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THE DEVIL IS IN THE DETAILS

Sex Differences in Simple Bargaining Games

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‘THE DEVIL IS IN THE DETAILS’
Sex Differences in Simple Bargaining Games

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Abstract

The study of gender differences in social preferences has shown mixed results, preventing economists and other social scientists from drawing definitive conclusions on this topic. Several original investigations and experimental reviews have hypothesized that the main reason of this heterogeneity of results is the myriad of experimental designs used to study gender differences. In this paper we test this hypothesis by making male and female participants to face two different but related experimental games and two different information treatments. Through this 2x2 factorial design, we obtain results in line with some recent papers: women are sensitive to the design and context of the experiment in ways that men are not. In addition, we go further providing a well-grounded account on the importance of the context for female decision-making.

Keywords: Beliefs, economic experiments, empathy, gender differences, social preferences.

JEL: C78, C91

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1 Introduction

After years of economic experiments on gender, we can hardly draw any general conclusion about gender differences in social preferences.[1] In a recent paper, Cox and Deck (2006) acknowledge the fact that, although several laboratory studies have found significant gender differences, the magnitude and direction of these differences are far from being known and explained. Similarly, in an exhaustive review, Croson and Gneezy (2006) only find support for the claim that 'women's social preferences are more sensitive to subtle cues that are men's' (2006: 45). In this sense, it is quite widespread among experimental economists the idea that there are no objective answers to questions like which is the more generous sex, the fairer one, etc.

In light of this despairing conclusion, should experimental economists give up studying gender differences in social preferences? We think they should not, as we explain below. However, interpreting gender experiments in a case by case manner does not help to make sense of the myriad of already existing experimental results. For this reason, not only this paper aims at integrating our original results, but also some previous results in a broader interpretative framework to understand gender differences in economic decision-making. To this end, we do not necessarily have to start from scratch, but to consider those gender differences in economic experiments that we have more evidence for.

The finding that has generated a larger consensus among behavioral economists is the difference between female and male risk preferences. Although the results obtained in laboratory experiments are mixed, there is enough evidence from the field suggesting that women are more risk averse than men (Eckel and Grossman 2003). The second difference behavioral economists agree on is the fact that men react very differently than women when facing highly competitive environments. This hypothesis has recently been supported by studies using adults' samples (Gneezy, et al. 2003; Niederle and Vesterlund 2007), and a study using a children's sample (Gneezy and Rusticini 2004). Note that these two findings are quite consistent with an evolutionary account of sex[2] differences in preferences

[1] Following Croson and Gneezy (2006), we define gender differences in social preferences as the different way in which others' payoffs (utilities) enter into the utility functions of men and women.

[2] The term "sex" is used here to refer to the biological categorization of the two sexes, male and female. In contrast, "gender" usually alludes to the social role allocated to each sex by cultural and social factors –although many people use both terms as synonyms. In this article, we use gender in a broader sense: to name the relationship between biological sex and behavior (Udry 1994).

(Croson and Gneezy 2006).

Contrary to the two aspects already mentioned, the relation between gender and social preferences is not so clear. Whereas some studies have found gender differences in bargaining behavior (Holm 2000; Eckel and Grossman 2001; Solnick 2001), generosity (Selten and Ockenfels 1998; Eckel and Grossman 1998; Andreoni and Vesterlund 2001; Dickinson and Tiefenthaler 2002; Dufwenberg and Muren 2006a; 2006b), and reciprocity (Croson and Buchan 1999; Cox and Deck 2006), others studies have found no gender differences in some of these aspects (Bolton and Katok 1995; Clark and Sefton 2001; Eckel and Wilson 2004a; 2004b). Furthermore, even when gender differences have been found, there is no clear picture of their exact meaning.

Only in the last few years a hypothesis encompassing these heterogeneous results is emerging. According to the review of Croson and Gneezy (2006), and the original paper of Cox and Deck (2006), women are more sensitive to the social context of the experiment. This implies that, when facing a strategic decision, women are more affected than men by the perception of the social environment. In other works, the contextual appraisal is highly important for female.

In this paper, we study whether women are more sensitive than men to social cues contained in economic situations. To this end, we use a 2x2 factorial design –two different but related experimental bargaining games and two different information treatments– to test the reaction of men and women to different social environments. In addition, we elicit beliefs in the four conditions –through an incentive compatible mechanism– to study not only the higher behavioral responsiveness of women to changes in the environment, but also the relation between these behavioral changes and the corresponding beliefs.

Our results provide support for the hypothesis that only female behavior is influenced by changes in the details of the social environment. In addition, we find that women are better than men in predicting certain environmental conditions. Turning to a cognitive, rather than a preference-based, account of sex differences in economic behavior, we can shed some light on this controversial issue.[3]

The paper is structured as follows. Section 2 outlays the research hypotheses.

[3] This cognitive turn in the interpretation of gender differences in decision making is also present in non-experimental economic investigations. For instance, Langowitz and Minitti (2007) show that perceptual variables are crucial to understand the entrepreneurial propensity of women.

Section 3 describes the experimental design and procedure. Section 4 reports the experimental results. Section 5 interprets these results in light of relevant findings from neuropsychology. Section 6 concludes.

