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Are Women More Sensitive to the Decision-Making Context?

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# Are Women More Sensitive to the Decision-Making Context?\*

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## Abstract

We conduct an experiment to assess gender differences across different economic contexts. Specifically, we test whether women are more sensitive to the decision-making context in situations in which different fairness principles can be used. We find that women adopt more often than men conditional fairness principles that require information about the context. Furthermore, while most men adopt only one decision principle, most women switch between multiple decision principles. These results complement and reinforce Croson and Gneezy's organizing explanation of greater context sensitivity of women. Keywords: Context-sensitivity, Distributive Justice, Gender differences. *JEL classification:* D63, C91.

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# 1 Introduction

A large number of experimental studies in Economics and Psychology have documented gender differences in preferences (Croson and Gneezy 2009). For example, women have been found to be less prone to competition (Gneezy et al. 2003; Niederle and Vesterlund 2007) and more risk averse in most contexts (Eckel and Grossman 2008). These differences are primarily based on comparisons between the aggregate behavior of men and women in a wide variety of experimental contexts. In contrast, there are few studies that look at gender differences at the individual level, and even fewer that explicitly address the important question of the interaction between individual characteristics, e.g. gender, and the (experimental) context.<sup>1</sup>

Croson and Gneezy (2009: 455) hypothesize that changes in the experimental context may indeed explain apparently contradictory results on gender differences in preferences. This hypothesis has received support from a few studies. Cox and Deck (2006) compare the behavior of men and women in dictator and trust games and find a higher sensitivity of women to different experimental contexts. Moreover, the results of Buchan et al. (2008) suggest that the nature of the experimental task will influence the level of cooperation extended by either gender. Yet, none of these papers provides a comprehensive analysis of the interaction between the gender of the decision-maker and the the social context in which decisions are made.

This paper aims to test Croson and Gneezy's hypothesis by use of a within-subject experimental design. In this study, the decisions of men and women are systematically compared in relation to changes in the experimental context. In order to do so, we have participants confronting twenty distribution decisions, each preceded by a real-effort task. The total amount of money to be distributed depends on participants' effort in the task as well as sheer luck. This makes the twenty decision

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<sup>1</sup>Andreoni and Vesterlund (2001) is an important exception.

contexts potentially different, in the sense that individual effort may vary between participants and sheer luck plays a role.

To interpret participants' decisions in a changing context, we refer to the literature on distributive justice in real-effort experiments (Konow 2003). This literature has shown that different people adopt different fairness principles in distribution situations (Konow 2000; Frohlich and Oppenheimer 2004; Cappelen et al. 2007; Becker and Miller 2009). Such a multiplicity of fairness principles can also be expected in this experiment. Before the distribution phase, participants learn their contribution to the production of the good that is to be distributed, and information on contributions allows participants to use several principles of justice (Konow 2003). For example, some participants may decide that all participants deserve to be rewarded equally, and other participants that distributions are to be merit-related or entitlement-based.

Interestingly, the experimental literature on fairness principles has also shown that people switch between different principles when the context changes (Messik and Sentis 1979; Babcock et al. 1995; Konow 2000; Ubeda 2010). This is important for this paper, since this study aims ultimately to demonstrate that women are more sensitive than men to relevant information provided in the experiment, and that women change their behavior according to that information.

Two sets of findings are reported here consistent with the idea that women are more sensitive to the decision context. First, women adopt more often than men conditional fairness principles that require information about the context. Second, while most men adopt only one decision principle, most women switch between multiple decision principles. These results complement and reinforce Croson and Gneezy's organizing explanation of greater context sensitivity of women.

The rest of the paper proceeds as follows. Section 2 describes the experimental

design as well as the fairness principles used in this work. In section 3, we use Croson and Gneezy’s hypothesis to derive some predictions for this experiment. In section 4, the results of the experiment are presented. Finally, section 5 discusses the results and concludes.

