

An Experimental Study of Gender Differences in Distributive Justice

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Abstract

This paper shows that women are more likely than men to employ the fair allocation that most benefits their financial payoff. The experimental evidence is gleaned from a dictator game with production, in which subjects first solve a quiz to accumulate earnings and then divide the surplus by choosing one over five different allocations, some of which represent a fairness ideal. The data also suggest that women are more sensitive to the context as their allocation choices depend on whether they have accumulated more or less money than their counterparts. This is not the case for men's allocation choices (JEL Codes: C91, D30, D64, J16)

Keywords: gender differences, distributive justice, fairness ideals, self-serving choices, experimental economics, dictator game with production.

“Equity is merely a word that hypocritical people use to cloak self-interest”

H.Peyton Young (1994)

1. Introduction

The fairness argument pervades the literature on behavioral economics and is frequently used to explain departures from equilibrium predictions (based on the assumption that subjects only care about their own material payoff). Recent findings in the experimental literature, however, suggest that individuals involved in a distributional problem such as the dictator game might choose fairness principles in a self-interested manner (Rutström and Williams 2000; Rodriguez-Lara and Moreno-Garrido, 2012). In a nutshell, the experimental evidence highlights that "the underlying motivation driving much fair behavior might be self-interest, coupled with a desire to maintain the illusion of not being selfish." (Dana, Weber and Xi Kuang 2007; Larson and Capra, 2009). Along these lines, some authors argue that dictators' giving might be explained because subjects want to be perceived as fair (Andreoni and Bernheim 2009), because they want to avoid the "greedy" tag (Bolton, Katok, and Zwick 1998) or simply because fairness imposes a constraint on their self-interested behavior (Kahneman, Knetsch and Thaler 1986).

Even when it may not be very surprising that self-interest combines with fairness principles to generate a behavioral pattern that suggests the importance of both, it remains to be discussed how subjects vary in this respect along observable dimensions (e.g., gender). The insights gleaned from this analysis might be important for economists and policymakers to approach the problem of distributive justice or for voters to understand the economic policies.¹ This paper is an attempt to study gender differences in social preferences by eliciting women's and men's preferences over redistribution in a dictator game with production.

¹ As pointed out by Debbie Walsh, the director of the Center for American Women and Politics at Rutgers University, understanding of gender differences might be particularly important nowadays since "*women may be the change [voters are] looking for*".

Although there exists a large number of papers that investigate gender differences in preferences (e.g., Eckel and Grossman 1998, Croson and Gneezy 2009, Cooper and Kagel 2009) the current paper departs from the bulk of the literature as participants in the experiment do contribute to the surplus that is being distributed. This feature is important to disentangle the effect of fairness concerns and property rights in the final outcome as noted by Cherry, Frykblom and Shogren (2002). The authors argue that if there is not a production stage, then dictators might give money away because they are fair-minded, or simply because the surplus to be divided is "manna from heaven", and dictators do not feel any right to keep the entire surplus for themselves.

The dictator game with production presented in this paper relies on two different phases. In the first one, subjects earn money by answering a multiple-choice test that pays a fixed and a random reward for each correct answer. In the second phase, dictators allocate the earned surplus after being informed about the reward levels (which might differ across individuals) and both members' contribution to the surplus. In particular, dictators are offered five different allocations to divide the surplus, some of which represent a fairness ideal.²

The chief question to be addressed is whether there exist gender differences in allocation choices when a production stage precedes the dictator's decision. More precisely, the experiment is aimed to test if some of the behavioral patterns that have been already identified in the literature (e.g., women being more likely to equalize payoffs) remain in the dictator game with production. The experimental design allows also for testing the hypothesis in Croson and Gneezy (2009) suggesting that women might be more sensitive to the experimental design. This is done by studying whether women and men behave in the same manner when they allocate after contributing more or less money than their counterparts. Finally, the data is used to shed light on how gender interacts with self-interest when dictators have to choose a division of the generated surplus.

² Technically-speaking, this is a mini-dictator game because dictators are not allowed to choose any division of the surplus, but have to choose from a set of allocations. In such a set, the allocations that represent a fairness ideal are the egalitarian, the accountability and the libertarian allocation. The interested reader can see Cappelen et al. (2007), Konow (2000) and Rodriguez-Lara and Moreno-Garrido (2012) for the application and the rationale of these fairness allocations. The supplementary material contains also information about how these allocations apply in a dictator game with production. Konow (2003) is an excellent revision of the different fairness ideals.

The remainder of the paper is organized as follows. In the next section, I present the experimental design. The research questions are detailed in Section 3. Section 4 contains the results. The final section concludes.

2. Experimental design

A total of 144 students (77 women and 67 men) were recruited among the undergraduate population of the University of Alicante. The experiment was run in May 2008 and November 2008 in the Laboratory for Theoretical and Experimental Economics (LaTeX). Each of the 6 sessions had 24 subjects and lasted around 1 hour.

