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Abstract

We introduce non-enforceable property rights over bargaining surplus in a two-stage dictator game in which the effort of the agents is differentially rewarded and determines the size of the pie. Using experimental data we elicit individual preferences over natural justice principles and provide evidence to support the inability of these principles to account for the observed behavior. We show that dictators do not follow a unique natural principle but instead employ self-interested criteria, maximizing their own payoffs constrained by these payoffs being considered just by one or more of the principles. The idea of the justice norm providing a constraint on otherwise self-maximizing agents is robust when we isolate the effect of selfish agents and focus on unselfish dictators to perform the analysis.

Keywords: dictator game, justice principles, self-interest.

JEL classification: C91, D3, D63, P14.

1 Introduction

In the one-shot dictator game, one of the players (dictator) chooses how to split a certain amount of money between herself and her counterpart (recipient), who has no strategic input into the final outcome of the game. Thus, the prediction is for dictators to give nothing to recipients if the dictators are not altruistic. However, dictators frequently violate this prediction in experiments, and that behavior has been usually interpreted as support for others-regarding preferences.

We explore the role of justice principles in the dictator game when the effort of the agents is differentially rewarded to determine the size of the pie. We design a laboratory experiment with two phases. In the first phase (the earning stage), subjects earn money by answering a multiple-choice test that pays each correct answer at fixed random reward. This reward is the same for all questions but might vary across individuals according to three different treatments in which dictators are paid less than, more than, or equal to, the

recipient for each correct answer. Hence, two factors determine a person's contribution to the pie: her score on the test and the rate at which this score is turned into money. Using this procedure, the available surplus to be divided depends on agents' effort and thereby rational, self-interested behavior should be produced, as argued by Konow (2000) and Cherry et al. (2002).¹ In the second phase (the bargaining stage), the dictators are randomly selected and asked to split the earned surplus after being informed about each agent's reward for each correct answer and their total contribution to the pie. Since it is common knowledge that reward levels and roles are completely random, dictators should have no incentives to employ a self-serving bias² and, therefore, it is likely that distributional preferences based on property rights are highlighted. In particular, the outcome of the second stage is then expected to be categorized according to three different justice principles: (i) dividing the surplus in two identical parts (egalitarian principle), (ii) using the number of agents' correct answer to split the pie (accountability principle) or (iii) taking into account agents' monetary contribution to the surplus (monetary principle). We refer to these as natural justice principles.

Our main finding is that there is no single natural justice principle that can explain the allocators' behavior. We find evidence to reject the egalitarian principle what suggests that entitlements over bargaining surplus play a role to determine the final division of the pie (Frohlich et al. 2004, Gächter and Riedl 2005). However, our results indicate that dictators do not split the surplus according to the accountability or the monetary principle, but that they adapt themselves to the exogenous payoff parameter choosing the "most selfish" alternative among both principles. Thus, dictators take part of the recipients' monetary contribution to the pie when dictators earn the money under unfavorable conditions (i.e., when they are paid a smaller reward per correct answer), although the accountability principle (which ignores reward discrimination introduced by experimenters and is based on agents' input) can be presented as a plausible explanation to describe their behavior in this framework. Not surprisingly, such a justice principle does not appear to characterize the dictators' choice when they have earnings under an advantageous position (i.e., when they are paid a higher reward per correct answer). The evidence in this latter scenario shows that dictators respect agents' monetary contribution to the surplus during the first stage, in spite of the exogenous reward discrimination. Indeed, when we undertake a pooled data analysis, we find evidence to reject the hypothesis that any of the three natural justice principles explain our data. However, we cannot

¹These studies argue that money should not be windfall but earned by participants to produce rational, self-interested behavior.

²Selfish behavior arises more frequently when the dictator is chosen after scoring higher in the test (Hoffman et al., 1994). This may occur because the dictator associates her role with property rights (i.e., because the dictator role is "earned") or simply because the use of this device to identify the person that is the dictator alerts the dictator to what her property rights are (Harrison and McKee, 1985).

reject the hypothesis that dictators divide the pie according to a minimum principle, which is defined as the most convenient justice principle applicable in each instance.