## 2 Experimental Design and Procedures

To study gender differences in context sensitivity, we analyze, focusing on gender, the experimental data reported in Ubeda (2010). Participants were 60 undergraduates (30 men, 30 women), recruited via the on-line recruitment system ORSEE (Greiner 2004) from a wide range of disciplines at the University of Oxford. The experiment was programmed and conducted using z-tree (Fischbacher 2007). Participants received £6 for taking part in a ‘Decision Making Study’ lasting approximately 90 minutes. They were also told that their total earnings would depend upon their decisions and other participants’ decisions during the experiment. The average earnings per participant were £11.5 and ranged from a minimum of £6 to a maximum of £26.

The experiment consists of 20 one-shot pure distribution games with production. In each one-shot, participants play two phases. At the beginning of the first phase random pairs are formed, and the same two subjects take part in the first and the second phase. In the first phase participants perform a real effort task; in the second phase, they make a pure distribution decision.

The goal of the production phase is to induce a feeling of entitlement by using a real-effort task. The real-effort task consists of a series of puzzles in which the letters of a word have been scrambled. Subjects have to unscramble as many puzzles as they can out of ten. Individuals are endowed with initial endowments corresponding

to their effort in this phase. For each word they correctly unscramble they receive four tokens. Individual and group endowments are common knowledge.

After the production phase, a random shock is introduced. Each individual outcome has an independent 50% probability to be affected. The shock halves participants' endowment, thus the group endowment is also reduced. In this experiment, both discretionary and non-discretionary variables can potentially differ among subjects, therefore changing the context in which decisions are made.

In the second phase, participants make a pure distribution decision. Both members of the group have to decide anonymously how to distribute, between them, the joint benefits after the shock -if a shock has occurred at all. They do not receive any feedback until the end of the experiment, preventing them from forming expectations about others' behavior, so trying to rule out reciprocity.

In every one-shot, participants are randomly paired with another participant in the room. A random stranger mechanism is used. At the end of the experiment, the computer randomly chooses one period and one decision for each pair to be paid. The exchange rate is 3 tokens=1 pound.

After the experiment, participants' decisions are classified according to several fairness principles. In this paper, we use the definition of fairness ideals proposed by Cappelen et al (2007) to evaluate subjects' decisions. The three fairness ideals are then defined as:

Strict egalitarian:

$$m^{SE}(a, q) = \frac{X(a, q)}{2} \tag{1}$$

Liberal egalitarian:

$$m^{LE}(a, q) = \frac{q_1}{(q_1 + q_2)} X(a, q) \quad (2)$$

Libertarian:

$$m^L(a, q) = a_1 q_1 \quad (3)$$

$m^k \in \{m^{SE}, m^L, m^{LE}\}$  represents the different fairness ideals, and it corresponds to the amount a particular subject keeps for herself.

$X(a, q)$  represents the final outcome to be distributed, and it comes from the amount produced by both subjects  $i$ , where  $i \in \{1, 2\}$ . In this case the outcome could be affected by two variables: discretionary ( $q$ ) and exogenous ( $a$ ) variables.

$$X(a, q) = x_1(a_1, q_1) + x_2(a_2, q_2) \quad (4)$$

$$x_i = a_i q_i \quad (5)$$

In this experiment,  $a$  is determined by an external shock, which subjects have no control over. In contrast,  $q$  corresponds to subjects' effort in the production phase, which of course can be discretionally affected by subjects.  $a$  and  $q$  take the following values:

$$a \in \{0.5, 1\} \quad (6)$$

$$q \in [0, 40] \quad (7)$$

Variables  $q$  and  $a$  potentially change across the 20 one-shot games producing heterogeneity in the final outcomes. This heterogeneity allows us to study the different decision principles that men and women use. In particular, participants' effort to produce the money to be distributed as well as the external random component may change in every game. Effort and luck are two key variables for the emergence of fairness principles in distribution situations (Konow 2003).