The experiment was implemented using the z-Tree software credited to Fischbacher (2007). Subjects had to complete a test during the first stage of the experiment.³ At the conclusion of the test, subjects were randomly matched in pairs and assigned a role that did not depend on their performance on the test or any individual characteristic. Subjects received a random reward level (p_i) for each of their correct answers. The realization of p_i occurred after subjects were informed about their role. To investigate how subjects held responsible for their outcomes (Cappelen et al. 2007, 2010) and introduce variability in the data, dictators were rewarded $p_d=150$ pesetas⁴ per each correct answer, whereas recipients received $p_r \in \{100,150,200\}$ pesetas depending on the treatment. Table 1 contains information about the reward levels and the number of observations (women and men) across treatment.⁵

³ See Appendix A for the experimental instruction and Rodriguez-Lara and Moreno-Garrido (2012) for further details in the procedures. I note that the current paper differs from Rodriguez-Lara and Moreno-Garrido (2012) because dictators have to choose from a set of allocation choices instead of choosing any division of the surplus. Besides, Rodriguez-Lara and Moreno-Garrido (2012) do not analyze the impact of gender differences on behavior, which is the main focus of the current study.

⁴ It is standard practice for all experiments run in the University of Alicante to use Spanish pesetas as experimental currency. Exchange rate: 1 Euro = 166,386 pesetas.

⁵ The information on gender was collected at the end of the experiment. Since roles did not depend on any individual characteristic, I cannot control for having exactly the same number of women and men in each treatment. I chose this procedure so as to guarantee equality of opportunities, what is important to avoid compensation and control for responsibility (Fleurbaey and Maniquet 2009).

Table 1. Reward levels and number of dictators in each treatment

	Reward Levels		Number of dictators		
	p_d	p_r	Women	Men	Total
Dictators Worse (DW)	150	200	12	12	24
Dictators Better (DB)	150	100	10	14	24
Baseline (BL)	150	150	15	9	24
			37	35	72

When subjects were informed about their reward levels and their contribution to the surplus, the total surplus was divided according to the dictator's decision. Dictators had to decide between five allocation choices to divide the surplus: (1) Keeping the entire surplus, (2) Giving the entire surplus to the other subject, (3) Dividing the surplus in two identical parts (the egalitarian allocation), (4) Dividing the surplus according to the subjects' contribution in terms of correct answers (the accountability allocation), (5) Dividing the surplus according to the subjects' monetary contribution (the libertarian allocation).

This set of allocation choices allows dictators to keep the entire surplus as would be predicted by the Nash equilibrium for selfish subjects. Likewise, the “fair allocations” (i.e., the egalitarian, the accountability and the libertarian allocation) can be used to categorize the subjects' preferences for fairness, as it is illustrated in Cappelen et al. (2007). The egalitarian allocation corresponds to the idea of equality (Fehr and Schmidt 1999) whereas the accountability and libertarian principles plead for a solution in which entitlements to the available surplus are determined by the subject's performance in the questionnaire. In particular, the accountability allocation is based on the exerted effort (i.e., the number of correct answers) and corresponds to the idea of equity in the sense that those factors that cannot be controlled by subjects are not considered by dictators when they are making their choice (Konow 1996, Roemer 1998). The libertarian allocation, on the contrary, takes into account the reward levels and states that subjects ought to receive as much as their (monetary) contribution to the surplus (Nozick 1974).⁶

⁶ Of course, there exist cases in which these allocations overlap. For instance, the accountability and the libertarian (the egalitarian) allocation coincide in the BL treatment (when both subjects have the same number of correct answers). For further discussion on the relationship between responsibility or control over outputs and fairness principles see Fleurbaey and Maniquet (2009) and Cappelen et al. (2010) among others. To see how the fairness ideals can be defined in a dictator game with production, the interested reader can see Appendix B.

3. Research questions

The main questions to be addressed concern the existence of gender differences in the allocation choices and the possibility of women and men behaving differently depending on the context (i.e., when they contribute to the surplus more or less than recipients). I also want to investigate whether subjects choose the fair allocation that is most convenient (i.e., the one that yields the highest payoff) and the extent to which this choice can be determined by the dictator's gender, the performance in the test (q_i) and the reward levels (p_i). Next, I present the research questions and relate them with previous findings in the literature on gender differences.

Q1. *In the dictator game with production, do men and women differ in their allocation choices? Are men and/or women inclined toward choosing a unique allocation?*

Evidence from previous studies that investigate gender differences highlight that women are more socially-oriented than men (e.g., Eckel and Grossman 1998), and are more concerned with equalizing payoffs (e.g., Andreoni and Vesterlund 2001, Dickinson and Tiefenthaler 2002). In that regard, it will be worth analyzing whether men (women) are more likely to choose the selfish (egalitarian) allocation. The fact that women and men might exhibit heterogeneous behavior with regard to the division of the surplus relates our study with Cappelen et al. (2007), where it is shown that dictators do not allocate the surplus according to a unique fairness ideal. However, the role of gender is disregarded in the analysis of Cappelen et al. (2007).

