (panel A) and treatment (panel B), disaggregated by gender. The corresponding regression results are reported in Table 5. The figure and table show that, in the control, male and female subjects generate similar inefficiencies but, in the treatment, male subjects generate significantly more inefficiencies than female subjects. Moreover, the significant coefficient on the partner gender dummy in the treatment indicates that male-male pairs generate the largest inefficiencies (column 4 in Table 5). This is consistent with our earlier finding that male-male pairs experience the longest delays when one partners adopts a strategic posture.

Figure 6: Wastage



For a measure of total resources, we consider the total points $point_i$ that subject i acquires as a continuous dependent variable. Figure 7 illustrates the average points subjects attain in the control (panel A) and treatment (panel B), disaggregated by gender. The corresponding regression results are reported in Table 5. The figure and table show that, in the control, male subjects acquire more points than female subjects (significant at 10%; column 5 in Table 5) but, in the treatment, female subjects acquire more points than male subjects (significant at 5%; column 6 in Table 5). Revealing gender therefore leads to behavioral responses that are more favorable to female subjects, and allow them to acquire greater resources than male subjects.

Figure 7: Total resources

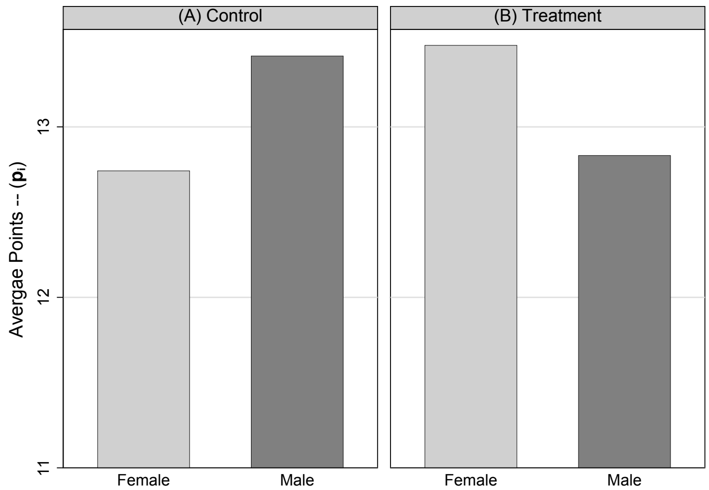


Table 5: Bargaining Outcomes

	(1) **Control** $\textbf{share}_i \vert T_i = 0$	(2) **Treatment** $\textbf{share}_i \vert T_i = 1$	(3) **Control** $\textbf{waste}_i \vert T_i = 0$	(4) **Treatment** $\textbf{waste}_i \vert T_i = 1$	(5) **Control** $\textbf{point}_i \vert T_i = 0$	(6) **Treatment** $\textbf{point}_i \vert T_i = 1$
Male_i	0.0323*	-0.00617	0.278	1.218**	0.708*	-0.714**
	(0.062)	(0.674)	(0.645)	(0.029)	(0.093)	(0.035)
Male_j	-0.0296***	0.00370	0.471	1.366***	-1.074***	-0.608**
	(0.008)	(0.642)	(0.329)	(0.000)	(0.002)	(0.030)
N	728	1091	728	1091	728	1091

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We can summarize these findings as follows: (i) when gender is not revealed, men acquire a significantly higher share of resources than women, there are no discernible differences in their bargaining inefficiencies, and so men acquire more resources overall, but (ii) when gender is revealed, there is no discernible difference in the share of resources that men and women acquire, men generate significantly larger inefficiencies, and so women acquire more resources overall.

4.5 Interpretation

We offer an interpretation consistent with our findings in terms of a strategic gender effect, as discussed in the introduction.

In our control, subjects are not aware of their partner's gender. As a result, we interpret differences in bargaining behavior as coming from intrinsic differences in characteristics (e.g., selfishness, deception, or competitiveness), social norms, or other non-innate environmental factors that differ across genders and affect bargaining behavior. For instance, previous literature has found that women are more self-regarding than men, more averse to deceive for financial gain, and less willing to compete. These intrinsic gender differences seem consistent with our findings in the control condition, where men are more likely to adopt a strategic posture in the first stage than women, and men therefore acquire a larger share of resources.