### 3 Predictions

In this section, Croson and Gneezy's organizing explanation is used to make two working hypothesis about the behavior of men and women in this experiment. These authors argue: 'We believe that the cause of these conflicting results is that women are more sensitive to cues in the experimental context than are men. [...] Small differences in experimental design and implementation will thus have larger impacts on female participants than on male participants' (p. 463). In our repeated distribution-game experiment this would mean that:

**Hypothesis 1.** Women on average react more often to changes in the social context of the experiment.

By changes in the social context of the experiment, we mean changes in the levels of the endogenous (effort) and exogenous (shock) variables. To put it differently, we hypothesize that while men disregard information on performance and the occurrence of the random shock, women use both pieces of information and change their behavior accordingly.

**Hypothesis 2.** Individual women adopt on average a larger number of decision principles.

Four decision principles are considered. On the one hand there is pure selfishness, on the other there are the three fairness principles described in section 2. We hypothesize that while men stick to one of the principles, women switch between different principles. Note that this hypothesis requires a within-subject analysis of participants' decisions.

## 4 Results

The data comprise 5 experimental sessions involving a total of 30 women and 30 men. Each session lasted for 20 periods. Given that each subject makes a decision in each of the 20 periods, we have a total of  $20 \times 30 = 600$  distribution decisions for each gender. Before testing our two hypotheses about distribution behavior, we report and compare the performance of men and women in the twenty repetitions of the real-effort task.

### 4.1 Relative performance in the real-effort task

Figure 1 shows the performance of men and women in the real-effort task across periods. Differences in performance across periods reflect the different levels of difficulty in the set of puzzles participants are asked to solved. The performance of men and women look remarkably similar; on average, women solved 6.01 puzzles per period, and men 6.03. Using a random-effect linear regression and controlling for the period, the performances of men and women are not significantly different (see Table 1 in appendix A). This result is consistent with the findings of previous papers that

show that there are no gender differences in performance in noncompetitive tasks (Gneezy et al. 2003; Niederle and Vesterlund 2007). Additionally, no decay over time is observed in the performance of men and women.