2 Research hypotheses

This paper aims at testing experimentally mainly two general hypotheses: (i) there are no systematic gender differences in social preferences across different experimental bargaining games[4]; (ii) when gender differences are observed in situations that trigger social preferences, these differences are related to the way women and men (cognitively) perceive the economic situation, rather than to intrinsic motivations.

Departing from these two general statements, we now present our working hypotheses for the proposers and the responders in the bargaining games that we are considering. Note that we use two asymmetric bargaining games where the roles played by the first mover (proposer) and the second mover (responder) differ considerably. Proposer's offer depends on his or her beliefs about the other player's willingness to accept a given offer. On the contrary, responder states his or her revealed preference when accepting or rejecting a given offer. Specific hypotheses for both roles are summarized below.

2.1 Hypotheses for Proposers

1. There are no systematic differences in the size of the offer between proposals made by men and women across simple bargaining games.

2. There are no systematic differences in the size of the offer depending on the responder's gender across simple bargaining games.

3. Women process more contextual information than men when they make a decision as proposers in simple bargaining games.

2.2 Hypotheses for Responders

1. There are no systematic gender differences in the responder's decision across simple bargaining games.

[4] Since previous results are mixed, we have decided to formulate our first and second hypotheses in negative terms, i.e., we expect no systematic sex nor gender effect.

2. There are no systematic gender differences in the responder's decision depending on the proposer's gender across simple bargaining games.

3. Both female and male decisions as responders are not influenced by contextual information.

In the next section, the experimental design to test these hypotheses is presented.

3 Experimental design and procedure

3.1 General features

For the experiment, 280 undergraduate students were recruited (from different disciplines) at Jena University, using ORSEE 2.0 (Greiner 2004). Eight experimental sessions were conducted, each using a different group of 32 participants (16 women and 16 men). Instructions of the experiment can be found in Appendix A. The experiment was programmed and conducted with the software z-Tree (Fischbacher 2007) at the computer laboratory of the Max Planck Institute of Economics (Jena, Germany). Subjects received written instructions, which were also read aloud by a research assistant to ensure everyone understood them. No communication between subjects was permitted. Subjects could not identify which other participant they were interacting with. At the end of every experimental session, subjects were paid in cash according to their payoff in the game (plus a show-up fee of 2.5€).[5]

The time sequence of every experimental session was as follows: In the main entrance of the laboratory there were two boxes containing two series of numbers (odd numbers for men and even numbers for women), and subjects picked them randomly.[6] Subjects were individually asked to pick a piece of paper from their corresponding gender box, and to sit down in front of the computer displaying

[5] Two weeks before conducting the real experiment, 32 subjects took part in a pilot session to test the instructions and the experimental procedure. Although the pilot was conducted successfully, the introduction of one minor change in the real experiment recommends not using the results of the pilot in the data analysis. This minor change will be explained below.

[6] In the pilot, subjects were aware that one box contained numbers for women and the other numbers for men. However, in order to minimize the so-called 'demand effect', in the real experiment the boxes' labels were omitted. This minor change seems to have a relative effect in subjects' perception of the experiment. Whereas in the pilot session 12 out of 32 participants (37.5%) guessed the topic of the experiment in a postexperimental questionnaire, in the real experiment only 40 out of 280 participants (14%) guessed it. We will extend below on how we overcame the potential demand effect.

the number they had taken. This procedure allowed us to ensure anonymity and random allocation of participants to computer terminals, while, at the same time, obtaining the sort of gender matching we were interested in. In every session we used the same matching procedure, consisting of four different gender combinations: men interacting with men (MM), men interacting with women (MF), women interacting with men (FM), and women interacting with women (FF). After the instructions were read aloud, and research assistants answered questions privately, the experimental tasks started. In the following, we explain each phase of the experiment sequentially.

3.2 Socio-demographic questions

As in every experiment interested in studying "gender pairing effects", the crucial issue of the design is how to communicate the partner's gender without inducing a "demand effect". To accomplish this, we use one of the procedures used by Holm (2000), consisting in providing the gender information embedded in a broader description of the co-player. Thus, the first task of the experiment was filling in three questions in the computer screen:

- Which semester are you in?
- Are you originally from Jena?
- Are you female or male?

The first one was a familiar, but theoretically irrelevant question, aimed to make more difficult for participants to guess the aim of the experiment. This information was never conveyed to the partners. On the contrary, the information about the partner's origin was always provided, whereas the information about the partner's gender was only provided in the treatment condition, but not in the control one.

3.3 Gender information

In the instructions we asked participants to check their role in a table located in the upper-right corner of their computer screen. The table consisted of two columns (named "you" and "your partner") and two rows, one indicating their own and their partner's role, and one providing the "extra information". In the "extra information" row, participants could check the place of origin and the gender (treatment condition), or just the place of origin (control condition) of both participants. The four possible combinations in the treatment condition were: "male from Jena", "male not from Jena", "female from Jena", and "female not from Jena". In the control condition, they could either read "from Jena" or "not from Jena".

As stated before, we were specially concerned with not revealing the aim of the experiment. After having asked participants to guess it in a postexperimental questionnaire, we are sure this was not an issue. First, only 14% of the participants thought that gender was the main topic of the experiment, less than the proportion of subjects that alluded to other motives, like selfishness, fairness, or cooperation. Second, the proportion of participants that guessed the topic of the experiment was almost the same in the treatment and the control conditions (14.5% vs. 12.5%). We believe that reporting these data is necessary to avoid the possible confounding effect of gender stereotypes. If the majority of participants were aware of the theme of the experiment, this could have became a survey about subjects' political views, and not a test of the behavioral changes induced by gender information.