The data in Croson and Gneezy (2009) suggest that women are neither more nor less socially oriented but their preferences seem to be more malleable. The second question is then related to the idea of women's decisions being more context-specific than men's (Cox and Deck 2006, Croson and Gneezy 2009) and the possibility of behavior varying with the “price of giving” (Andreoni and Vesterlund 2001).

Q2. *Do men and women choose the same allocation choices regardless of their contribution to the surplus? Does their behavior depend on the external factors (e.g., the reward levels)?*

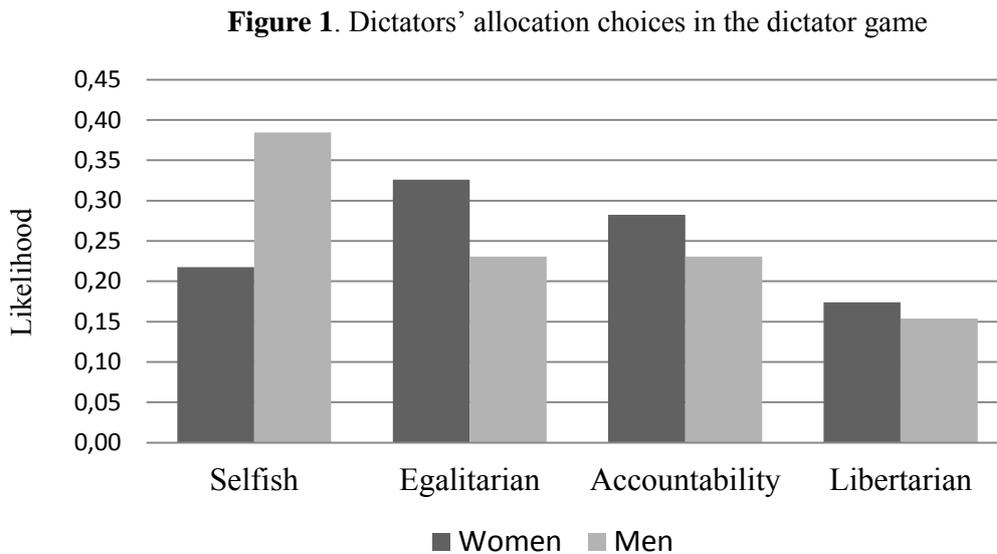
The final question is in line with recent findings suggesting that dictators are likely to choose fairness principles in a self-interested manner (Rutström and Williams 2000; Rodriguez-Lara and Moreno-Garrido, 2012).

Q3. *Do men and women choose the fair allocation that brings them the highest payoff?*

The objective is to shed light on the (possible) interaction between gender and the self-serving choices of fairness allocations.⁷ I will hereafter consider that the dictator chooses the most convenient allocation whenever he/she chooses the fairness ideal (egalitarian, accountability or libertarian allocation) that brings him/her the highest payoff.

4. Results

The dictators' decisions are summarized in Figure 1, which plots the likelihood of choosing each possible allocation by considering women and men separately. Since no dictator chose to give the entire surplus away, such an allocation is not listed.



We see in Figure 1 that roughly 70% of dictators chose one of the fair allocations. If we look at the choice of fairness allocations, we observe that there is no a unique

⁷ Rodriguez-Lara and Moreno-Garrido (2012) provide evidence for self-serving choices of fairness ideals. The use of the most convenient allocation might be also related to the existence of what Croson and Konow (2009) call "moral bias" (i.e., behavior biased away from impartial standards). Other concepts in the literature of distributive justice that might be related to the choice of the most convenient allocation are "self-serving bias" and "egocentric bias" (e.g., Messick and Sentis 1985, Babcock et al. 1995, Konow 2000), but these concepts require to compare the dictators' allocation choices with their choices as impartial judges who divide the surplus for two other subjects.

fairness ideal that can be used to describe the dictators' behavior. Instead, there exists heterogeneity in the use of fair allocations, which is consistent with Cappelen et al (2007).

Result 1 Women and men do not choose a unique allocation when they divide the surplus but exhibit heterogeneous behavior concerning redistribution.

In Figure 1, it is eye-catching that women are less likely to choose the selfish allocation and more likely to choose the egalitarian allocation. The test of proportion, however, suggests no significant difference between the proportion of women choosing the selfish option and the proportion of men doing so ($Z=1.16, p\text{-value}=0.123$). The same result holds when testing for the proportion of women and men choosing the egalitarian principle⁸ ($Z=1.33, p\text{-value}=0.183$) and there is not any significant correlation between the dictator's gender and the possibility of choosing a fair allocation ($p\text{-value}=0.148$). If I compare the distribution of allocations that women and men chose, the Fisher exact probability tests cannot reject the null hypothesis these allocation choices come from the same distribution (Fisher's exact=0.351). These results are consistent with the idea in Croson and Gneezy (2009) of women being neither more nor less socially oriented.