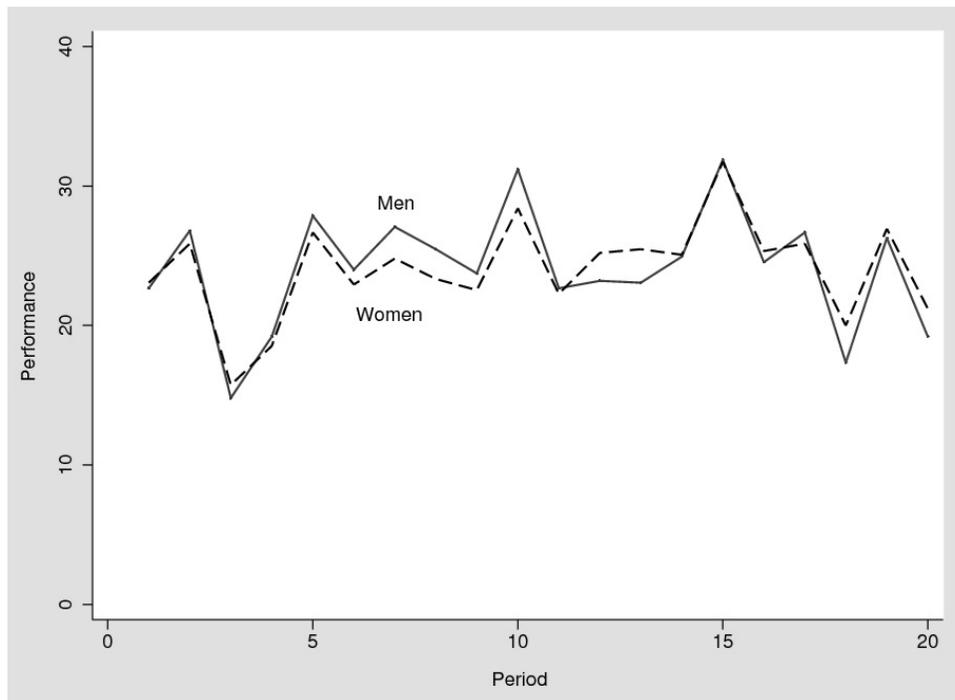


Figure 1: Average performance by period

The fact that there are no gender differences in performance allows us to focus exclusively on the distribution phase. On average men and women reach the distribution phase with the same endowment, so no gender bias is transferred into the second part of the experiment.

## 4.2 Overall differences between genders

Figure 2 plots the average relative amount that participants keep in the distribution phase. In sharp contrast to performance data, we find clear gender differences in distribution behavior. In each and every period, men on average keep a larger share of the total amount than women do. Across periods, women keep fourteen

percentage points less than men (73% vs. 87%). Using a random-effect regression model and controlling for the period, the result that women keep less than men is significant at any conventional statistical level (see Table 1 in the Appendix A). This result is consistent with the findings of some experimental papers on generosity (Eckel and Grossman 1998). However, other studies do not find gender differences in generosity (Bolton and Katok 1995).

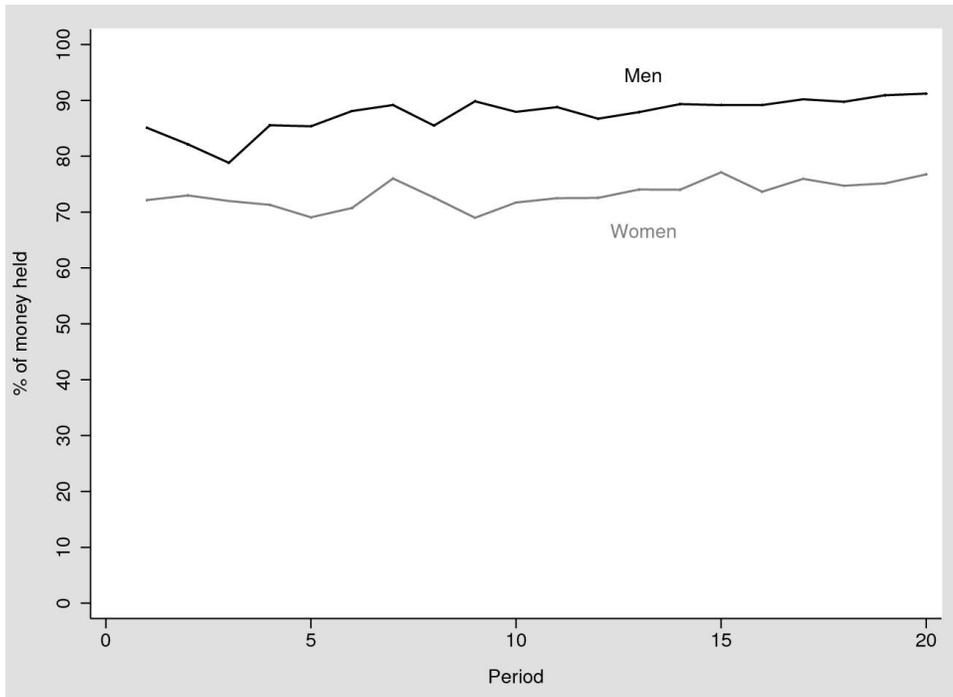


Figure 2: Average relative amount participants keep

An average decision across individuals and periods is a very bold measure of participants' behavior, especially if our working hypotheses are correct and gender differences vary with the context. To understand whether this is so, in the next section we distinguish between two types of decision rules that people may adopt in this experiment. Participants may adopt *unconditional rules*, such as *pure selfishness* and *strict egalitarianism*, that do not require information about the context of the decision, i.e., information about individual efforts and the result of the random shock. On the other hand, people may adopt *conditional rules*, such as *liberal egal-*

*itarianism* and *libertarism*, that do require information about the previous phase of the experiment. Based on our first hypothesis, we expect a higher frequency of conditional decisions in women.