3.4 Game phase

According to a 2x2 between subjects factorial design, different participants took part in four different scenarios. In the first four sessions (128 participants), the subjects played a standard Ultimatum game (Güth et al. 1982) with gender information (UGT). The fifth session (32 participants) was a control session (without gender information) for the Ultimatum game (UGC). In the following three sessions (80 participants), the subjects played a Yes-or-No game (Gehrig et al., forthcoming) with gender information (YNT). The last session (32 participants) was a control session for the Yes-or-No game (YNC). Table 1 lists the main features of the experiment.

Table 1: Experimental design

	UGT	UGC	YNT	YNC
N^o of sessions	4	1	3[7]	1
N^o of participants	128	32	80	32
Date		06/21/07		
Game	UG	UG	YNG	YNG
Treatment	Yes	No	Yes	No
Average earnings	8.29€	8.08€	8.73€	8.73€

In both games, a proposer (called player X) proposed a way of sharing 100 ECUs (10 ECUs = 1€) between him or herself and another participant. The proposer could choose among nine different distributions ([10-90], [20-80], [30-70], [40-60], [50-50], [60-40], [70-30], [80-20], [90-10]). Whether the proposed distribution was actually earned by participants depended on the decision made by the responder (called player Y). If the responder accepted the offer, both participants got the corresponding number of ECUs, otherwise they got no payoff in this part of the experiment.

For responders in the Ultimatum game (UG hereafter), the strategy method (Selten 1967) was used. Every responder had to accept or reject every single potential offer. Thus, we can obtain the "minimum acceptable offer" (MAO), i.e., the minimum amount of ECUs that the responder was willing to accept. On the contrary, responders in the Yes-or-No game (YNG hereafter) had to decide if they accept or reject the offer before knowing it.[8]

3.5 Belief elicitation phase

After playing one of the two games just once, every participant was asked to predict the behavior of his or her partner. Our belief elicitation procedure is adapted from the one used by Schotter and Sopher (2007),[9] and worked as follows.

In both games, for the responder, we asked what they though the probability was of receiving every potential offer. Specifically, we asked them to enter a vector $r = (r_1, r_2, r_3, r_4, r_5, r_6, r_7, r_8, r_9)$, with $\sum_{k=1}^{9} r_k = 100$. Responders were rewarded using a quadratic scoring rule described in Appendix B.

[7] The third YNT session involved 24 subjects (12 females and 12 males).

[8] As in the paper of Gehrig et al. (forthcoming), all the responders accepted the offer in this game.

[9] This belief elicitation procedure, introduced by Nyarko and Sopher (2002), has been used successfully in other two studies (Schotter and Sopher 2004; 2006).

To elicit truthful beliefs from the proposer we use a similar procedure. We asked the proposer to assign a probability to the acceptance of the offer he or she actually proposed.[10] The proposer typed a single probability of acceptance (π_a^k). Proposers were rewarded using a quadratic scoring rule described in Appendix B.

Note that the belief elicitation procedure used is incentive compatible both for the proposer and for the responder (see Appendix B for a complete explanation). This method provides the best way of eliciting truthful beliefs without inducing behavioral changes in the participants. In addition, we made sure that the amount of money that could potentially be earned in the belief elicitation phase of the experiment was not very large, in order not to induce changes in the participants' behavior. In this sense, while the participants could earn a maximum of 100 ECUs in the game phase, they could only earned 20 ECUs in the prediction task.

4 Results

4.1 Descriptive statistics

In the following, a preliminary analysis of the experimental results is presented. Mainly we concentrate on the behavioral differences between men and women in both roles (proposer and responder). Here the results obtained from the UG and the YNG are analyzed separately. In the next subsection we pool the data from both games to perform regression analyses.

4.1.1 Proposers' behavior

Mean offers by gender pairing in both games are reported in tables 2a (UG) and 2b (YNG). On average, women offer less than men, both in the UG (39.5 vs. 44.25) and in the YNG (27.33 vs. 28.00), although none of these differences are statistically significant. Considering the gender of the responder, on average, men receive lower offers than women, both in the UG (41.87 vs. 45.62) and in the YNG (26.36 vs. 29.09). Again, these differences are not significant.

At a first glance, it seems that both the sex of the subjects and their partner's gender have no impact in proposer's behavior. However, when we explore the

[10] This is true for the UG. In the case of the YNG, the procedure is technically the same although the probability asked is not the one attached to the actual offer but to the fact of accepting any offer, since the responder does not know the actual proposal.

data to test how gender information affects each gender's behavior, the picture is somewhat different. In both games, women but not men change their behavior in the treatment condition. Thus, in the UG, when women have information about their partners' gender, they offer significantly more than when they do not have this information (Mann-Whitney U-test: $z = -1.966$, $p = 0.049$). We do not find the same pattern for men (Mann-Whitney U-test: $z = -0.428$, $p = 0.668$). Note that, in this case, gender information induces women to give more to both genders (indeed, they give on average exactly the same to both groups). Gender information also induces changes in the female but not the male proposers' behavior in the YNG. When having information about the partner's gender, women offer significantly more to women than to men (Mann-Whitney U-test: $z = -2.062$, $p = 0.039$). Gender information has no impact in male proposers' behavior in the YNG (Mann-Whitney U-test: $z = -0.174$, $p = 0.862$).