These results provide insights into the agents' self-interested behavior by suggesting that the justice norm provides a constraint on otherwise self-maximizing agents. And this interpretation is shown to be robust when we isolate the effect of purely selfish individuals to perform the analysis. Hence, robust methods that down-weight the outliers influence and linear regression over unselfish dictators are run to replicate our findings. In addition, when we consider men and women separately, we find that gender cannot explain the dictators' self-interested behavior.

Theoretically, it turns out that this empirical evidence can be explained relying on the social preferences literature which, roughly speaking, underscore the assumption that allocators' utility does not depend only on their final payoffs but also on other agents' ones as well as on the relationship between both amounts. However, our approach does not consider the possibility that dictators give money away because they have increasing utility in recipients' payoff (Kritikosa and Bollea 2001, Andreoni and Miller 2002), because they dislike payoff differences (Fehr and Schmidt 1999; Bolton and Ockenfels 2000) or because they want to maximize the lowest payoff to any one party (Engelmann and Strobel 2004). We conjecture instead that dictators maximize their own payoffs constrained by being considered fair by at least one principle and, thereby, deviations from narrow self-interest are basically motivated by a context-dependent justice principle.³

Section 2 offers a template for different justice principles that could be considered in our dictator game analysis and formally presents our hypotheses. We outline our experimental design in Section 3 and devote Section 4 to present the main results, including robustness checks in Section 5, in which we also present results for gender. Section 6 is used to conclude and relate our findings with previous literature. We also discuss in this final section plausible ways to model our results.

2 Selfishness and Justice Principles in the Dictator Game

Consider the dictator game where players can be labeled $i \in \{a, b\}$ such that $i = a$ (player a) embodies the dictator and $i = b$ (player b) is the recipient. The dictator has to divide a certain surplus ($M \geq 0$) between herself and her counterpart, where the available amount of money to be shared depends on agents' contribution to the pie, denoted by $m_i \geq 0$ for $i = \{a, b\}$.

³Andreoni and Vesterlund (2001) and Andreoni and Miller (2002) use a different approach to show that altruistic concerns change according to the "price of giving".

In particular,

$$M = \sum_{i=a,b} m_i = \sum_{i=a,b} p_i q_i$$

where $q_i \geq 0$ represents agent i 's performance in a previous stage and $p_i > 0$ is the weight assigned to this input (in our context, subjects will be asked to solve a questionnaire so q_i will be the number of agent i 's correct answers in a quiz and p_i the reward for each correct answer).

Definition 1 Let $s \in [0, 1]$ denote the proportion of the surplus that dictator allocates to the recipient, where $s(p_a, p_b; q_a, q_b) : \mathbb{R}_+^2 \times \mathbb{Z}_+^2 \rightarrow [0, 1]$. Then, we say that the dictator is purely selfish if $s(p_a, p_b; q_a, q_b) = 0$, $\forall p_i > 0, q_i \geq 0, i = \{a, b\}$. When $s(p_a, p_b; q_a, q_b) = 0.5$, $\forall p_i > 0, q_i \geq 0$, we say that the dictator allocation satisfies the egalitarian principle.

Therefore, a *selfish dictator* would keep the entire surplus, regardless of the agents' contribution to the pie, whereas an *egalitarian dictator* would choose to divide it equally, ignoring the source of the surplus or its size. Both concepts are distant from other justice theories that plead for a solution where entitlements over the available surplus are directly determined by subjects characteristics, namely their inputs.⁴

Definition 2 Let $s \in [0, 1]$ denote the proportion of the surplus that dictator allocates to the recipient, where $s(p_a, p_b; q_a, q_b) : \mathbb{R}_+^2 \times \mathbb{Z}_+^2 \rightarrow [0, 1]$. Then, we say that the dictator follows the accountability principle if $s(p_a, p_b; q_a, q_b) = q_b/Q$, where $Q = q_a + q_b$.

We say that the dictator behaves according to the accountability principle whenever she takes into account discretionary variables (the number of correct answers) rather than exogenous variables (rewards) to make the division of the pie. Basically, this notion of justice corresponds to an *equity principle*, especially in our context where both agents have had the same opportunities to answer the test and it implies that those factors that cannot be controlled by agents (i.e., the rewards) are not considered by dictators when making their choice. It can be argued, however, that *justice principles* and *entitlements* are related so those agents who have contributed more should get their contribution to the surplus, regardless of the special circumstances that determined this situation.

