



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 that demand the use of different fairness principles. 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.

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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 willing to compete (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.¹

Croson and Gneezy (2009: p. 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 several 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 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. 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 contexts potentially different, in the sense that individual effort may vary between participants and sheer luck plays a role.

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¹ Andreoni and Vesterlund (2001) is an important exception.

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 et al., 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 (Messick 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 the 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 employ 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.² The experiment was programmed and conducted using z-tree (Fischbacher, 2007). Participants received £4 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–£4 show-up fee plus £2 for completing a post-experimental questionnaire – to a maximum of £26.

The experiment consists of 20 one-shot pure distribution games with production. In each game, 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.³ 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 percent probability to be affected. The shock halves participants' endowment, thus the group endowment is also reduced. Participants learn the outcome of their own shock, as well as their partner's shock. Feedback is provided for each individual and in total before they make the distribution decision. 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 anonymously decide 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 game, participants are randomly paired with another participant in the session. 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. At the end of the experiment, participants complete a post-experimental questionnaire which asks them about their strategies in the experiment, as well as a set of demographic questions.

After the experiment, participants' decisions are classified according to several fairness principles. In this paper, we use the three fairness ideals proposed by Cappelen et al. (2007) to evaluate subjects' decisions. The first fairness principle is *Strict Egalitarianism* and it states that the tokens should be divided equally, ignoring the first phase of the experiment. The second principle, *Liberal Egalitarianism*, suggests that the tokens should be distributed in proportion to performance in the first phase of the experiment, ignoring the outcome of the shock. It is a principle of input equity, since what is relevant is

² All but one of the participants were native English speakers, and the mean and median of participants' age distribution were 23 and 22 years, respectively. See Appendix C (Online Supplementary Content) for additional information on demographics.

³ Subjects do not know immediately whether a word is correct or not. They are informed about how many words they correctly solved on the information screen between the two phases of the experiment.

the contribution of participants to the common pie before the shock. The third principle, *Libertarianism*, considers both the performance of participants in the first phase and the outcome of the shock. It is a principle of output equity, since what is relevant here is the actual contribution of each participant to the common pie after the shock. According to this third principle, the tokens should be divided in proportion to participants' contribution to the common pie after the shock.

In addition to the three fairness principles proposed by Cappelen et al. (2007), participants' decisions will be classified as *purely selfish* if participants keep the full amount of tokens. An additional rule, not anticipated before the experiment and defined ex post as *charity*, explains a non-negligible proportion of behavior. The group defined as *charity* consists of subjects that give less than 4 tokens and more than nothing. Note that the exchange rate is 3 tokens 1 GBP. Frohlich et al. (2004) and Becker and Miller (2009) find a similar rule of behavior.

The multiplicity of decision principles allows us to study the different decision rules 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. Hypotheses

In this section, Croson and Gneezy's organizing explanation is used to form two working hypotheses 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 respond 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. To operationalize this hypothesis, we distinguish between two types of decision rules that people may adopt in this experiment. Participants may adopt *unconditional rules*, such as *pure selfishness*, *strict egalitarianism* and *charity*, 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 egalitarianism* and *libertarianism*, that do require information about the previous phase of the experiment. We expect a higher frequency of conditional decisions in women.

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

Five decision principles are considered here. 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

Fig. 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 solve.⁴ 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 the first column of Table 1 in Appendix B of the Online Supplementary Content). 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 decrease over time is observed in the performance of men and women. Although the main effect of time is not significant, we find that women get marginally better at solving puzzles with time (see the last column of Table 1 in Appendix B of the Online Supplementary Content).

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 There were very easy words, like GYM, which most participants correctly unscrambled, and not-so-easy words, like PIANIST, with which a large number of participants struggled.

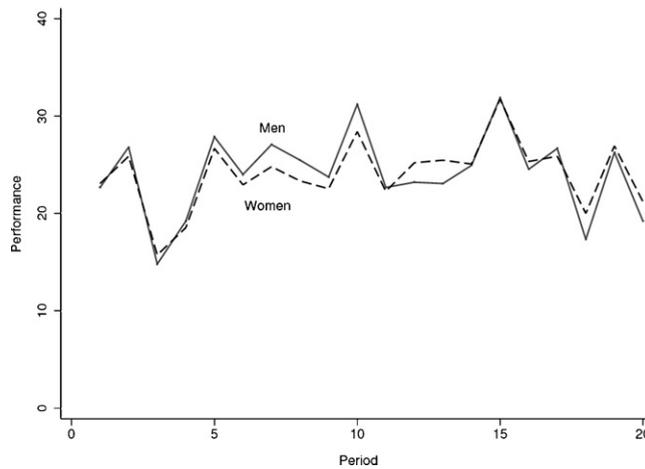


Fig. 1. Average performance by period.