Table 2a

Offers by Type of Pair Average and Standard Error in the UG

	Responder			
Proposer	Male	Female	Sex Unknown	Average
Male	41.87	45.62	46.25	44.25
	(3.44)	(2.41)	(6.53)	(2.08)
Female	41.25	41.25	32.50	39.5
	(2.87)	(2.87)	(4.53)	(1.89)
Average	41.56	43.44	39.38	41.49
	(2.20)	(1.88)	(4.23)	(1.42)

Table 2b

Offers by Type of Pair Average and Standard Error in the YNG

	Responder			
Proposer	Male	Female	Sex Unknown	Average
Male	26.36	29.09	28.75	28.00
	(5.27)	(6.39)	(5.81)	(3.30)
Female	18.89	33.08	27.50	27.33
	(4.55)	(4.44)	(4.53)	(2.79)
Average	23.00	31.25	28.13	27.67
	(3.56)	(3.73)	(3.56)	(2.14)

4.1.2 Responders' behavior

Since everyone accepts the offer in the YNG, we present the data regarding the 80 subjects that play the role of responder in the UG. Specifically, table 3 reports the minimum acceptable offer (MAO) stated by every subject, i.e., the lowest offer that they are willing to accept when asked to accept or reject every potential offer. Again, there are no general differences if we consider which gender is willing to accept lower offers. Both genders demand almost the same (men 22.75 vs. women 22.50). Gender pairing has no effect either. Both genders demand slightly more to women than to men (22.81 vs. 21.56), but this difference is far from being significant. Only when observing the effect of the treatment, behavioral gender differences in responders' behavior appear. When having information about the partner's gender, women demand significantly less than they do when not having this information (Mann-Whitney U-test: $z = -2.33$, $p = 0.019$). This is not the case for men (Mann-Whitney U-test: $z = -0.860$, $p = 0.390$). Note that this effect in female responders' behavior is consistent with the one observed in female proposers in the UG. When women have information about their partners' gender, independently of the exact content of this information, they behave more sympathetic, i.e., they offer significantly more and demand significantly less.

Table 3
MAO by Type of Pair Average and Standard Error

	Responder		
Proposer	Male	Female	Average
Male	23.75	19.38	21.56
	(2.86)	(3.70)	(2.34)
Female	25.00	20.63	22.81
	(3.16)	(3.22)	(2.56)
Sex unknown	16.25	32.50	24.38
	(4.20)	(3.66)	(3.41)
Average	22.75	22.50	22.63
	(1.93)	(2.20)	(1.45)

4.2 Regression analysis

Now we consider our hypotheses. We are interested in studying gender differences across games and treatments. To this end, we study proposers' and responders' behavior using *ordered probit regression models* and controlling for all the socio-demographic and treatment variables that we can obtain from our design (see table 4). Both for proposers and for responders, we present three different regression analyses: one including the complete sample and controlling for the gender of the player and two separate analyses, one for each gender. This latter procedure tries to capture our third hypotheses: women and men make decisions in a (cognitively) different way. Table 4 reports the definition of the variables included in the regression models.

Table 4
Definition of Variables

Variable	Definition
Proposal	*Proposer's decision*
MAO	*Responder's minimum acceptable offer*
Female	1 if female
YNG	1 if playing the YNG
Treatment	1 if gender information is provided
Experience	The semester the subject is attending
City	1 if the subject is not from Jena
City pairing	1 if the partner is not from Jena
Female pairing	1 if the partner is female
Decision time	N^o of seconds needed to make the decision
Prediction time	N^o of seconds needed to make the prediction

Note: Dependent variables in italics.

4.2.1 Proposers' behavior

Table 5 reports the regression analyses for proposers' behavior. We study our first and second hypotheses for proposers looking at the first of the three models presented. Regarding these hypotheses, our main results are:

Result 1: Female proposers make weakly significant lower offers when controlling for other seven socio-demographic and treatment variables.

Result 2: The gender of the responder does not affect significantly the size of the offer when controlling for other seven socio-demographic and treatment variables.

Apart from these two results –directly related to our hypotheses– we find other two variables that affect significantly the size of the offer. Both variables behave in an expected way. First, offers are significantly lower in the YNG than in the UG, what is in line with the findings of Gehrig et al. (forthcoming). Second, students in advanced stages of their degree behave closer to the game theoretical prediction. This fact could be related to the number of previous participations in economic experiments. Unfortunately, due to anonymity conditions, we cannot check if this is the case.

Now we are interested in how men and women face the proposer's decision. To this end, we compare the second and third models presented in table 5. That the social context of the experiment influences females, but not males proposer's behavior is clear. Contextual information –whether they have gender information, the origin of the responder, and the gender of the responder– has a weekly significant impact on the size of female offers. Women offer more when they know the partner's gender, when they know precisely the city of origin of the responder[11], and when they know that the responder is a woman. In the next section, we interpret these results in terms of empathy.

For men, contextual information is not important at all . On the contrary, individual variables like the semester they are attending and the own origin are significant.

Result 3: Contextual information influence female but not male proposers' behavior.

Finally, the structure of the game definitely influences both male and female offers in the sense described above.

[11] We assume that being from Jena is a more precise piece of information that not being from Jena. Students living in this city can represent in their mind a much more accurate picture of people "from Jena" than of people loosely defined as "not from Jena".