Result 2 Women and men' are equally likely to be selfish and their allocation choices cannot be rejected to come from the same distribution.

To study whether decisions are context-dependent or not, I consider the dictator's relative position with regard to the accumulated surplus as a reference point. Consider that the surplus to be divided is denoted by $\bar{y} \geq 0$, and depends on the dictator and the recipient's monetary contribution, which are denoted by y_d and y_r respectively. In particular, $y_i = p_i q_i$ where $q_i \geq 0$ stands for the number of correct answers and $p_i > 0$ is the reward for each correct answer for $i \in \{d, r\}$.

In Table 2, I report the p-values of the Fisher exact probability test that compare the distribution of allocation choices when dictators contribute to the surplus more than recipients ($y_d \geq y_r$) and when they contribute less ($y_d < y_r$). I compare also the dictators'

⁸ If I compute the women's and men's deviations from equality, the Kolmogorov-Smirnov test cannot reject the null hypothesis that women's and men's allocation choices come from the same distribution (KS=0.250, p-value=0.15).

behavior when they are paid more ($p_d \geq p_r$) or less ($p_d < p_r$) than recipients for each correct answer.

Table 2. Dictator’s behavior depending on the context

	Women	Men
Behavior when $y_d \geq y_r$ is the same as behavior when $y_d < y_r$	0.033**	0.382
Behavior when $p_d \geq p_r$ is the same as behavior when $p_d < p_r$	0.007***	0.412

p-values of the Fisher Exact test. Significance at *10%, **5%, ***1% level.

The Fisher exact test rejects the null hypothesis that the distribution of women's allocation choices when $y_d \geq y_r$ is the same as the distribution of women's allocation choices when $y_d < y_r$. The test does not reject this hypothesis for men, who seem to behave in the same manner when they are in an advantageous position and when they are in a disadvantageous position with regard to the accumulated surplus. The same conclusion holds when considering differences in the reward levels.⁹

Result 3 Women's allocation choices are sensitive to the context since choices depend on whether women have accumulated more or less money than recipients. Women’s allocation choices do also depend on the reward levels.

The third research question presented in Section 3 concerns the extent to which dictators choose a convenient allocation. To approach this issue, I compare the relative payoffs associated to the allocation choices in Figure 1 and what dictators would get if they followed the fair allocation that is most-convenient to them (i.e., the payoff

⁹ The interested reader can see the distribution of allocation choices depending on the context in Appendix C. In line with Croson and Gneezy (2009) and Cox and Deck (2006), the data suggest that women might be more sensitive to the context than men. It seems that women are more likely to equalize payoffs when they contribute to the surplus less than recipients; e.g., the test of proportion rejects the null hypothesis that women are equally likely to choose the egalitarian principle when $y_d \geq y_r$ and when $y_d < y_r$, in favor of the alternative that the egalitarian principle is chosen more frequently when $y_d < y_r$ (p-value=0.056).

maximizing one).¹⁰ The Wilcoxon signed-rank test cannot reject the null hypothesis that women's allocation choices are the most convenient ones ($W=0.75$, $p\text{-value}=0.449$), but it rejects the same null hypothesis for men's allocation choices ($W=2.36$, $p\text{-value}=0.018$). At the individual level, I find that 27 women chose to give money away, and 18 of them (i.e., roughly 66%) chose the most convenient allocation. There are 20 men who chose to give money away, and 8 of them (i.e., 40%), chose the most convenient allocation. The test of proportion rejects the null hypothesis that women and men are equally likely to be biased at the 10% significance level ($Z=1.522$, $p\text{-value}=0.063$).

Overall, it seems that women and men's behavior is fairly close when the production of the surplus is disregarded, but women are somehow inclined toward choosing the fair allocation that is most convenient to them. This finding can be affected by the subjects' performance in the test. Assume that women and men do have exactly the same preferences over redistribution so that they would choose the same allocations. If women do contribute to the surplus less than men but choose the same allocations, women would appear as being more convenient than men (even though they both have exactly the same preferences). Thus, the fact that women appear to be more likely to choose the convenient allocation could be explained by their gender or simply by their relative performance in the quiz (e.g., $Q_{dif} = q_d - q_r$).¹¹ The treatment conditions (i.e., the reward levels) could also affect the likelihood of choosing the most convenient allocation, since dictators may feel good or bad for being paid more or less than recipients. To disentangle the effect of these variables, I estimate a logit regression in which the dependent variable is the probability of choosing the fair allocation that gives

¹⁰ I am not aware of any statistical test that compares distributions of categorical data when more than two outcomes are possible and observations are not independent, so I use the dictator's earnings. To control for the effect of different reward levels (that yields a higher size of the surplus in the DB treatment), I focus on the proportion of the surplus that dictators decided to keep.