Definition 3 Let $s \in [0, 1]$ denote the proportion of the surplus that dictator allocates to the recipient, where $s(p_a, p_b; q_a, q_b) : \mathbb{R}_+^2 \times \mathbb{Z}_+^2 \rightarrow [0, 1]$. Then, we say that the dictator follows the monetary principle if $s(p_a, p_b; q_a, q_b) = m_b/M$, where $M = m_a + m_b$.

⁴For further description of various theories of justice see Konow (2003).

Broadly, the monetary principle embodies the idea that those who had been lucky with reward assignments should not be punished to favor those who had been not, so that nature plays a crucial role to determine justice concerns.

Any of these three principles could be claimed to reflect entitlements over bargaining surplus and, thereby, they could be considered as plausible *justice norms* from the dictators' point of view. Thus, the egalitarian principle implies that neither the score in the test nor the prices are important to determine the dictators' giving. The accountability principle is based solely on the first factor and the monetary principle is based on both.

Our first hypothesis, however, is that dictators do not follow any of these principles. Hence, they will divide the total surplus according to the number of correct answers (accountability principle) if they are at a relative disadvantage to accumulate profits ($p_a < p_b$), but that they will follow the monetary principle (i.e., the criteria based on earnings) when their correct answers are being paid at a higher rate ($p_a > p_b$). Formally, we can summarize:

Hypothesis 1. *There exists not an stationary justice principle that prevails in all circumstances. Thus, if $p_a < p_b$, dictators' allocation will satisfy the accountability principle rather than the monetary or the egalitarian principle. However, when $p_a > p_b$ dictators' allocation will satisfy the monetary principle rather than the accountability or the egalitarian principle.*

If we find evidence to support our first hypothesis, we can claim that there is no unique or absolute natural justice principle to explain dictators' behavior, but dictators are affected by the exogenous variables (i.e., reward levels). This would lead us to consider different justice principles for different earning conditions according to a self-interested behavior approach.⁵

Our second hypothesis conjectures that the justice norm actually provides a constrain on otherwise self-maximizing agents. In other words, that the dictators will either be purely selfish or self-interested agents who follow the most convenient justice principle:

Hypothesis 2. *Let $s \in [0, 1]$ denote the proportion of the surplus that the dictator allocates to the recipient, where $s(p_a, p_b; q_a, q_b) : \mathbb{R}_+^2 \times \mathbb{Z}_+^2 \rightarrow [0, 1]$. Then, dictators who are not purely selfish will follow the minimum principle, that is, if $s(p_a, p_b; q_a, q_b) \neq 0$ then $s(p_a, p_b; q_a, q_b) = \min\{m_b/M, q_b/Q, 0.5\}$ where $M = m_a + m_b$ and $Q = q_a + q_b$.*

⁵Rawls (1999) suggests that the egalitarian principle would be expected when agents decide the principle of justice from behind the veil of ignorance. Since the dictators do not make their choices under the veil of ignorance in our experimental design, we expect entitlements over total surplus playing an important role (Konow 2000, Frohlich et al. 2004, Gächter and Riedl 2005, Oxoby and Spraggon 2008).

In short, this second hypothesis states that dictators reciprocate based on recipients' contribution, but that they will choose which justice principle best maximizes their earnings.

3 Experimental Design

A total of 144 students reporting no previous experience in experiments were recruited from Alicante University in May 2008 and November 2008. Through different sessions, subjects were received in the Laboratory for Theoretical and Experimental Economics and invited to take a numbered ball to determine their place during the computerized experiment. The Laboratory consists of 24 networked computer workstations in separate cubicles. The experiment was implemented using the z-Tree software due to Fischbacher (2007).

The Earning Stage

When subjects are in front of their computers, instructions are read aloud and students understand that they have to individually complete a test that will provide earnings for the second stage of the experiment. At this point, it is common knowledge that the test is the same for all individuals and subjects are also informed about the existence of a second phase. However, they are not told that the test is intended to redistribute earnings. The quiz takes 35 minutes and contains 20 multiple-choice questions, with only one correct answer over the five possibilities. Before answering the questions, subjects know that each of their correct answers will be randomly paid at a certain reward rate $p_i \in [p_0, p_1]$, for $i \in \{a, b\}$. The reward coincides for all questions but might vary across individuals. The values of p_0 and p_1 are common knowledge but the realization of p_i is unknown until the second period.⁶

Treatments

When the time for the test expires, subjects are randomly matched in pairs and assigned a type, namely "player a " (dictators) or "player b " (recipients). This type does not depend on agents' performance in the test and is used to determine the subjects' role through the second stage of the experiment as well as the reward for their correct answers. Hence we fix $p_a = 150$ pesetas⁷ and $p_b \in \{100, 150, 200\}$ pesetas as follows.