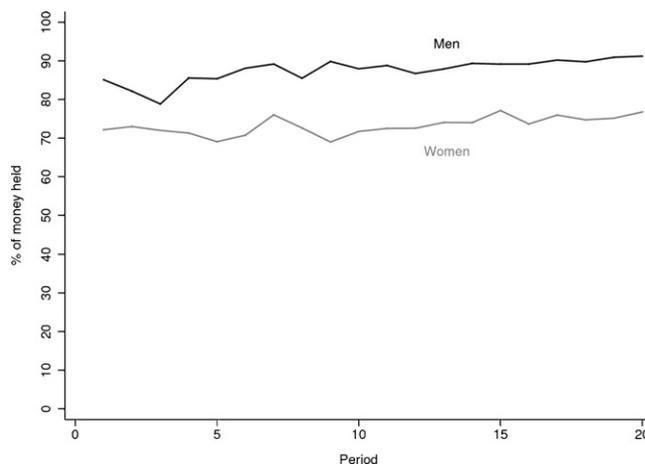


Fig. 2. Average relative amount participants keep.

4.2. Overall differences between genders

Fig. 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 on average fourteen percentage points less than men (73 percent vs. 87 percent). 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 2 in Appendix B of the Online Supplementary Content).⁵ This result is consistent with the findings of Eckel and Grossman (2008). However, other studies do not find gender differences in generosity (Bolton and Katok, 1995).

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 two sections our two hypotheses are tested.

4.3. Gender differences in allocation rules

Fig. 3 reports the frequency of different allocation rules by gender. We classify decisions according to the exact prediction of each rule. Given that 76.2 percent of decisions exactly coincide with one of the five behavioral rules described so far, in

⁵ As suggested by an anonymous referee, it may have taken a few rounds for participants to figure out the information provided between the two phases of the experiment. To control for potential learning effects, we replicate our main analyses restricting the sample to the last fifteen periods of the experiment. We perform this robustness check for performance and amount kept by participants (Tables 1 and 2 in Appendix B of the Online Supplementary Content). We find similar results as when we use the twenty periods.

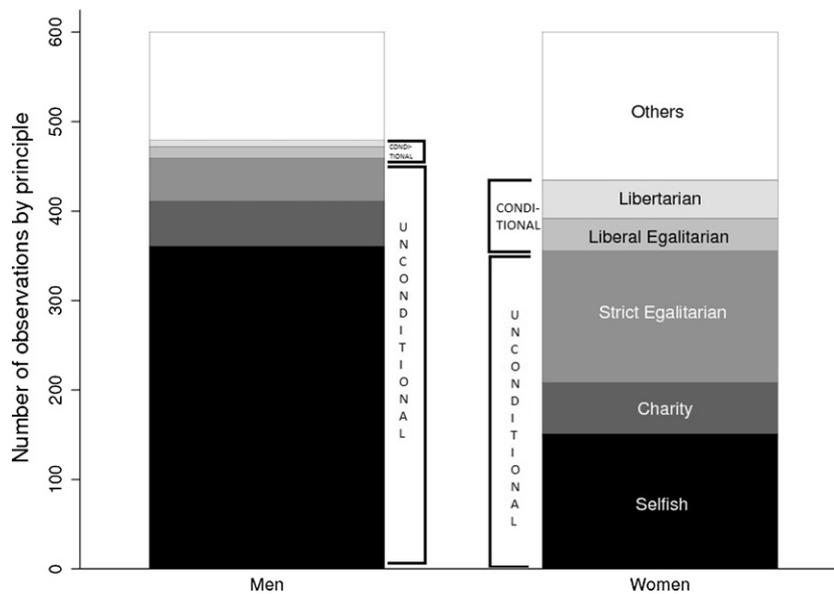


Fig. 3. Frequency of different principles.

the following analysis we will not put any additional structure on the data in order to avoid over-fitting. When an outcome can be explained by several principles, we select one of the principles randomly and assume the decision is guided by that principle. Thus, if outcome X can be explained by principle A and also by principle B , we select one of the two principles randomly (50 percent chance of selecting either A or B), and assume that outcome X is guided by either A or B . The proportion of overlaps is very small, about 8 percent of all decisions.