¹¹ This is particularly important in our experiment because on average, women had 8.64 questions correctly when they were dictators, whereas men had 11.77 questions correctly (standard deviations are 2.27 and 2.77 respectively). Women faced recipients who had on average 11.32 questions correctly, whereas men's counterparts had 10.4 questions correctly. A simple t-test rejects the null hypothesis that women and men had the same number of questions correctly when they were dictators ($t=5.23$, $p\text{-value}<0.000$). In addition, the t-test rejects the null hypotheses that women and men had the same questions correctly than their counterparts (for women, $t=4.03$, $p\text{-value}<0.003$; for men $t=2.10$, $p\text{-value}<0.043$).

the dictator the highest payoff. The explanatory variables are the dictator's gender (i.e., a dummy variable WOMEN that takes the value 1 if the dictator is a woman), the treatment conditions (i.e., the dummy variables DW and DB) and the difference in subjects' correct answers ($Q_{dif} = q_d - q_r$). The estimates and the marginal effects are presented in Table 3.¹²

Table 3. Logit regression to study biased behavior

	Coefficient	Std. Error	Marginal Effect
Intercept	-0.923	0.55	
Women	1.241**	0.60	0.27**
DW	-0.137	0.62	-0.03
DB	-0.888	0.66	0.19
Qdif	0.019	0.06	0.004

Significance at *10%, **5%, ***1% level. Number of observations = 72.
Pseudo $R^2 = 0.08$. LR-test (p-value) = 0.06

Neither the treatment conditions nor the difference in correct answers seem to have a statistically significant effect on the likelihood of choosing the biased allocation. The dictator's gender, however, has a significant effect as women are 27% more likely to choose the biased allocation than men (*ceteris paribus*).

Result 4 Women are more likely than men to employ the fair allocation that most benefits their financial payoff

6. Conclusions

This paper studies gender differences in distributive justice by means of a controlled laboratory experiment. In the first phase, subjects solve a questionnaire to earn money. In the second phase, dictators divide the surplus according to five different allocations, some of which represents a fairness ideal.

¹² I note that the regression results are robust to a number of other specifications. Hence, the marginal effects do not change qualitatively if instead of Q_{dif} I consider a dummy variable DQ_{dif} that takes the value 1 if $Q_{dif} \geq 0$, or if I include in the model the product of the dummy variables WOMEN and Q_{dif} as explanatory variable. The results are also invariant if the size of the surplus is considered as explanatory variable. The interested reader can find some of these regressions in Appendix D.

I find that roughly 70% of the subjects choose one of the fair allocations, and no difference exists between the percentage of women and men who choose to keep the entire surplus. The data support the hypothesis of heterogeneity in the use of fair allocations for both men and women and no significant differences are found in the way that women and men allocate the surplus (i.e., the unconditional distribution of allocation choices when subjects' production is disregarded is fairly close). Despite these similarities in women's and men's allocation choices, some striking results emerge. Interestingly, women do not behave in the same manner when they allocate the surplus after contributing more or less money than their counterparts, whereas men's allocation choices are invariant to their relative position with regard to the accumulated surplus (thus, the distribution of allocation choices when relative production is accounted for is different). The same results hold when considering effort levels: women do not behave in the same manner when they allocate the surplus after being paid more or less than their counterpart, whereas men do. These findings provide support for the hypothesis in Croson and Gneezy (2009) suggesting that women are more sensitive to the experimental design.

The existence these gender differences toward the use of the most convenient allocation represents one of the main contributions of the paper. I find that women's allocation choices cannot be rejected to be the most convenient ones, whereas men's allocations are far away from being the fair allocations that yield them the highest payoff. The statistical analysis reveals that 66% of women who chose a fair allocation, indeed chose the payoff-maximizing one. Only 40% of the men who chose the fair allocation did so. To isolate the possible effects of women and men's different contributions to the surplus, I consider a logit model that controls for this feature. It is found that (*ceteris paribus*) women are 27% more likely to choose the fair allocation that is most convenient to them (i.e., the fair allocation that brings them the highest payoff).

Overall, these findings lead to a subtle but significant change in our understanding of what other studies have found with respect to the effect of gender on problems of distributive justice. The existence of the production stage has probably contributed these new findings on gender differences. Although this feature of the experimental design has been shown to be a key component to study fairness (Cherry, Frykblom and Shogren 2002, Konow 2000, Cappelen et al. 2007) it has been widely ignored in papers that investigate gender differences in behavior. One remarkable exception is Miller and

Ubeda (2011), who consider a dictator game with production and show that women are more likely to switch between fairness principles, choosing the most convenient one across rounds. I note, however, that the scope of their paper (and therefore the experimental design) is slightly different as they test the hypothesis in Croson and Gneezy (2009) by means of a within-subject design that analyze the consistency of fairness principles, whereas the current paper relies on a between-subject analysis.