⁶The instructions are in the appendix and the complete test is available on request. Our test is intended to be solved by making some effort. We use questions from 1 to 10 in List and Cherry (2000) and 10 additional questions of our own.

⁷It is standard practice for all experiments run in Alicante to use Spanish pesetas as experimental currency. The reason for this design choice is twofold. First, it mitigates integer problems, compared with other currencies (USD or Euros, for example). Second, although Spanish pesetas are no longer in use (replaced by the Euro in 2002), Spanish people still use pesetas to express monetary values in their everyday life. In this respect, by using a "real" (as opposed to an artificial) currency, we avoid the

In our *dictator worse (DW) treatment*, with 24 observations, dictators are treated relatively worse than recipients since their correct answers are paid at a lower reward rate, so $p_a = 150$ pesetas and $p_b = 200$ pesetas. In the *dictator better (DB) treatment*, with 24 observations, the previous situation is reversed and players a receive a higher reward per correct answer than players b , that is $p_a = 150$ pesetas and $p_b = 100$ pesetas. Finally, in our *baseline (BL) treatment*, with 24 observations, reward levels coincide for both subjects, so $p_a = p_b = 150$ pesetas.

The Bargaining Stage

When subjects are informed about their rewards and their contribution to the pie, it is common knowledge that reward levels and roles have been randomly decided. Then, the total surplus is divided according to dictators' decision, which is made under anonymous conditions.⁸

A show-up fee of 4 Euros is paid to each participant at the end of the session, regardless of their performance in the quiz.

4 Behavior in the dictator game

On average the dictators divided around 3000 pesetas (18 Euros) in the bargaining stage and no significant difference exists between the number of dictators' and recipients' correct answers except in the BL treatment, where recipients have more correct answers than dictators.⁹

Table 1 summarizes the main variables for each treatment and presents an overview of our data. Whereas q_i denotes the number of agent i 's correct answers for $i \in \{a, b\}$ and $s \in [0, 1]$ stands for the proportion of the pie that dictators give away, we define two new variables here which measure the dictators' deviation from monetary principle ($s - m_b/M$) and the dictators' deviation from accountability principle ($s - q_b/Q$).

-Table 1 here -

If we test for the purely selfish hypothesis above, we reject it at any common significance level so we can conclude that, regardless of the treatment under consideration, the recipients' effort in the test is taken into account by the dictators when making their choice. Furthermore, we find that positive transfers occur problem of framing the incentive structure of the experiment using a scale (e.g. "Experimental Currency") with no cognitive content. Exchange rate: 1 Euro = 166,386 pesetas.

⁸We do not use the double-blind procedure because it might make agents skeptical about whether transfers will be carried out (Bolton et al., 1998). The appendix provides further details about the bargaining stage.

⁹In the BL treatment, the null $H_0 : q_a = q_b$ can be rejected at a 5% significance level in favor of the alternative $H_1 : q_a \neq q_b$ ($t = 2.14$, $p - value = 0.036$).

nearly 90% of the time with the average being around forty percent of the pie (significantly higher than the average given in other dictator games). The key question to be addressed in this section is whether dictators behave in a self-interested manner as defined by our hypotheses.

The Inexistence of a Unique Natural Justice Principle

A first approximation to the answer comes from the Figures 1A and 1B. In each graph we plot the proportion of the pie that is due to recipients' performance in the quiz in the horizontal axis and we use the vertical axis to represent dictators' giving, $s \in [0, 1]$. As a consequence, the 45 degree line represents the appropriate theoretical prediction in the sense that observations on this line show that recipients are being transferred exactly the proportion of the pie that they have contributed. Since the recipients' contribution to the pie depends on inputs and payments, we need to distinguish between the proportion of the pie that is due to recipients' monetary contribution (m_b/Q) in Figure 1A and the proportion that is due to their correct answers (q_b/Q) in Figure 1B. Obviously these variables do not coincide except for the BL treatment where $p_a = p_b$.