Table 5

Ordinal probit regressions on proposers' decisions

	Both genders		Male		Female	
Ind. variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Female	-0.320	0.186*	(Dropped)		(Dropped)	
YNG	-0.997	0.194***	-1.159	0.288***	-0.965***	0.276
Treatment	0.251	0.220	0.000	0.307	0.575*	0.322
Experience	-0.065	0.028**	-0.085	0.041**	-0.069	0.044
City	-0.447	0.304	-0.729	0.381*	0.529	0.603
City pairing	-0.020	0.238	0.363	0.338	-0.689*	0.373
Female pairing	0.258	0.183	0.131	0.257	0.481*	0.271
Decision time	0.000	0.004	0.003	0.006	-0.006	0.007
Numb of obs	140		70		70	
Prob > chi2	0.000		0.002		0.001	

Significance levels: $*** < 0.01$ $** < 0.05$ $* < 0.1$

4.2.2 Responders' behavior

When considering responders' behavior we can only analyze the UG, since the homogeneous pattern of acceptance in the YNG makes the responders' behavior in this game trivial. In contrast, responders' behavior in the UG draws quite interesting results (table 6). Regarding our two first hypotheses for responders, and looking at the first model presented, we obtain the following results:

Result 4: The gender of the responder is not significantly correlated with the size of the minimum acceptable offer (MAO) in the UG.

Result 5: The gender of the proposer is not significantly correlated with the size of the minimum acceptable offer (MAO) in the UG.

Table 6

Ordered probit regressions on responders' decisions

	Both genders		Male		Female	
Ind. variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Female	-0.116	0.275	(Dropped)		(Dropped)	
Treatment	0.085	0.331	0.734	0.529	-0.280	0.498
Semester	0.063	0.045	0.033	0.061	0.109	0.082
City	0.024	0.382	-0.601	0.632	0.475	0.529
City pairing	-0.800	0.466	-0.541	0.559	-8.250	
Female pairing	-0.236	0.264	-0.077	0.387	-0.306	0.405
Decision time	0.026	0.007***	0.025	0.013*	0.023**	0.009
Numb of obs	80		40		40	
Prob > chi2	0.010		0.182		0.021	

Significance levels: $* * * < 0.01$ $** < 0.05$ $* < 0.1$

Now we consider if contextual information matters for female or male responders. To do this, we focus on the second and third model presented. We find that:

Result 6: Contextual information does not influence either male or female behavior in the UG.

Apart from the results we are interested in, we find an interesting correlation between the time subjects take to make a decision and the decision itself. In this case, the longer they take, the higher the MAO.[12]

From a methodological point of view, it is quite interesting to see how the impact of knowing the partner's gender on female responders' behavior reported in the previous subsection vanishes when controlling for other five variables.

Once we have tested our main hypotheses, and before discussing them, we study gender differences in beliefs.

4.3 The analysis of beliefs

In the experiment, we elicited the probability attached by every proposer to the acceptance of his or her offer. The data show that there are no significant

[12] The relation between response time and decisions in the UG and the YNG is analyzed in Brañas-Garza et al. (2007).

gender differences in the proposers' beliefs. Thus, even controlling for the size of the offer in the UG, women and men do not differ significantly in what they think about the probability of a given offer being accepted (figure 1a). Proposers's beliefs in the YNG do not differ significantly by gender either (figure 1b). However, although there are not quantitative differences in the probabilities stated by women and men, we can observe how women are more aware of the strategic advantage of the proposer in the YNG. This fact can be observed in figure 1b, and comparing the average female stated probability of acceptance (0.89) with the male one (0.85) in the YNG.

Figure 1a
Stated probability of acceptance in the UG

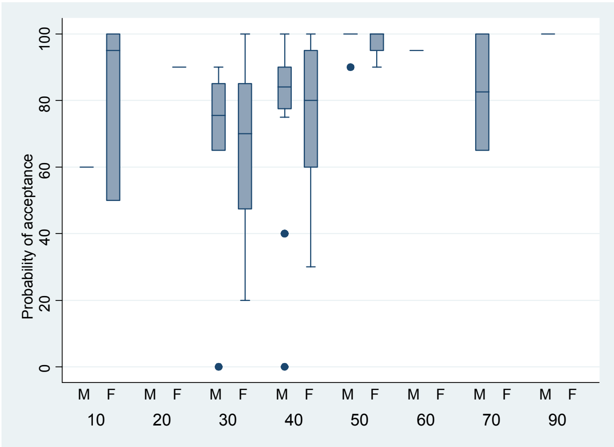
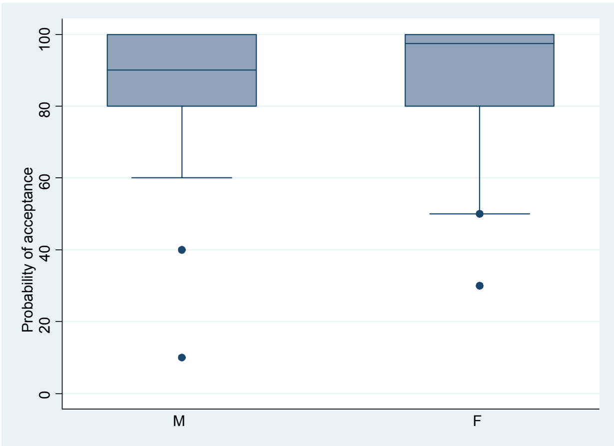