A majority of men's decision (60.2 percent) are purely selfish, and men rarely display egalitarian or conditional behaviors. In sharp contrast, women take as many egalitarian (24.5 percent) as selfish (25.1 percent) decisions, and they also adopt a conditional principle, either liberal egalitarian or libertarian, in 6.2 percent and 7.2 percent of the cases respectively. The number of charity decisions is evenly distributed, each gender adopts the charity principle in about 10 percent of the decision situations.

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; Cadsby et al., 2010). However, to the best of our knowledge, no paper has shown that women are also more equity-minded.⁶ 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 and the shock 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 unconditional.⁷

We estimate the probability of taking a decision in accordance with a conditional principle using a multinomial logit model and controlling for a set of control variables. We find that women are significantly more likely to adopt a conditional principle than men (see Table 4 in Appendix B of the Online Supplementary Content). 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 in which 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

⁶ We use here the classical definition of equity, in which "the value of what a member of a group receives from other members should be proportional to his investments" (Homans, 1961)(Homans, 1961: p. 237).

⁷ The novelty of the fact that women seem to be more equity-minded may need to be qualified. What the literature has shown so far is that women are more inequality averse, more specifically that they tend to split the cake equally more often (see, for instance, Andreoni and Vesterlund, 2001; Dufwenberg and Muren, 2006; Guth et al., 2007). However, to the best of our knowledge, no previous paper has shown that women also act according to an equity rule more often than men. This is partly because previous real-effort distribution experiments have not reported results on gender.

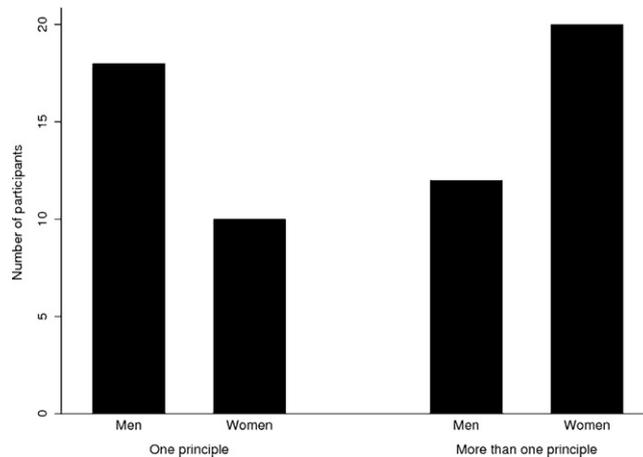


Fig. 4. Number of decision principles.

between keeping the whole pie and splitting it equally, that participant adopts two principles. We consider only four types of principles: *selfishness*, *charity*, *strict egalitarianism* and *conditional behavior*.⁸

Fig. 4 shows the number of men and women that adopted one principle or more than one principle. Consistent with our second prediction, most men (60 percent) adopt only one decision principle, selfishness. In contrast, most women (66 percent) adopt more than one principle. The difference in the selection of multiple principles between women and men is significant at 5 percent level ($Z = 2.0702$, $p = 0.038$). Among the women that adopt more than one principle, 40 percent adopt two principles, 23 percent three principles and only one woman all the four principles (see Table 5 in Appendix B of the Online Supplementary Content).

The reason behind men adopting less principles is that more than half of the men always make the same decision across periods, whereas only one third of women do so. The high rate of men following only one decision rule is driven by the fact that men are very consistent when they make purely selfish choices. In contrast, there are very few consistent women. Most of the inconsistent women switch between the strict egalitarian principle and at least one of the conditional principles. In this respect, most of women's switching is between fairness principles.

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 previous 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 responses 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 (Messick 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*, *charitable* 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 *equity* behavior as conditional principles, since participants need to use information about the source

⁸ The number of observations for the two conditional principles is very low for men. This is why we consider the two principles together in this section. Treating the two principles separately does not change the results reported here.

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 results provide two examples of women's higher context sensitivity.

While women seem to be more sensitive to the decision making context in situations that trigger several forms of social preferences, previous papers have found a form of context sensitivity that would typically affect men. Men seem to be social surplus maximizers and conditional to changing total payoffs (Andreoni and Vesterlund, 2001; Kamas and Preston, 2010). This latter effect cannot be studied using our data. Future research should consider the interplay of several types of contextual changes and how they affect each gender's behavior.

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. Supplementary Data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.jebo.2011.06.014](https://doi.org/10.1016/j.jebo.2011.06.014).

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