- Figure 1 here -

In the DW treatment ($p_a < p_b$), dictators would be strictly better off if they followed the accountability principle instead of the monetary principle (Hypothesis 1). Figure 1A actually shows that observations lie on the right hand side of the 45 degree line when we consider the monetary principle as the theoretical prediction. This implies that the recipients' monetary contribution to the pie is an upper bound from the dictators' objective of deciding how much to give in this treatment. Dictators do not transfer their earnings to the recipients probably under the belief that recipients are being paid a higher reward per correct answer. In this treatment, however, Figure 1B suggests that the dictators take into account recipients' correct answers when they split the money, since the data pattern can be better adjusted to the 45 degree line $s = q_b/Q$.

We use robust standard errors (White, 1980) and estimate Weighted Least Squares (hereafter, WLS) to see whether the observed data pattern adjusts to any of these justice principles, by comparing the regression lines with the 45 degree lines in Figures 1A and 1B.¹⁰ Estimating $s_i = \alpha + \beta(m_b/M)_i + e_i$ allow us to test whether the monetary principle holds when we test for the intercept (α) not being significantly different from zero and the slope (β) not being significantly different from one. Similarly, the observed data pattern

¹⁰If we run OLS and test for the assumption that the linear regression model residuals have constant variance, we reject that hypothesis using Cook-Weisberg test. We run WLS to compensate for heteroskedasticity. Our results could be influenced, however, by the existence of selfish dictators on the horizontal line $s = 0$ (outliers). We deal with this problem in the robustness section.

in the DW treatment provides evidence in favor of the accountability principle when this null hypothesis cannot be rejected for equation $s_i = \alpha + \beta(q_b/Q)_i + e_i$. In both cases, not rejecting the hypothesis that the intercept is 0.5 and the slope is 0 would imply that there is no evidence to reject that dictators follow the egalitarian principle, giving away half of the pie.

In Table 2 we present the estimates of the parameters (α and β) and the corresponding p-values for the individual significance (in brackets). We find that the intercept is generally not significantly different from zero, but the slope is. Moreover, and consistent with our Hypothesis 1, we observe that in the DW treatment ($p_a < p_b$) the dictator's allocation fails to satisfy the monetary ($F_{2,22} = 7.93$, p -value = 0.0025) or the egalitarian principle (p -values = 0.023 and 0.027), although we cannot reject the accountability principle here ($F_{2,22} = 2.04$, p -value = 0.1534).

-Table 2 here -

The results are reversed for the DB treatment. In this case, the last two rows in Table 2 show that we cannot reject the monetary principle ($F_{2,22} = 0.88$, p -value=0.4278), although the accountability and egalitarian principles can be rejected at any plausible significance level ($F_{2,22} = 7.50$, p -value=0.003 for the accountability principle and p -value = 0.0002 in the case of the egalitarian principle). Graphically, the results for the DB treatment can be observed in Figures 2A and 2B. We see in Figure 2B that all dictators but one transfer a proportion of the pie that is below q_b/Q , so that recipients' correct answers can be presented as an upper bound on dictators' giving. Figure 2A shows that dictators' behavior seems to adjust better to the monetary principle in this case.¹¹

- Figure 2 here -

The same result is obtained when we consider Mann-Whitney-Wilcoxon tests summarized in Table 3. This table presents median shares and recipients' contribution to the pie in the first three columns. Paired-data procedures are then used to study whether the monetary, accountability and egalitarian principle hold in each treatment.

- Table 3 here-

¹¹In principle, the accountability and the monetary principle overlap in the BL treatment (i.e., $q_b/Q = m_b/M$), in which case dictators are expected to follow these principles rather than making an egalitarian division of the pie (Konow 2000, Frohlich et al. 2004, Gächter and Riedl 2005). However, the fact that dictators have significantly less questions correctly than recipients implies that we reject these principles in the BL treatment ($F_{2,22} = 12.69$ and p -value = 0.000 for the monetary and accountability principle, and $F_{2,22} = 4.62$, p -value = 0.021 for the egalitarian one).