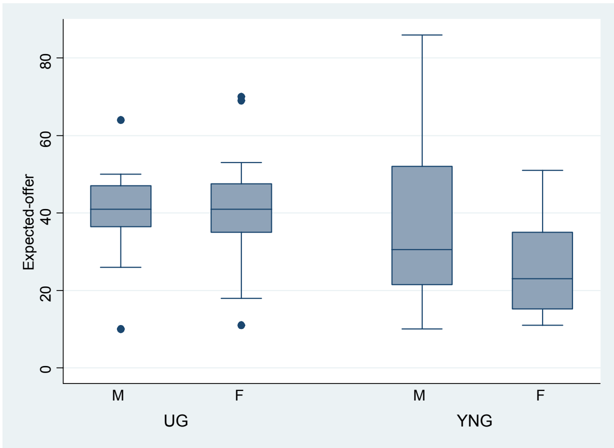
Figure 1b
Stated probability of acceptance in the YNG



On the responders' side, we elicited the probabilities attached by every subject to every potential offer. From these data, we compute the mean expected offer for every subject (figure 2). The analysis of responders' beliefs give us additional clues to interpret gender differences in experimental games. Whereas in the UG there are no differences, i.e., female and male proposers expect on average the same amount of money, women anticipate better the proposer's strategic advantage in the YNG. In this game, women, on average, expect much less than men (25.78 vs. 41.14). This difference is statistically significant (Mann-Whitney U-test: $z = 2.477$, $p = 0.013$).

Figure 2

Expected offer by game



5 Interpreting the results: the role of empathy

In this section we provide a possible explanation for our main results: female but not male proposers are affected by contextual variables, and women are better in anticipating others' behavior in certain conditions. Specifically, we connect our findings with the growing interest in cognitive neuropsychology to examine the neural mechanisms underlying the human capacity to mentalize, i.e., the ability to make attributions about the desires, beliefs, and intention of others. This evidence can shed some light on differences between men and women in simple experimental situations.

As Singer and Fehr (2005) have pointed out, 'economist still know little about what enables people to put themselves into other's shoes and how this ability interacts with their own preferences and beliefs.' In our experiment, when strategic considerations are important, women are affected by the social cues (the partner's gender and origin) contained in the environment. This fact might be explained by the specific cognitive mechanisms that interact with women's social preferences. In fact, most of these cognitive processes are known to be related to strategic decision making.

One of the most important social skills involved in predicting others' behavior is empathy. Empathy allows one to quickly, and automatically relate to the emotional state of others, which is something essential for the regulation of social interaction toward shared goals (Preston and de Wall 2002). Two components should be distinguished in empathy: the affective component, i.e., the ability to share the emotional experience of others; and the cognitive component –'cognitive empathy'–, i.e., the understanding of the others' mental states (Decety and Jackson 2004). According to this latter dimension, empathy requires a mental capacity: a social-cognitive ability to explain the behavior of others by attributing to them independent mental states, such as belief, desires, emotions or intentions (Decety and Jackson 2004; de Waal forthcoming; 1996; Gallagher and Frith, 2003).

What is the connection between our results and empathy? Women but not men are sensitive to the contextual information, namely the gender and the origin of the partner. Understanding these data in terms of empathy leads us to the importance of social closeness when empathizing. The more familiarity and similarity with the object –e.g. being of the same specie, age or sex– the more empathy experimented (de Vignemont and Singer 2006). This effect is in agreement with one result obtained in our experiment: women offer more when they know the partner's gender and origin, and when they know that the responder is another woman.

Familiarity and similarity have been already discussed by behavioral economists. Physical similarity and social closeness have been studied in terms of social distance. Hoffman et al. (1996) argue that a decrease in social distance could induce reciprocity. Bohnet and Frey (1999) allude to identification, not reciprocity when explaining giving behavior in a dictator game. In contrast, Hoffman et al. (1999) consider that these two results are compatible, since identification and reciprocity are linked. Small and Loewenstein (2003) conclude that simply indicating that there is a specific victim without providing any personal information increases caring. But the evidence about the "identifiable victim effect" is mixed, and different results depend on the specific form of the identification mechanism (Güth et al. 2007).

In our experiment, what results clearly show is how the contextual appraisal is relevant for women in one particular situation. Female players use the given information about their partner when they face a strategic decision. Women playing as proposers process as much information as possible, because their decision has to be aware of the responder's veto power. In this scenario, knowing more about the responder was valuable for them but not for men. In this sense, we find support for the claim that when women have to make a decision considering the behavior of others, cognitive mechanisms related to empathizing and mentalizing processes are activated.

According to the empathizing-systemizing (E-S) theory of sex differences (Baron-Cohen 2005), a stronger systemizing is present in males, i.e., the drive to analyze a system in terms of the rules that governs the system in order to predict the system. Empathizing is higher in females[13] –because of the higher interhemispheric connectivity–, which is the drive to identify the mental states of others in order to predict and to respond to the behavior of another person (Baron-Cohen et al. 2005).

Furthermore, neuroscientists have identified the relationship between sex hemispheric lateralization and contextual appraisal. Cahill (2003) shows how the right hemisphere amygdala modulates right hemispheric processing of central aspects of a situation, while the left hemisphere amygdala modulates left hemispheric processing of contextual details of a situation. The latter effect is more pronounced in females, whereas the former in males.