However, when genders are revealed, women can exploit beliefs about intrinsic gender differences in order to send a more powerful signal with a strategic posture. If it is more likely that a man will be willing to mimic a committed type, then a man who adopts a strategic posture is sending only a weak signal of their commitment. On the other hand, if a women, in general, is more likely to adopt a fair posture, then a women who adopts a strategic posture is sending a powerful signal that she is one of the committed types.

To illustrate, we can perform a simple calculation based on our control data. In our control condition, there is close to an equal share of male and female subjects, approximately 25% of female subjects demand 20, and approximately 50% of male subjects demand 20. Overall, approximately 40% of subjects demand 20.[6] By default, 1/8 subjects are coded as committed types, who always demand 20. Now consider a subject whose partner demands 20. Then the conditional probability that their partner is a committed type is $\frac{10}{38}$ if the partner's gender is unknown, $\frac{2}{9}$ if the partner is male, and $\frac{4}{11}$ if the partner is female (see Appendix A.2). As a result, if subjects did not adjust their posturing behavior, a strategic posture would be a stronger signal for a female subject in the treatment than in the control, and a strategic posture would be a weaker signal for a male subject in the treatment than in the control. Of course, subjects do not know the proportions demanding 20 by gender in our control condition and, even if they did, we would not expect them to make precise Bayesian calculations. However, the evidence from previous literature that women are more self-regarding than men, less averse to deceive for financial gain, and less willing to compete, suggests that previous experience (or stereotypes) could well lead subjects to believe that men are intrinsically more aggressive in their bargaining demands than women. Given the basic logic of the Bayesian argument, it seems plausible to us that simple heuristics would lead incentivized subjects to internalize the change in signaling power that arises when gender is revealed, and adapt their posturing behavior accordingly.

Consistent with this strategic gender effect we find that, in our treatment condition, a women who adopts a strategic posture is significantly more likely to provoke a quick concession

[6]The proportion of male subjects in our control is $\frac{465}{840} \approx 0.55$, the proportion of male subjects demanding 20 is $\frac{241}{465} \approx 0.52$, the proportion of female subjects demanding 20 is $\frac{107}{375} \approx 0.28$, and the proportion of all subjects demanding 20 is $\frac{348}{840} \approx 0.41$. We round-off these figures to simplify the illustration.

from her partner than a man. Moreover, men who adopt a strategic posture experience longer delays in the bargaining process, primarily due to male-male pairs, where strategic postures seem to be only a weak signal. Our treatment data for the first stage suggests that subjects anticipate this strategic effect. The strategic effect also appears to be significant, and entirely mitigates the intrinsic differences in the control condition.

The strategic gender effect does not rely on the fact that a subject knows her partner's gender, but rather that the partner knows the subject's gender. This is consistent with our finding that differences in strategic posturing between our control and treatment conditions are due to a subject's gender, not the gender of their partner.

Finally, our results for bargaining outcomes suggest that the strategic gender effect is consequential. When gender is not revealed, we find that women acquire a significantly smaller share of resources and fewer resources overall. However, when gender is revealed, there are no significant gender differences in the share of resources men and women acquire, but women acquire more resources in total because they generate less inefficiencies in the bargaining process. The additional inefficiencies that men generate are driven by the long delays in male-male pairs where at least one of the partners adopts a strategic posture, but strategic postures are a weak signal that do not provoke quick concessions. In contrast, women who adopt a strategic posture appear to send a powerful signal, provoking quick concessions and reducing delay in the bargaining process. As a result, the strategic gender effect allows women to capture more points in an asymmetric information environment where bargaining delays are a rational equilibrium outcome.

5 Conclusion

For a bilateral bargaining problem with asymmetric information, we present experimental findings on gender differences in strategic posturing. By implementing our design in two conditions, we disentangle intrinsic gender differences in bargaining behavior from a strategic gender effect that arise because gender-stereotypes provide women with greater signaling power than men.