Our findings are consistent with Hypothesis 1: the accountability principle does not hold in the DB treatment ($t = 3.257$, $p - value = 0.0011$), and the monetary principle does not hold in the DW treatment ($t = 4.095$, $p - value = 0.0000$).¹²

The Minimum Principle

Our second hypothesis states that dictators are self-interested agents, and will either follow the theoretical prediction of giving no money away or they will behave according to the minimum principle, so that they will maximize their own payoff constrained by the allocation being considered fair by at least one of the natural justice principles. In this section we employ pooled data analysis, isolating the effect of purely selfish dictators. Hence, we develop our analysis for Hypothesis 2 relying on the 62 observations in which the dictators give money away.¹³

We initially estimate WLS in equation $s_i = \alpha + \beta x_i + e_i$, for $x_i \in \{m_b/M, q_b/Q, min\}$ and $min = \min\{0.5, m_b/M, q_b/Q\}$, to test the null hypothesis $H_0 : \alpha = 0, \beta = 1$ in each particular regression.¹⁴

-Table 4 here -

The first row of Table 4 presents the $F_{2,62}$ statistical values and the corresponding p-values (in brackets) for each of the possible justice principles under consideration. None of the three natural justice principles can be used to explain the non-selfish dictators' behavior ($p - value = 0.0000$ in all the cases). This finding is consistent with our previous discussion, and suggests that there does not exist a unique natural principle that can be used to explain the pooled data. However, we cannot reject the hypothesis that the minimum

¹²Although the egalitarian principle cannot be rejected in the DW treatment ($t = 1.060$, $p - value = 0.2889$) the interpretation for this result is straightforward. Since recipients' correct answer contribution is exactly half of the pie in this treatment, the egalitarian and the accountability principle can be hard to distinguish when testing for average behavior. Hence, if we cannot reject the null hypothesis $H_0 : s = 0.5$ using the Mann-Whitney-Wilcoxon test we should interpret this as showing that there exists no evidence to reject the claim that dictators give to recipients half of the pie on average. However, this result does not imply that dictators *unconditionally* transfer half of the pie as the egalitarian principle states.

¹³In total we have 72 observations (i.e., 24 observations in each treatment). We have 8 dictators choosing $s = 0$, one giving $s = 0.01$ and another one transferring $s = 0.02$. We do not consider these observations here because they correspond to selfish dictators who give away less than 5% of the pie and can be said to follow the theoretical prediction $s = 0$. Still, we have one dictator who gives $s = 0.08$ in the DB treatment. We include this observation in our analysis but exactly the same results are valid when this observation is removed.

¹⁴We use WLS because the Cook-Heisberg test reveals a lack of homoskedasticity. The results for the egalitarian principle can be derived from any of the regressions and testing for the null $H_0 : \alpha = 0.5, \beta = 0$. In Table 4 we present the statistical values after estimating $s_i = \alpha + \beta(m_b/M)_i + e_i$. Hereafter, we use this regression to test for the egalitarian principle, but similar results are obtained when the explanatory variables are either q_b/Q or min .

principle drives dictators' behavior ($F_{2,60} = 0.69$, $p - value = 0.5064$). This evidence is also found when we use the Mann-Whitney-Wilcoxon test (paired data), as observed in the second row of Table 4. Again, we cannot reject the minimum principle ($t = 0.84$, $p - value = 0.4038$), but any other principle can be rejected at any significance level (specifically, we find that $t = 3.34$ and $p - value = 0.0014$ for the monetary principle, $t = 4.13$ and $p - value = 0.0001$ for the accountability principle, and $t = 2.91$, $p - value = 0.0000$ for the egalitarian principle).

Therefore, we find evidence in this section to support our Hypothesis 2 and conclude that non-selfish dictators remain self-interested agents in the sense that they appear to behave according to the most favorable justice principle (minimum principle) when dividing the pie.

5 Robustness

Our objective in this section is twofold. On the one hand, we want to isolate the effect of the purely selfish dictators since these observations are clearly outliers that might bias our evidence in favor of Hypothesis 1 by affecting the LS-estimation. On the other hand, we are interested in looking at the role of gender to test whether this variables can explain our findings concerning the dictators' self-interested behavior.