Our results, and the interpretation provided above, suggest that the mixed results on gender differences in social preferences might be analyzed in terms of differences in mentalizing and empathic capacities between the two sexes. One main difference we have tested is the higher sensitiveness of women to the information provided during the experiment. But further attention to both abilities is needed to understand how men and women perceive social situations when making strategic decisions.

[13] Many experiments underline how sex differences related to empathy and emotion regulation processes –showing a female superiority– are partly biological in origin (Jackson and Decety 2004; Seifritz et al.; 2003; Baron-Cohen and Wheelwright, 2004; Baron-Cohen et al., 2005, de Vignemont and Singer 2006). Ickes (1997), on the contrary, stresses on motivational factors. But this natural difference has been observed in the youngest infants (Lutchmaya and Baron-Cohen 2002; Lutchmaya et al. 2002); and gender differences are even found in human neonates (Conellan et al. 2001).

6 Conclusion

This paper has studied the differences between men and women in social preferences, in the context of two experimental bargaining games. Our results are in line with several recent papers: we find no systematic quantitative gender differences. Hence, instead of treating any behavioral gender difference as a consequence of differences in female and male preferences, we concentrate on how cognitive mechanisms impact women's and men's decision making. We find that when women face a strategically relevant situation, they gather as much contextual information as possible, while men are not affected by this information. In contrast, when information is strategically irrelevant, like in the case of the responder in the UG and the YNG, both men and women behave similarly.

We have connected our results with recent neuropsychological research on female empathy. Women need information about the partner, "putting in the other's shoes", to behave in a more sympathetic way. Thus, female proposers in our experiment offer higher amounts when they know precise information about their partner. When they do not know this information they behave even greedier than men. This interpretation of female proposers' behavior might be important for interpreting other experimental results, since we are suggesting that information provided in the experimental context may affect women and men differently. This is an interesting hypothesis that deserves further attention, but recent investigations in neuroscience and neuropsychology show that the cognitive mechanisms behind empathy work quite differently in male and female minds.

The analysis of participants' beliefs about their partner's behavior seems to support our main conclusion. Under certain circumstances, women are better in predicting others' behavior than men. Thus, whereas we find no differences in how women and men predict other's behavior in the UG, we find interesting differences in the YNG. Female proposers, on average, anticipate responder's behavior better than men, although this difference is not statistically significant. Furthermore, we find a strong significant difference in the way male and female responders' predict proposers' behavior. Women are much more aware of the strategic advantage of the proposer in the YNG. The higher the level of uncertainty is, the better women predict others' behavior.

To conclude, we have to note that our results refer to strategic situations where contextual information is provided. In this context, women use cues contained in the social environment to make decisions. If this is the case in other contexts, it is an interesting line of enquiry for future research.

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Appendix A: Experimental instructions[14]

Game instructions

Both games

Welcome and thank you very much for participating in this experiment. Please read the instructions carefully. If you have any questions or concerns, please raise your hand. It is strictly forbidden to communicate with other participants during the experiment. It is very important that you follow this rule. Otherwise we must exclude you from the experiment and from all payments. Should you have any question, please raise your hand and we will answer it individually.

During the experiment, we use ECU (Experimental Currency Unit) instead of euro. At the end of the experiment, the ECU you have earned, will be

[14] This is a translation of the original German instructions. Note that the instructions for the game phase were given in printed sheets, whereas the instructions for the belief elicitation phase were only shown in the computer screen.

converted to euro (10 ECU = 1€) and the obtained amount will be paid to you in cash.

In this experiment, two participants will interact with each other just once. Each of the two members of a pair will be randomly assigned one of two roles: X or Y. In the top right corner of the computer screen, you can read which role (either X or Y) has being assigned to you and to your partner.

Each pair can share 100 ECU. X has the right to propose the distribution of the 100 ECU. In particular, X chooses the distribution (x, y) meaning that X wants to keep x ECU for him/herself, and to give y ECU to Y. More specifically, X can choose any of the following 9 distributions:

x	10	20	30	40	50	60	70	80	90
y	90	80	70	60	50	40	30	20	10

Ultimatum game

Y must decide for each possible distribution of the 100 ECU, if he or she accepts or rejects it. Thus, Y will face the following table:

x	10	20	30	40	50	60	70	80	90
y	90	80	70	60	50	40	30	20	10
Accept									
Reject									

For each possible distribution, Y must specify if he or she accepts or rejects it by checking the corresponding box (thus Y is required to make 9 decisions).

After X and Y have made their choices, their payoffs are determined as follows:

- If Y has accepted the actual proposal by X, then both get what X has proposed, i.e., X earns x and Y earns y.
- If Y has rejected the actual proposal, then both earn nothing, i.e., the 100 ECU are lost.

Yes-or-No game

Without knowing which of the 9 possible proposals X has chosen, Y must accept or reject it.

After X and Y have made their choices, their payoffs are determined as follows:

- If Y has accepted, then both get what X has proposed, i.e., X earns x and Y earns y.
- If Y has rejected, then both earn nothing i.e., the 100 ECU are lost.

It must be emphasized that Y **does not know** the actual distribution (x, y) proposed by X when deciding whether to accept or reject it.