Still, there are some things to be done. Although this paper provides a correlation between the dictator's gender and the self-serving use of justice principles, it remains to be discussed the rationale for this result. One possible explanation might be offered by the dual interest theory (Lyne 1999, Czap et al. 2012). This theory establishes that there is a natural, inherent cognitive dissonance in the brain, which is reflected in the egoistic-hedonistic based self-interest. This tendency needs to be tempered by the tendency to empathy-sympathy based other-interest which refers to the subject's capacity to put in someone else's shoes (empathy) and his/her concern for others' welfare (sympathy). The idea of designing an experiment that investigates the extent to which women and men differ in these dimensions would be an excellent area for future research.¹³ The possibility of considering the dictators' behavior as a third-party view (i.e., comparing their choices when they are involved in the problem and their choices for other subjects) or extending the game to the possibility of taking (List 2007, Bardsley 2008, Cappelen et al. 2013) seem to be also fruitful areas for future research. I hope the current research helps to spark interest in the study of gender differences in distributive justice.

¹³ The evidence gleaned from this experiment can be useful to reconcile the data in dictator games with and without production. For example, Andreoni and Vesterlund (2001) or Dickinson and Tiefenthaler (2002) find that women are more likely to equalize payoffs, whereas the current paper suggests that this only occurs if women contribute to the surplus less than their counterparts (see footnote 9). Maybe the egoistic-hedonistic based self-interest and the empathy-sympathy based other-interest are related to the relative position with regard to the accumulated surplus or to the dictator's gender.

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Appendix A: Instructions

Welcome to the Experiment! (Spanish translation)

This is an experiment to study decision making, so we are not interested in your particular choices but rather on the individual's average behavior. Thus, all through the experiment you will be treated anonymously. Neither the experimenters nor the people in this room will ever know your particular choices. Please do not think that we expect a particular behavior from you. However, keep in mind that your behavior will affect the amount of money you can win.

Next, you will find instructions on the computer screen explaining how the experiment unfolds. The instructions are the same for all subjects in the laboratory and will be read aloud by experimenters. Please follow them carefully, as it is important that you understand the experiment before starting.

Talking is forbidden during the experiment. If you have any questions, raise your hand and remain silent. You will be attended to by the experimenters as soon as possible.

THE EXPERIMENT

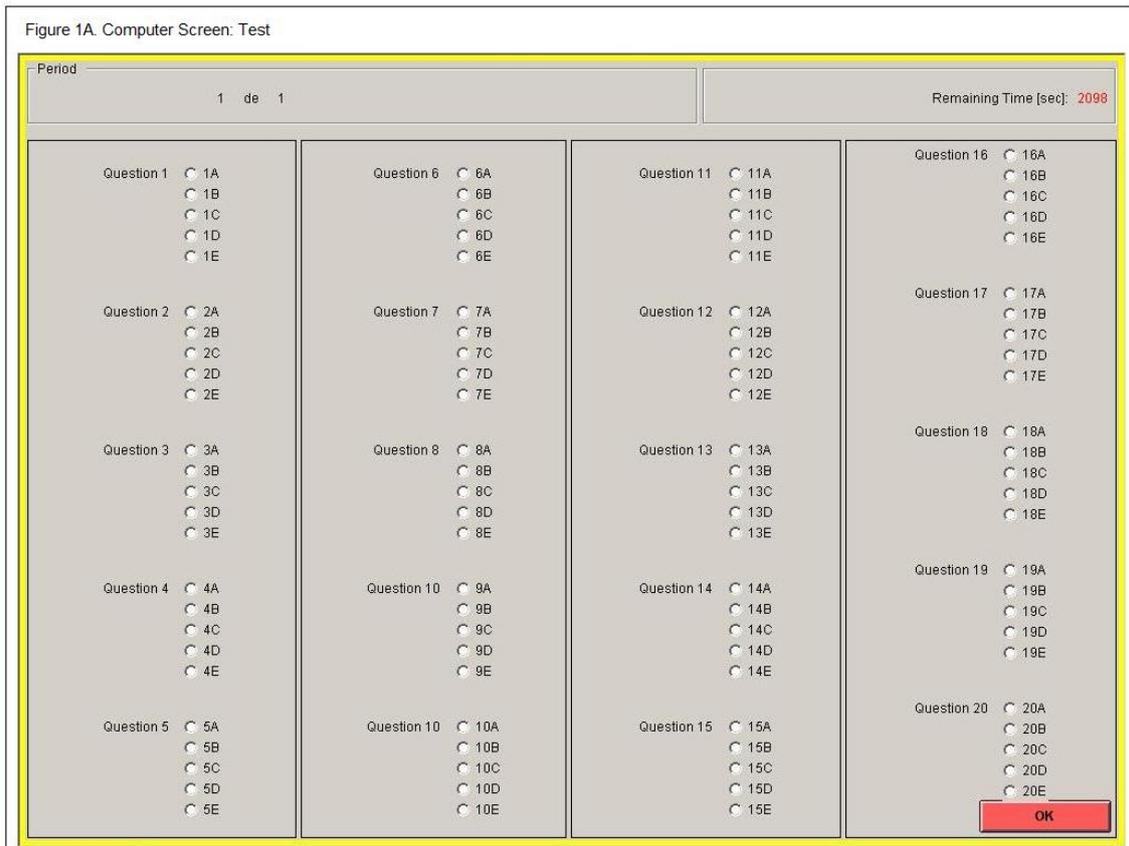
First phase

The experiment has two phases. In the first one, you are able to get money by solving a questionnaire.