### 4.3 Gender differences in allocation rules

Figure 3 reports the frequency of different allocation rules by gender. A majority of men’s decision (60.2%) are purely selfish, and men rarely display egalitarian or conditional behaviors. In sharp contrast, women take more egalitarian (27.8%) than selfish (25.3%) decisions, and they also adopt a conditional principle, either liberal egalitarian or libertarian, in 12.5% and 14% of the cases respectively.<sup>2</sup>

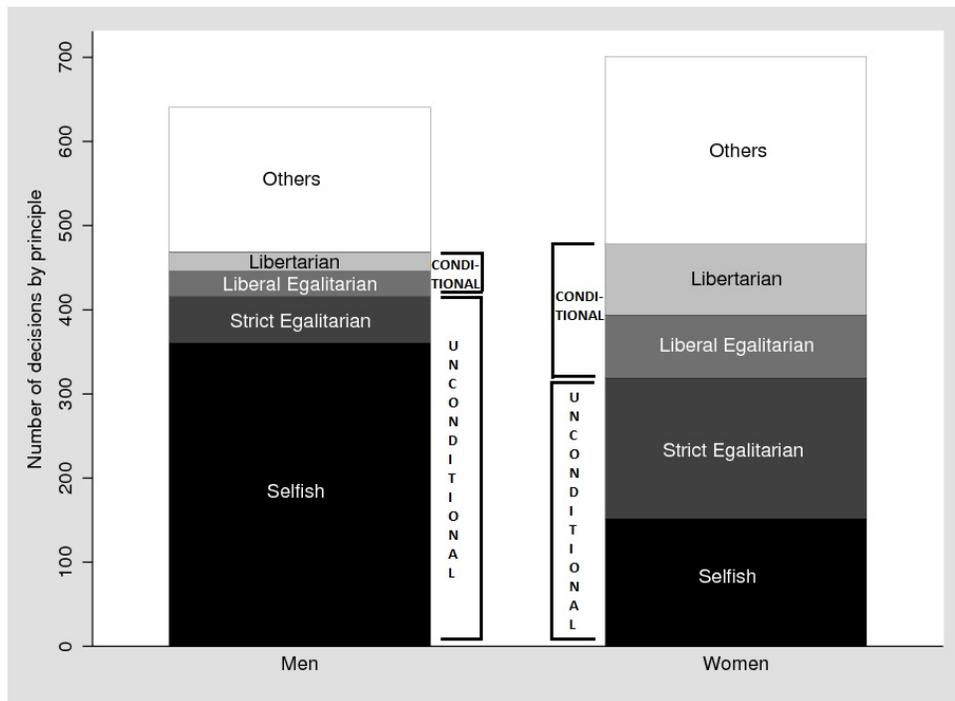


Figure 3: Frequency of different principles

<sup>2</sup>We classify decisions according to the exact prediction of each rule. Given that 80% of decisions exactly coincide with one of the four behavioral rules described so far, in the following analyses we will not put any additional structure on the data in order to avoid an over-fitting of the data.

The fact that women are more egalitarian than men has been reported in previous studies (Andreoni and Vesterlund 2001; Dufwenberg and Muren 2006; Guth et al. 2007). However, to the best of our knowledge, no paper has shown that women are also more equitable. This later result gives support to the first hypothesis made in section 3. Equity rules are conditional by definition; people need to use information about the production phase to determine what is the equitable distribution. The fact that women make equity choices more often than men is consistent with the idea that female behavior is partly conditional, while men behavior is mostly unconditionally selfish.