Both games

At the end of the experiment, the actual payoff will be paid out in cash, together with the show-up fee of €2.50 for having shown up on time.

Belief elicitation instructions

Belief elicitation procedure for responders

Now you will be given the opportunity to earn additional money by predicting the choices of your partner. Please, answer the following question:

- On a scale from 0 to 100, how likely do you think it is that the other member of your pair has chosen every of the following 9 distributions?

x	10	20	30	40	50	60	70	80	90
y	90	80	70	60	50	40	30	20	10
%									

You must select for each distribution a number from 0 to 100. Moreover, the sum of the numbers that you provide **must be exactly** 100.

For example, suppose that you think there is a 30% chance that your partner has chosen distribution 10-90, a 25% chance that your partner has chosen distribution 40-60 and a 45% chance that your partner has chosen distribution 50-50. In this case, you will enter 30 in the box under the 10-90 distribution and 25 and 45 in the 40-60 and 50-50 distributions, respectively.

You will earn up to 20 ECUs for your predictions according to a specific payoff function that guarantees that the more accurate your prediction is the more the ECUs you earn. This implies that the higher the probability stated in the distribution your partner has chosen the higher your payoff. And, vice versa, the higher the probabilities stated in the other distributions, the lower your payoff. If you want to check this payoff function please raise your hand and we will show you privately.

Note that since your prediction is made before you know what your partner has actually chosen, the best thing you can do to maximize the expected side of your prediction payoff is simply state your true expectations about what you think your partner has done. Any other prediction will decrease the amount you can expect to earn as a prediction payoff.

Note also that you cannot loose money from making predictions, you can only earn more ECUs. The worst thing that could happen is that you predict that your partner has chosen one particular action with 100% certainty but it turns out that the he or she actually chose a different action. In this case, you will earn 0 ECUs. In all other situations, you will earn a strictly positive number of ECUs.

Belief elicitation procedure for proposers

Now you will be given the opportunity to earn additional money by predicting the choices of your partner. Please, answer the following question:

- On a scale from 0 to 100, how likely do you think it is that your partner has accepted your offer (the offer in the YNG)?

Accepted

You must select a number from 0 to 100.

You will earn up to 20 ECUs for your predictions according to a specific payoff function that guarantees that the more accurate your prediction is the more the ECUs you earn. If you want to check this payoff function please raise your hand and we will show it to you privately.

Note that since your prediction is made before you know what your partner has actually has chosen, the best thing you can do to maximize the expected side of your prediction payoff is simply state your true expectations about what you think your partner has done. Any other prediction will decrease the amount you can expect to earn as a prediction payoff.

Note also that you cannot loose money from making predictions, you can only earn more ECUs.

Appendix B: Belief elicitation procedures[15]

Belief elicitation procedure for responders

Let $r = (r_1, r_2, r_3, r_4, r_5, r_6, r_7, r_8, r_9)$ indicated the reported beliefs of the responders. Remember that these are the responder's belief that he or she will receive every potential offer $(90, 80, 70, 60, 50, 40, 30, 20, 10)$. Since only one such amount will actually be sent, the payoff to player Y (the responder) when the amount m is chosen will be:

$$\Pi_m = 20.000 - \left\{ (100 - r_m)^2 + \sum_{k \neq m} (r_k)^2 \right\}$$

Note that this function says. A subject starts out with 20.000 points and states a belief vector $r = (r_1, r_2, r_3, r_4, r_5, r_6, r_7, r_8, r_9)$. If his or her partner chooses to send the amount m, then the subject would be best off is he or she had put all the probability weight on m. The fact that he or she assigned it only r_m means that he or she has made a mistake. To penalize this mistake we subtract $(100 - r_m)^2$ from the subject's 20.000 endowment. Further, the subject is also penalized for the amount he or she allocated to the other eight potential offers, by subtracting $(r_k)^2$ from his or her 20.000 points endowment as well. The worst possible guess, i.e. putting all your probability mass on one potential offer to have your partner chooses another, yields a payoff of 0. Telling the truth is optimal.[16]

Belief elicitation procedure for the proposer

The proposer types only one probability (Π_a^k), where k is the index of one of the 9 potential offers. This is the probability that the proposed offer will be accepted. In addition, let define (Π_r^k) as the complementary probability that the offer will be rejected. From this point on the payoffs are determined by a quadratic scoring rule. The proposer's prediction payoff would be defined as follows:

[15] The procedure and its description is directly adapted from Schotter and Sopher (2007).

[16] We use exactly the same scoring rule as Schotter and Sopher (2007). In order to calculate our participants' payoffs in ECUs, we divided the resulting amount by 1.000. Only 6 out of 280 participants asked to check the payoff function. Therefore, we guarantee telling the truth to participants (that the better their prediction, the higher their payoff in the prediction task), without asking them to perfectly understand the technical procedure.

$$\Pi_k = 20.000 - \left\{ \left(100 - \Pi_a^k\right)^2 + (\Pi_r^k)^2 \right\}$$

In other words, if the offer was accepted but the proposer only predicted that it would be accepted with probability Π_a^k, the payoff function penalizes him or her by subtracting $\left(100 - \Pi_a^k\right)^2$ from his or her 20.000 point endowment. It also subtracts $(\Pi_r^k)^2$ since that is the probability predicting that the offer will be rejected which it was not. An analogous payoff can be defined if the offer was rejected.