The quiz that you will face is the same for all subjects in the room and contains 20 multiple-choice questions with 5 possible answers (only one of them is correct). You have 35 minutes to solve the quiz. Each of your correct answers will be rewarded at a reward rate that will be the same for each correct answer but may vary across individuals. No questions will be rewarded higher than others and the reward of each correct answer will be randomly announced once you finish the questionnaire. This reward per correct answer lies between 100 and 200 pesetas and does not depend on your performance.

You will now receive the questionnaire on a piece of paper. To answer the questions, you must use the computer screen. Please do not write on the questionnaire, and make sure that you have selected your answers correctly on the computer screen before continuing, as the computer will automatically check your answers at the end of this phase. Calculators cannot be used during the experiment. You will be provided an additional piece of paper to make computations if needed.

Remember that during the experiment you are not allowed to communicate with each other: you can only communicate with the experimenters.



-Figure 1A: Computer Screen: Test (Not for publication)-

Second phase

In this second phase, you will be randomly matched with a subject in this room and your total earnings will be announced. Remember that the reward of each correct answer is randomly determined so it does not depend on your performance in the quiz.

(Subjects were informed about their earnings. They faced a computer screen quite similar to the one that appears below).

Now, you will be assigned a type, that is, you will either be player A or player B. This type is randomly determined to choose the one subject that divides the pie. Hence, the subject selected as player A will divide the total earnings. This player has five different options to divide the earnings, as you will see in the computer screen. Player B will also have the possibility to choose an allocation, but the decision of player B will not be paid.

Remember that your choices will be treated anonymously. Neither during the experiment nor after the experiment will you know the identity of the person you are matched with.

Figure 2A. Computer Screen: Dictator's choice

Periodo 1 de 1 Tiempo restante [seg]: 26

You have been randomly selected as player A and you have to decide how to split the money.

You have answered 10 questions correctly.

Since each question is paid at a price 150 pesetas, you have contributed 1500 pesetas to the total amount.

Player B has answered 8 questions correctly.

Since each question is paid at a price 200 pesetas, player B has contributed 1600 pesetas to the total amount.

The total amount of money that you both have contributed is 3100 pesetas.

You have to choose one of the following 5 allocations.

Allocation 1 (Keep it all). You get 3100 pesetas and player B receives 0 pesetas.
Allocation 2 (Give it all). You get 0 pesetas and player B receives 3100 pesetas.
Allocation 3 (50-50). You get 1550 pesetas and player B receives 1550 pesetas.
Allocation 4 (Dividing the money according to the number of correct answers). You get 1722 pesetas and player B receives 1378 pesetas.
Allocation 5 (Dividing the money according to the monetary contribution). You get 1500 pesetas and player B 1600 pesetas.

Allocation choice.

I choose the following allocation:

- Allocation 1 (Keep it all)
- Allocation 2 (Give it all)
- Allocation 3 (50-50)
- Allocation 4 (Dividing the money according to the number of correct answers)
- Allocation 5 (Dividing the money according to the monetary contribution)

- Figure 2A. Computer Screen: Dictator's choice -

Appendix B: Fair allocations in the dictator game with production

Consider that the dictator may choose from a set of allocations to divide a certain surplus ($\bar{y} \geq 0$). The size of the surplus depends on the dictator and the recipient's monetary contributions, which are denoted by $y_d \geq 0$ and $y_r \geq 0$ respectively. In particular,

$$\bar{y} = y_d + y_r = p_d q_d + p_r q_r$$

where $q_i \geq 0$ represents subject i 's performance in a previous stage and $p_i > 0$ is the weight assigned to this input, for $i \in \{d, r\}$. In the experiment, subjects were asked to complete a test, so q_i is the number of subject i 's correct answers and p_i the reward for each correct answer.

In principle, three allocations can be identified with a fairness ideal (see Cappelen et al. 2007, 2010) and Rodriguez-Lara (2012). The allocations are described in Table 1B. I denote the amount that the dictator keeps by $k \in [0, \bar{y}]$ and the percentage of correct answers that are due to the dictator by $r_d^q \in [0, 1]$, where $r_d^q = q_d / (q_d + q_r)$

Table 1B. Fair allocations in the dictator game with production

	Definition	Description of the Allocation
Egalitarian	$k = \bar{y}/2$	Keeping half of the surplus.
Accountability	$k = r_d^q \bar{y}$	Keeping the part of the surplus that is due to his/her effort.
Libertarian	$k = y_d$	Keeping exactly his/her monetary contribution to the surplus.