We estimate the probability of taking a decision in accordance with a conditional principle using a random-effect probit model and controlling for the period. We find that women are significantly more likely to adopt a conditional principle than men (see Table 2 in Appendix A). We also show that women are significantly more likely to split the pie equally and that men are significantly more likely to behave selfishly.

Although the higher rate of conditional behavior suggests that women are more sensitive to the context of the experiment, context sensitivity can only be tested in a repeated setting where individual decisions are studied across different contexts. In the next section, we exploit the within-subject feature of our design to test our second hypothesis.

#### **4.4 Adoption of decision principles**

We predicted above that individual women would adopt a larger number of decision principles than individual men. To test this hypothesis, we look at the number of different decision principles that each participant adopted in the experiment. For example, a participant that always split the pie equally adopts one principle; on the other hand, if a participant alternates between keeping the whole pie and splitting

it equally, that participant adopts two principles. We consider only three types of principles: selfishness, strict egalitarianism and conditional behavior.<sup>3</sup>

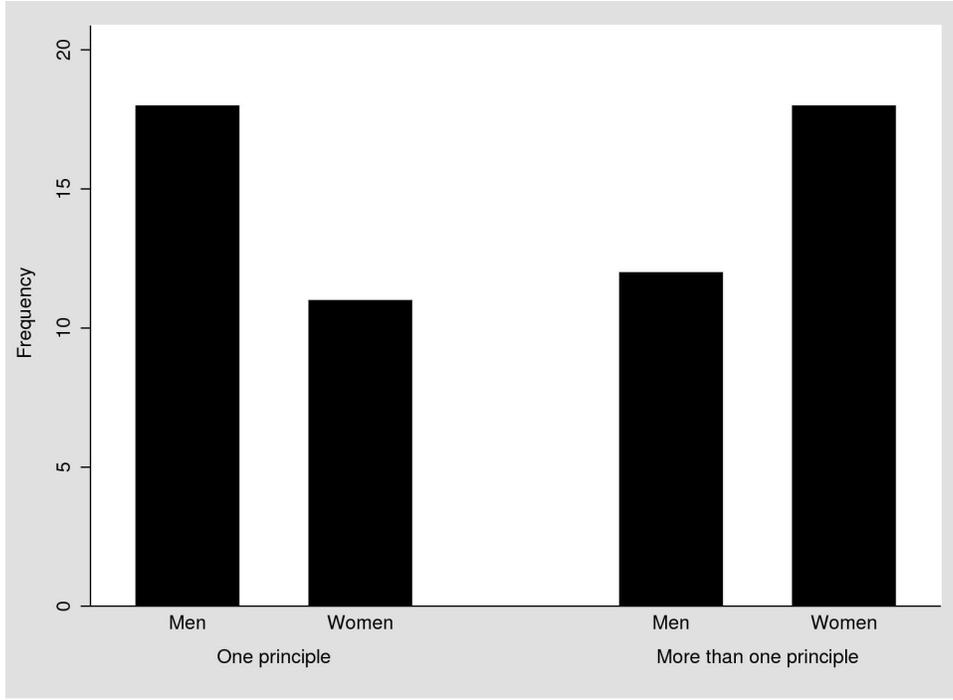


Figure 4: Number of decision principles

Figure 4 shows the number of men and women that adopt one principle or more than one principle. Consistent with our second prediction, most men (60%) adopt only one decision principle, selfishness. In contrast, most women (62%) adopt more than one principle.<sup>4</sup> The difference in the selection of multiple principles between men and women is significant at 5% level ( $Z = -1.6951$ ,  $p = 0.045$ ).<sup>5</sup> Among the women that adopt more than one principle, about two thirds (12) adopt two

<sup>3</sup>For some games, the two conditional principles defined in section 2, liberal egalitarian and libertaria, predict the same behavior. This is why we decide to consider the two principles together in this section. Treating the two principles separately does not change the results reported here.