Self-Interested Behavior and Outliers

Figures 1 and 2 show that dictators sometimes transfer no money away, behaving according to the theoretical prediction. Although this behavior is completely rational for self-interested agents, observations on the horizontal line $s = 0$ can be considered vertical outliers, especially when we are using the linear regression to test the theoretical prediction of justice (45 degree line).¹⁵ We present robust estimates in Table 5. Broadly, our results replicate the previous findings: the monetary principle can be rejected in the DW treatment ($F_{2,22} = 17.89$, $p - value = 0.0000$), the monetary principle can be rejected in the DB treatment ($F_{2,22} = 25.97$, $p - value = 0.0000$), and the egalitarian principle can be rejected in both treatments.¹⁶

- Table 5 here -

¹⁵Vertical outliers are defined as observations that have outlying values for the y-dimension but are not outlying in the x-dimension. Verardi and Croux (2008) argues that M-estimators (i.e., the Tukey Biweight function) can be used to accomplish robust estimates in this case. This procedure down-weights the observations that deviate from the majority of the data and is about 95% as efficient as OLS.

¹⁶The intercept is significantly different from zero in the DW treatment, in which the accountability principle is also rejected. Still, in light of these results, we can conclude that there is no unique principle that survives in all treatments.

An alternative approach to achieve robust estimates is to run WLS for those observations where $s > 0.05$. In this case, we do not consider all observations and down-weight the outliers, but instead we focus on the unselfish dictators (i.e., we rely on the 21 observations for the DW treatment and the 22 observations for the DB treatment which correspond to the dictators who transfer above 5% of the pie). We can also perform the Mann-Whitney-Wilcoxon test if we consider these observations. The results for both procedures are presented in Table 6.

- Table 6 here -

The monetary principle can be rejected as an explanation of the dictators' choice in the DW treatment regardless of the test procedure under consideration ($F_{2,19} = 8.55$, $p - value = 0.002$ and $t = 3.786$, $p - value = 0.000$). The accountability principle is rejected in the DB treatment ($F_{2,20} = 10.43$, $p - value = 0.001$ and $t = 2.939$, $p - value = 0.003$), and we reject the egalitarian principle in both treatments ($F_{2,19} = 6.87$ and $t = 0.087$ in the DW treatment and $F_{2,20} = 14.71$ and $t = 2.722$ in the DB treatment).¹⁷

Self-Interested Behavior and Gender

Women are not only more generous than men (Eckel and Grossman, 1998) but they are also expected to be (Aguiar et al., 2009). Indeed, Andreoni and Vesterlund (2001) show that women and men behave differently concerning altruism depending on the "price of giving", but that women exhibit some tendency to behave in an egalitarian manner. In our experiment, we have 38 women and 34 men who are dictators, so we can look at their choices to see whether gender might explain our results. Do we fail to find a unique justice principle simply because women and men are following different justice principles?

On average, women answer $q_a = 8.68$ questions correctly, while men answer $q_a = 11.82$. This yields average contributions around 44% and 54% of the pie, respectively.¹⁸

In Table 7 we study whether women (who contribute to the pie below 0.5) follow any natural justice principle when they split the pie or, on the contrary, are they self-interested dictators who behave according to the minimum principle. In each row, we consider the different justice principles (including the minimum

¹⁷In the BL treatment, neither the accountability nor the monetary principle lead to the dictators' choice, but there exists no clear evidence for the egalitarian principle in this case since results depend on the test procedure.

¹⁸The null hypothesis that "women and men answer the same questions correctly" can be rejected at any significance level ($t = 5.26$, $p - value = 0.0000$). The same result holds when we test for "their average monetary contribution to the pie is the same" ($t = 2.95$, $p - value = 0.0043$). Men are more likely to be selfish: we have 35 of 38 women who give more than 5% of the pie away, while only 27 of 34 men transfer above this proportion. This finding is consistent with Andreoni and Vesterlund (2001).

principle). In the columns, we use different approaches to perform our analysis. Hence, the first column (Biweight function) stands for the pooled data analysis after down-weighting the outliers so it shows the $F_{2,36}$ statistics and the p-values (in brackets). In the remaining procedures we rely on women who give above 5% of the pie. Thus, the second column (WLS) uses White estimates of the variance and run WLS to correct for heteroskedasticity. In the column, we presents the values of the $F_{2,33}$ statistics and the p-values (in brackets). The Paired data column presents the values of the statistic t and the p-values (in brackets) for the Mann-Whitney-Wilcoxon test .