^a The amount that the dictator keeps is denoted by k in $[0, \bar{y}]$, where \bar{y} is the total surplus. The dictator's monetary contribution is denoted by y_d and the proportion of correct answers by the dictator is r_d^q in $[0, 1]$.

As detailed in the main text, these allocations differ in the weight that dictators assign to effort and circumstances. If the dictator chooses the egalitarian allocation, then the dictator will divide the surplus in two identical parts, so that the source of the surplus and its size will be ignored. The accountability allocation is based on the exerted effort (i.e., the number of correct answers) whereas the libertarian allocation takes into account the reward levels and is based on monetary contributions to the surplus. Note that the accountability and the libertarian allocation coincide ($r_d^q = y_d$) if $p_d = p_r$. When $q_d = q_r$, the accountability allocation and the egalitarian allocation coincide ($r_d^q = 1/2$). When the subjects' monetary contribution to the surplus is the same ($y_d = y_r$), then the libertarian and the egalitarian allocations coincide ($y_d = \bar{y}/2$).

Appendix C: Data

This appendix presents the data. Recall that there are 72 dictators (37 women and 35 men), which are divided in three different treatments depending on the reward levels.

The dictators' decisions in the distribution phase are summarized in Table 1C. In Panel A, I report the number of dictators choosing each possible allocation by considering women and men separately. Since no dictator chose to give the entire surplus away, such an allocation is not listed. Likewise, recall that justice principles may coincide in some cases, so Table 1C presents both the raw data and the grouped data, which has been used to plot (Figure 1 in the main text).

Table 1C. Dictators' allocation choices in the dictator game

A. Unconditional distribution of allocation choices

	Raw Data			Grouped Data		
	Women	Men	Total	Women	Men	Total
Selfish	10	15	25	10	15	25
Egalitarian	10	6	16	15	9	24
Accountability	6	5	11	13	9	22
Libertarian	2	5	7	8	6	14
Egal. = Account.	3	3	6			
Egal. = Libert.	2	0	2			
Account. = Libert.	4	1	5			
	37	35	72			

^a In each cell, I report the number of observations. The grouped data takes into account that some allocation choices might coincide under different scenarios.

B. Distribution of allocations depending on the dictator's relative earnings.

	$y_d \geq y_r$			$y_d < y_r$		
	Women	Men	Total	Women	Men	Total
Selfish	5	10	15	5	5	10
Egalitarian	0	3	3	10	3	13
Accountability	2	1	3	4	4	8
Libertarian	1	4	5	1	1	2
Egal. = Account.	1	2	3	2	1	3
Egal. = Libert.	2	0	2	0	0	0
Account. = Libert.	2	1	3	2	0	2
	13	21	34	24	14	38

^a In each cell, I report the number of observations.

Appendix D: Econometric Analysis

For the sake completeness, I present further regressions that attempt to see if some of the results presented in the paper are robust to other specifications (additional regressions are available upon request).

The main results of the logit specification are presented in Table 1D. In columns (1), (2) and (3), the dependent variable is the probability of choosing the most convenient allocation. Column (4) presents the results of a model in which the dependent variable is the probability of choosing the selfish allocation –i.e., the idea is testing if women are more socially oriented than men. In all specifications, the standard errors are presented in parenthesis and the marginal effects in the column ME.

Table 1D. Additional regressions

	Model (1)		Model (2)		Model (3)		Model (4)	
	Estimates	ME	Estimates	ME	Estimates	ME	Estimates	ME
Intercept	-0.915*		-0.865		-0.129		-0.164	
	(0.55)		(0.62)		(0.85)		(0.53)	
Women	1.164**	0.25**	1.134**	0.25**	1.680*	0.36**	-0.734	-0.16
	(0.53)		(0.50)		(0.89)		(0.58)	
DW	-0.118	-0.02	-0.100	-0.02	-0.087	-0.02	-0.778	-0.16
	(0.62)		(0.63)		(0.63)		(0.64)	
DB	0.850	-0.18	-0.825	-0.18	-0.796	-0.17	-0.526	-0.11
	(0.64)		(0.66)		(0.66)		(0.63)	
DQ_{dif}			-0.097	-0.02	0.494	0.11		
			(0.56)		(0.82)			
Women* DQ_{dif}					-0.975	-0.19		
					(1.16)			
Q_{dif}							0.025	0.01
							(0.07)	

Recall that $Q_{dif} = q_d - q_r$. The dummy variable DQ_{dif} takes the value 1 if $Q_{dif} \geq 0$ (and it is 0 otherwise). Significance at *10%, **5%, ***1% level.

The role of the gender is always positive (and significant) in specifications (1), (2) and (3), what supports Result 4 (i.e., women are more likely to choose the most convenient allocation). The gender is not significant in model (4) in line with Result 2 (i.e., women are neither more nor less socially oriented than men).