In a control condition without gender revelation, we find that men adopt strategic postures that mimic committed types more often than women. In a treatment condition where gender is revealed, however, women adopt a strategic posture as often as men do. Moreover, women adopting a strategic posture experience less delays, and are more likely to provoke a quick concession from their bargaining partner. These results are consistent with a strategic gender effect generated because women are believed to be less aggressive than men (as confirmed by our control condition), and are therefore able to use a strategic posture as a more credible signal of their commitment. In effect, women have an element of surprise by following counter-stereotypical behavior, which makes strategic posturing a more effective strategy when their bargaining partner is aware of their gender. In terms of bargaining outcomes, women earn more than men when gender is known, while men earn more when gender is unknown. Our results therefore indicate that the strategic gender effect is a potentially important determinant of bargaining outcomes in an asymmetric information environment.

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A Appendix

In this section, we (i) compare our control data with the data in Embrey et al. (2015), (ii) provide the Bayesian calculations for the interpretation of our experimental findings in Section 4.5, and (iii) provide the experimental instructions and screen shots.

A.1 Comparison with Embrey et al. (2015)

Our control condition is comparable to the second treatment condition in Embrey et al. (2015) (henceforth, EFL), where committed types are introduced and there is no gender revelation. Our control replicates EFL's treatment well, with only small quantitative differences. The initial demand patterns are bi-modal and inline with EFL's demand patterns. In our control, the majority of our subjects (≈83% versus EFL's subjects ≈50%) cluster at the demand of 15 and 20, which is what we report. The comparison reveals that we have less heterogeneity resulting in smaller range of demand made in stage 1, relative to EFL. The proportion of subjects with demands of 15 and 20 is therefore significantly higher for us than EFL.[7] For the mean delays and concessions, the difference across EFL and our control is not significantly different. We

[7] In terms of demand of 10 and 30 which is not reported, we see differences in proportions. However, on the one hand the demand of 30 signals a restrictive type therefore it is rational to see smaller proportions but on the other hand demand of 10 may be viewed as a complement to the induced 20 types, but also signal non-restrictive type. We see significantly less proportions for this demand in our data relative to EFLs.

present these results in Table A1.

Table A1: Control & EFL

	(1)	(2)	(3)	(4)
	Demand-15	Demand-20	Concession	Delay
EFL-Control	0.236***	0.264**	0.981	-10.51
	(0.006)	(0.044)	(0.830)	(0.141)
N	1363	1363	815	815

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.2 Strategic gender effect

Below, we provide the calculations for the discussion in Section 4.5. Suppose that a subject has an equal probability of being matched with a male (M_j) or female partner (F_j). Independently of gender, there is a 1/8 probability that the partner is a committed type (denoted by C). Moreover, suppose that (regardless of whether genders are known or unknown) female partners will demand 20 with probability 1/4 and male subjects will demand 20 with probability 1/2; unless either is a committed type in which case they always demand 20. Given that their partner demands 20, a subject cares about the probability that the partner is a committed type. Using Bayes rule, we can calculate these probabilities in the case where gender of the partner is unknown, when it is known that the partner is male, and when it is known that the partner is female.

$$
\begin{aligned}
P\left(C \middle| d_j^{20} = 1\right) &= \frac{P\left(d_j^{20} = 1 \middle| C\right) P(C)}{P\left(d_j^{20} = 1 \middle| C\right) P(C) + P\left(d_j^{20} = 1 \middle| \neg C\right) P(\neg C)} \\
&= \frac{1 * (1/8)}{1 * (1/8) + (4/10) * (7/8)} = \frac{10}{38}; \\
P\left(C \middle| d_j^{20} = 1, M_j\right) &= \frac{P\left(d_j^{20} = 1 \middle| C, M_j\right) P\left(C \middle| M_j\right)}{P\left(d_j^{20} = 1 \middle| C, M_j\right) P\left(C \middle| M_j\right) + P\left(d_j^{20} = 1 \middle| \neg C, M_j\right) P(\neg C | M_j)} \\
&= \frac{1 * (1/8)}{1 * (1/8) + (1/2) * (7/8)} = \frac{2}{9}; \\
P\left(C \middle| d_j^{20} = 1, F_j\right) &= \frac{P\left(d_j^{20} = 1 \middle| C, F_j\right) P\left(C \middle| F_j\right)}{P\left(d_j^{20} = 1 | C, F_j\right) P\left(C \middle| F_j\right) + P\left(d_j^{20} = 1 \middle| \neg C, F_j\right) P\left(\neg ot \middle| F_j\right)} \\
&= \frac{1 * (1/8)}{1 * (1/8) + (1/4) * (7/8)} = \frac{4}{11}.
\end{aligned}
$$