<sup>4</sup>We only include 29 women in the analysis. We cannot classify any of the twenty decisions of one of the female participants, so we decided to exclude her from the analysis.

<sup>5</sup>We use a one-sided two-group test of proportion that assumes that women are more likely to adopt multiple principles.

principles and one third (6) the three principles (see Table 4 in Appendix A).

This result confirms our second hypothesis and gives support to Croson and Gneezy's organizing explanation using a within-subject analysis. In this experiment, more women than men adopt a multiplicity of principles, therefore they change their behavior more often. This result, combined with the fact that women adopt conditional principles more often than men, suggest that women are in fact more sensitive to the decision-making context.

## 5 Conclusion

There is a tradition in moral psychology which maintains that women differ from men in moral decision making (Gilligan 1982). One of the main differences suggested in that literature is that women are more sensitive to social cues in determining appropriate behavior than are men (Croson and Gneezy 2009). Although this idea has been discussed in several Behavioral Economics studies, appropriate empirical tests have proven elusive to date. We believe that the reason for this elusiveness is the lack of an experimental framework for testing women's higher context sensitivity in the economic lab. We provide an example of such a framework in this paper following the suggestion of Croson and Gneezy (2009) in a recent review article. These authors argue that 'small differences in experimental design and implementation will thus have larger impacts on female participants than on male participants' (p. 463).

In this paper, we have investigated the different reactions of men and women to changes in the experimental context. The context that we study is a repeated distribution situation in which experimental participants can potentially adopt different principles of justice. In this respect, participants may switch between different principles when the experimental context changes. Previous studies have shown that

not only do different people adopt different principles, but they adopt one principle or another depending on the context (Messik and Sentis 1979; Babcock et al. 1995; Ubeda 2010).

Women's higher context-sensitivity is operationalized in two ways. First, we look at whether participants' decision principles are conditional on the experimental context. We define purely selfish and egalitarian behaviors as unconditional principles, since people do not need to know the context of the decision to use them. On the contrary, we define different forms of equitable behavior as conditional principles, since participants need to use information about the source of the money to be distributed. Second, we study whether women adopt a larger number of different decision principles than men. This is a proxy for women's higher probability of changing behavior across contexts.

We find that women adopt conditional principles significantly more often than men. Therefore, women's behavior is more often conditional on the context of the experiment. Additionally, we find that the proportion of individual women adopting more than one principle is significantly higher than the proportion of men. These two results are just two examples of women's higher context sensitivity.

To conclude, the experiment reported on in this paper provides support for Croson and Gneezy's (2009) hypothesis about the larger impact on women of differences in experimental design and implementation. This is the first paper in which Croson and Gneezy's hypothesis has been explicitly tested and, although the results clearly support it, further new evidence as well as replications of the existing results are needed.

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## Appendix A: Statistical Analyses

	Performance	Money kept
<i>Cons</i>	23.029*** (0.932)	84.048*** (3.398)
<i>Period</i>	0.105*** (0.036)	0.332*** (0.052)
<i>Gender</i>	-0.080 (1.208)	-14.334*** (4.743)
Number of observations=1200		Number of subjects=60

\*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.1$

Table 1: Random Effect Linear Regression Estimates of Gender Differences in Performance and Distribution (Standard Errors in Parentheses).

Rules	Men	Women
<i>Selfish</i>	361 (60.2%)	152 (25.3%)
<i>Strict Egalitarian</i>	55 (9.2%)	167 (27.8%)
<i>Liberal Egalitarian</i>	30 (5.0%)	75 (12.5%)
<i>Libertarian</i>	23 (3.8%)	84 (14.0%)
<i>Others</i>	172 (26.8%)	223 (31.8%)

Note: The sum of the percentage in Table 1 is higher than 100%. That is because of in some cases different rules predict the same behavior.

Table 2: Frequency of different principles.