From these calculations we see that

$$P\left(C \middle| d_j^{20} = 1, M_j\right) < P\left(Ct \middle| d_j^{20} = 1\right) < P\left(C \middle| d_j^{20} = 1, F_j\right).$$

As a result, if subjects did not adjust their posturing behavior in the treatment condition where gender is known, a strategic posture by a male subject would be a weaker signal that they are a committed type in the treatment than in the control, and a strategic posture by a female subject would be a stronger signal that they are a committed type in the treatment than in the control.

A.3 Experimental instructions and screen shots

Figure 8: Screen shot (initial demand)

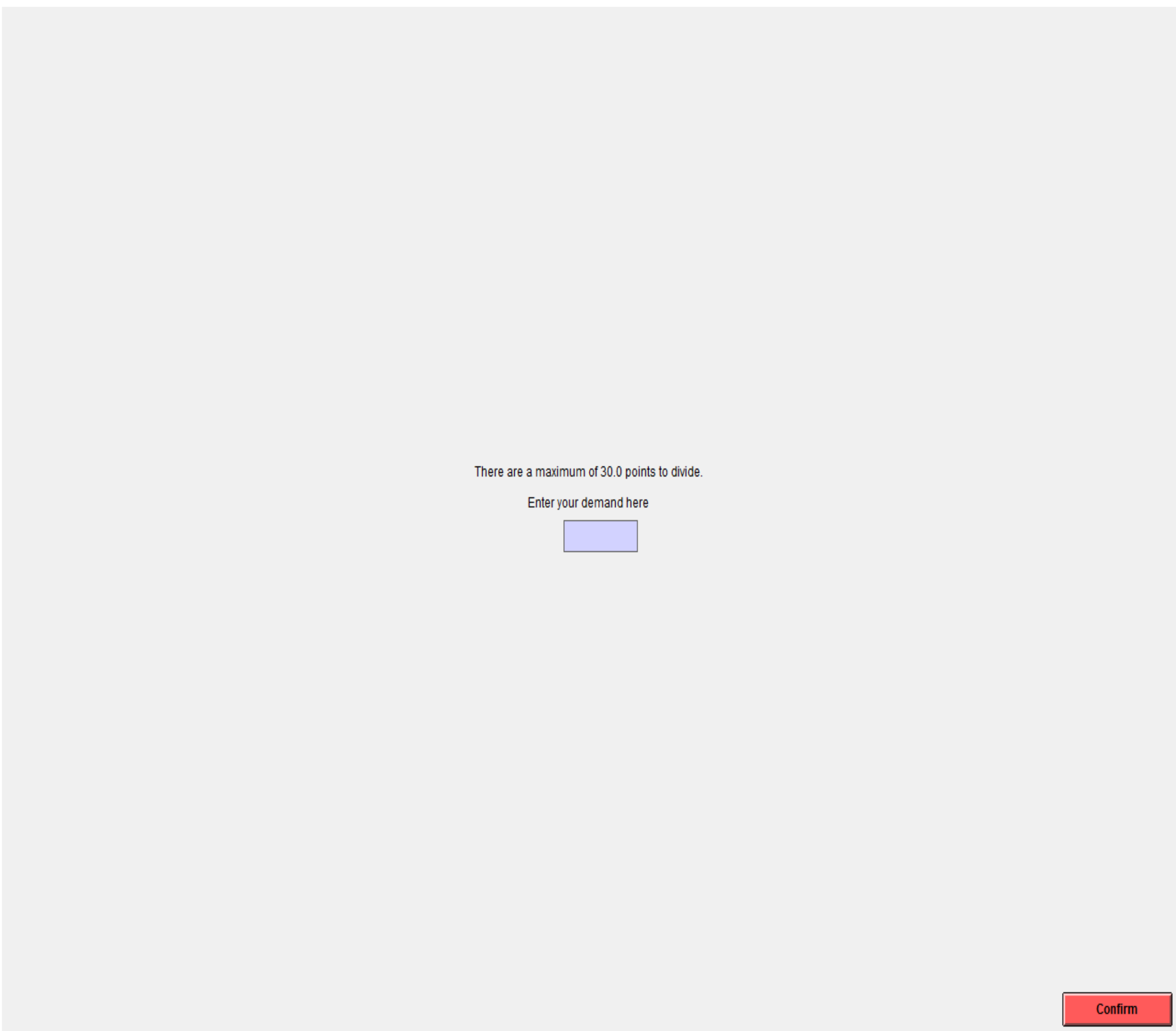


Figure 9: Screen shot (stage 2)

	You accept	Other player accepts
Your payoff	9.14	18.28
Other's payoff	18.28	9.14

Accept

Instructions Part 1 (Control)

In front of you, there is an envelope. In this envelope there a pseudonym. Every player receives their own pseudonym (e.g., **“player Berlin”**) and keeps their pseudonym throughout the entire experiment.

In part 2 you will play against other subjects. Players will receive information about the pseudonym of the other players with whom they are paired. This is why you need to type in your pseudonym in part 1.

As soon as any questions have been answered, part 1 will begin on your computers. On the screen, you will a space for typing. Type in your pseudonym (e.g., **“player Berlin”**) and press on **“Continue”**.
As soon as all players have typed in their pseudonym you will be directed to a new screen in which you are asked to type a password. Please then open your cabin door, you will receive the instructions to part 2.

In Summary:

1. Type in your pseudonym. For example **“player Berlin”**.
2. Press on **“Continue”**.
3. Open your cabin door as soon as a password is to be entered.

Are there any questions?

Instructions Part 1 (Treatment)

In front of you, there is an envelope. In this envelope there a pseudonym. Every player receives their own pseudonym (e.g., **“player Berlin”**) and keeps their pseudonym throughout the entire experiment.

In part 2 you will play against other subjects. Players will receive information about the pseudonym of the other players with whom they are paired. This is why you need to record the audio file in part 1.

To do so, put on your headset and make sure the microphone is in front of your mouth. As soon as any questions have been answered, part 1 will begin on your computers. On the screen, you will see a button “**begin recording**”. After you have pressed the button wait until you see the message “**no cam**” and then say your pseudonym (e.g., **“player Berlin”** clearly into the microphone. Afterwards stay quiet and say nothing further, the recording will end automatically As soon as all players have recorded their pseudonym you will be directed to a new screen in which you are asked to type a password. Please then open your cabin door, you will receive the instructions to part 2.

In Summary:

1. Put on your headsets and place the microphone in front of your mouth.
2. Press the button “**begin recording”** and stay quiet.
3. Wait until the message “**no cam**” in displayed (approx. 2-3 seconds).
4. Say clearly your pseudonym. For example **“player Berlin”**.
5. Stay quiet and leave your headset on.
6. Open your cabin door as soon as a password is to be entered.

Are there any questions?

Instructions- Part 2

There are a total of 16 players in this experiment, you and 15 others. There are two types, Diamond and Spade. Each of the 16 players will learn their type at the start of the experiment and everyone keeps their type throughout the entire experiment. There are 14 type Diamond and 2 are type Spade. Which type you are is determined at random.