	Selfish	Strict Egalitarian	Conditional
<i>Cons</i>	0.682 (0.453)	-2.894*** (0.408)	-2.166*** (0.289)
<i>Period</i>	0.062*** (0.014)	-0.034*** (0.012)	-0.013 (0.010)
<i>Women</i>	-3.908*** (0.616)	1.795*** (0.579)	0.927*** (0.324)
Number of observations=1200    Number of subjects=60			

\*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.1$

Table 3: Random Effect Probit Estimates of the Probability of Choosing Different Allocation Principles (Standard Errors in Parentheses).

<b>Rules</b>	Men	Women
<i>1 principle</i>	18 (60%)	11 (38%)
<i>2 principles</i>	9 (30%)	12 (41%)
<i>3 principles</i>	3 (10%)	6 (21%)
<i>Total</i>	30 (100%)	29 (100%)

Table 4: Number of decision principles.

## Appendix B: Instructions

Dear participants,

Welcome and thank you for participating in our experiment. The experiment will last for about one and a half hour. Please do remain quiet from now on until the end of the experiment. You will have the opportunity to ask questions in a few minutes, they will be answered privately.

### INSTRUCTIONS

The experiment consists of 20 periods and in each period there will be two phases.

### **First phase**

- At the beginning of every single period, groups of two people will be formed. You will be randomly paired with another participant in this room. You will remain together until the end of that period. None of you will know with whom you have been paired.
- On the computer screen you will see a series of puzzles in which the letters of a word are scrambled. It is your task to unscramble them. You will see one scrambled word at a time, with a blank below each given letter. In each blank, enter the letter that you think belongs in that space in the correct, unscrambled word. In each blank, please enter **only one letter, with no spaces**, and use only the letters given in the original scramble. None of the words is an acronym. **The words are the same for all the participants in this room and they will follow the same sequence.**
- You may use the mouse or the TAB (on the keyboard) to switch to the next blank.
- You will have a total of **90 seconds** to correctly solve as many scrambles as you can. For each correct answer, you will receive 4 tokens. In each period there are **ten words to unscramble**.
- You may leave a puzzle blank, but once you click on the 'Submit and Continue to Next Puzzle' button, you **will not be able to return to that puzzle**.
- At the end of the first phase, you will know: the number of tokens you receive in that period; the number of tokens the other participant of your group receives in that period; and the total number of tokens the two of you receive.

## Second phase

- The second phase starts with a random shock. This shock may affect the number of tokens of each participant with 50% probability. It is independent that the other participant was affected by the shock for you to be affected as well. The shock works in one of the following ways:
  1. By halving your tokens;
  2. By halving the tokens of the other participant;
  3. By halving the tokens of both participants in the group;
  4. By not halving any participant's tokens.
- Both participants in the group have to decide how to distribute the total number of tokens of the group (your tokens + the other participant's tokens) between the two group members. The decision will be taken individually and anonymously. Neither you nor the other participant will know the decision of the other.
- After the 20 periods have been completed, the computer will randomly choose one of the twenty periods to be paid. Only the decision of one participant in each group will be implemented. All earned tokens will be exchanged into pounds at the end of the experiment and paid in cash according to the following exchange rate:

$$3 \text{ tokens} = \text{£}1$$

Finally, each participant will be informed about her/his earnings, which will consist of the profit from the experiment plus the participation fee (£4).

We ask you to remain quiet during the whole experiment. Those who do not respect the silence requirement will be asked to leave the experimental room. Once the

experiment is finished, please remain seated. We will need between 10 and 15 minutes to calculate your payment. We will move to another room and you will be called up successively by the number on your table; you will then receive an envelope with your earnings and you will be asked to sign a receipt.

Finally, note that your participation is considered voluntary and you are free to leave the room at any point if you wish to do so. In that case, we will only pay you the participation fee of £4.

**Please leave these instructions on your table when you leave the room.**

You can take notes on these pages if you wish to do so.

If you have any questions, please raise your hand now.