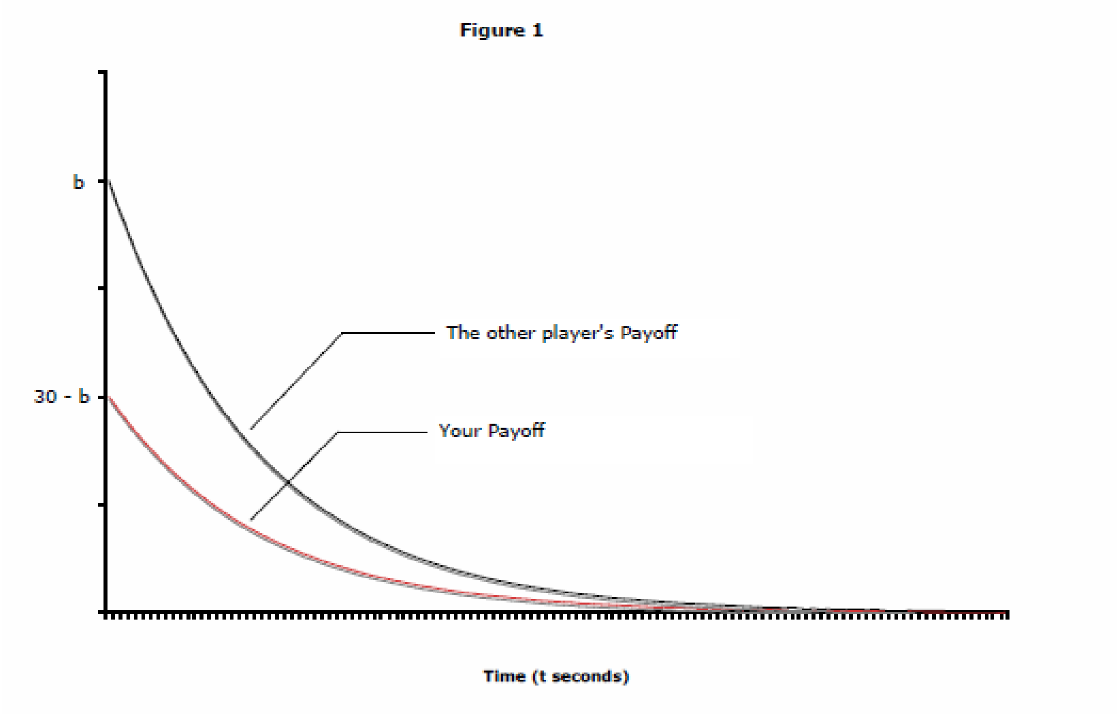
As a player of type Diamond, you will make decisions over 15 periods. At the beginning of each period, you will be matched with a randomly assigned player. That player will be either another player of type Diamond or one of type Spade (more on a type Spade later). At the start of each period, you will hear the pseudonym of the other player. For this reason, you should keep your headsets on throughout the experiment. **[This instruction differed in the control condition where the instruction was: At the start of each period, you will see the pseudonym of the other player.]** During each period, your task is to divide 30 points between yourself and the other player you are matched with.

Each period has up to two stages:

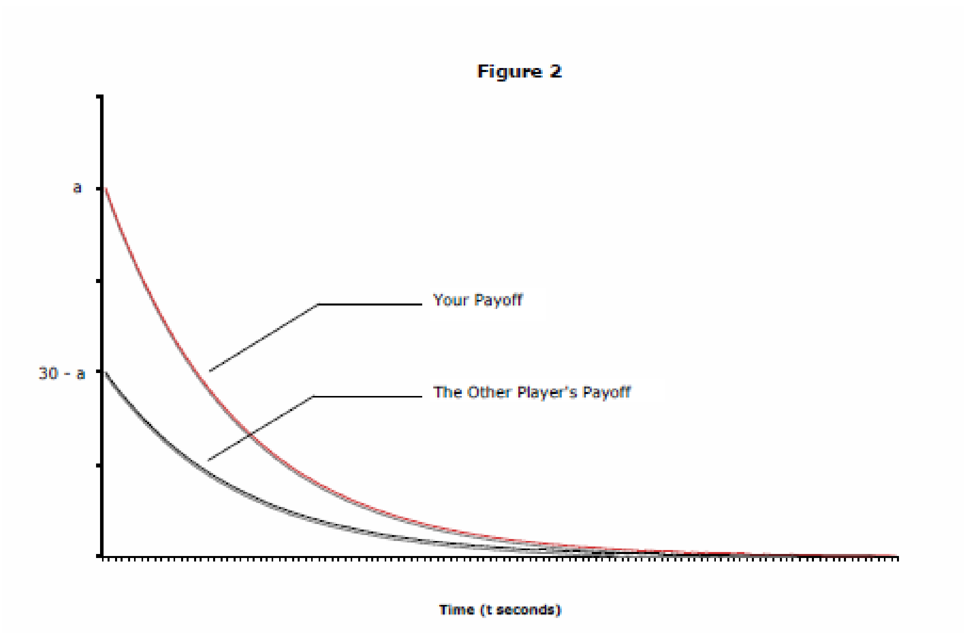
Stage 1: You place an announcement for the number of points that you want for yourself out of the 30 (denote this by a). Simultaneously, the other player will make an announcement for the number of points they want for themselves (denote this by b).

- If the two announcements sum to 30 or less, then you will receive your announcement plus half of what is left over (30 minus the sum of the two announcements) and the period will end. In other words, you will receive a + (30-a-b)/2 points and the other player receives b + (30-a-b)/2.
- If the two announcements sum to more than 30, then you move on to the second stage.

Stage 2: You can now either accept the other player's announcement or wait until they accept your announcement. Accepting their announcement immediately means that you receive 30 – b points for that period. However, the longer you wait the less your points are worth. Approximately, points decrease at a rate of 1% per second. More precisely, if you accept the other player's announcement after t seconds, you will receive $(30 - \mathrm{b}) \times (0.99)^{t}$ and the other player will receive b x $(0.99)^{t}$. The following graph illustrates this:



If on the other hand, the other player accepts your offer after t seconds, you will receive a x $(0.99)^t$ and the other player will receive $(30 - \mathrm{a})$ x $(0.99)^t$. The following graph illustrates this:



Your computer screen will display the points you and the other player would receive if you were to accept, or if they were to accept your announcement at different points in time. Once either you or the other player has accepted, or the value of the points have reached zero, the period is over.

A few examples might help your understanding. These are not meant to be realistic:

1. In the first stage, you announce 1.5 and the other player announces 3.5. Since 1.5 + 3.5 = 5, which is smaller than 30, the period ends and you receive 1.5 + (30 - 5)/2 = 14 points. If instead the other player had announced 23.5, then you would have received 1.5 + (30 - 25)/2 = 4 points.

2. In the first stage, you announce 15 and the other player announces 23. Since 15 + 23 = 38, which is greater than 30, you go to the second stage. In the second stage, the other accepts your announcement after 1 second. You get 15 x $(0.99)^1$ = 14.85 points. If instead, the other player does not accept immediately and you accept after 10 seconds, then you obtain $(30 - 23)$ x $(0.99)^{10}$ = 6.33 points.

3. In the first stage, you announce 25 and the other player announces 5. Since 25 + 5 = 30, the period ends and you obtain 25 points.
As you can see there are many possibilities.

When every pair has finished this task, the next period begins. You will be matched with a randomly assigned player in the next period. The task in the next period is exactly the same as the one just described (apart from that you will be playing with a new player).
The experiment consists of 15 such periods.

Players of type Spade do the same thing every period. Their strategy is as follows. In the first stage, the Spade player will always announce that they want 20 points. If the period goes to the second stage (that is the announcements are incompatible), the Spade player will never accept the offer of the other player. At the beginning of each period, The Diamond player has a 2/15 chance of being matched to a Spade player.

Once the 15 periods have been completed, the total number of points you have earned will be displayed (denote this by P). These points determines the odds of winning a prize in your lottery. Your lottery has the following structure:

- The odds of winning are given by the number of points you earned throughout the experiment divided by the total number of points available. Since there are 15 periods and there are 30 points available in each period, the total number of points available is given by 15 x 30 = 450. Thus the odds of winning are P/450.
- The prize is 20 euro.
- That is, you have P/450 chance of winning the prize and 1 - P/450 chance of receiving 0.

In summary, your earning from this session is comprised of a 10 euro participation fee and the outcome of your lottery. The probabilities associated with your lottery depend on the number of points you have earned throughout the session. You can earn either 0 or 20 from the lottery.

Are there any questions?

Summary

Before we start, let me remind you that:

- After a period is finished, you will be matched to a randomly assigned new player for the next period. You will hear the pseudonym of your partner via your headset.
- In each period, you and another player will make announcements to divide 30 points between both of you. If the sum of your two announcements is less than 30 the period ends. If the sum of the two announcements is 30 or more you move to a second stage. In the second stage, the points decrease in value until either you or the other player accepts the announcement made by the other party, at which point the period ends.
- At the end of the session, your earnings are determined by a lottery with probabilities that depend on the number of points you have earned throughout the experiment. You can earn either 0 or 20 from the lottery. In addition you will receive a 10 euro show-up fee.

Good Luck.