- Table 7 here -

We reject the hypothesis that women behave according to the monetary or the accountability principle, regardless of the test procedure. The egalitarian principle can always be rejected except when we use paired data test for unselfish women ($t = 1.422$, $p - value = 0.1642$), while the *minimum principle* can never be rejected.¹⁹

6 Discussion

The dictator game has long been presented as generating clear evidence to support the view that agents behave unselfishly. The gist of the argument is that subjects who are initially allocated a certain amount of money (dictators) usually share it with those agents who must accept any transfer (recipients). Broadly speaking, the experimental evidence shows that dictators' average giving exceeds 20% of the pie (Camerer, 2003), and this result has been shown to be robust when doubling the size of the pie (Forsythe et al., 1994), when dictators' decision are anonymous even for experimenters in a double-blind procedure (Hoffman et al., 1994) and when subjects come from different cultures (Henrich et al., 2001).

Nevertheless, recent studies show that significant changes in dictators' behavior take place when the surplus is not provided by experimenters, but salient in the agents' effort. Cherry et al. (2002) find, under anonymous conditions, that 95% of dictators transfer no money at all when their effort determines the size of the pie, while Oxoby and Spraggon (2008) point out that the dictators will be prone to give money away if the recipients also strive for the pie. The idea of deservingness is also presented in other papers such as

¹⁹When we consider these regressions for men, we find that the egalitarian principle can always be rejected. Moreover, our results provide no evidence to reject the minimum principle and, in general, the accountability or the monetary principle are not rejected either. A plausible explanation for this result is that men's contribution to the pie exceeds 0.5 so that giving according to the egalitarian principle is "the worst" possibility, while behaving according the accountability or the monetary remains a self-interested option.

Eckel and Grossman (1996), Ruffle (1998), Frohlich et al. (2004) and Gächter and Riedl (2005), who discuss the relationship between choices based on entitlements and egalitarian divisions of the pie, and conclude that dictators are basically motivated by the former criteria.

The main contribution of our approach is to elicit the subjects' preferences over justice principles when both agents contribute to the pie, but their effort is differentially rewarded. In our experimental procedure, justice principles arise naturally, in the sense that we do not constrain dictators to choose from a menu or a set of alternatives, but they freely decide how to divide the earned surplus according to some internal principle. Overall, our results support the claim that even though the legitimacy of endowments is important from the dictators' perspective, there exists a self-interested justice principle explaining their choices. This implies, on the one hand, that legitimacy of endowments is not the unique important variable to be considered in the dictator game (Mittone and Ploner, 2006). On the other hand, our findings seem to suggest that individuals exhibit a weak preference for fairness (Dana et. al., 2007) or at least a self-interested preference over redistribution (Rutström and Williams, 2000).

Theoretically, our results could be explained in several ways. For instance, we could consider the possibility of cognitive dissonance as a context-dependent factor (Konow, 2000) or we could extend the models of Fehr and Schmidt (1999) and Frohlich et al. (2004) to the case in which dictators take into account the difference in reward levels in addition to the usual inequality aversion components. Hence, we may think of a model in which taking money away from recipient's contribution is perceived as costly from the dictator's point of view, and the final division of the pie would be determined after weighting differences in payoffs, earnings and reward levels. However, rather than assuming any particular utility function for dictators, we interpret that dictators are simply self-interested agents who maximize their utility being constrained by the justice norms.

We can build this conclusion on economic decisions. For instance, Andreoni et al. (1998, p.850) suggest that "taxpayers are far more compliant than the theory might predict" so other factors such as moral rules and fairness concerns might be used to explain their behavior. Rather than rejecting this hypothesis, we suggest that if justice motivates taxpayers behavior, then a self-interested feeling would be leading their behavior, what actually sheds light on the empirical evidence, since the 1988 Tax Compliance Measurement Program (TCMP) reveals that taxpayers usually miss-report their income, underestimating their tax liabilities.²⁰

²⁰Obviously, if taxes were considered *just* then taxpayers would find no incentives to cheat, especially when the low probability of detection and the small expected penalties make evasion an optimal behavior for expected utility agents. Moreover, even though subjective probabilities of being detected could be used to explain taxpayers' behavior (Dhami, S. and al-Nowaihi, 2007), other factors such as morale and fairness concerns are plausibly involved.

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Appendix

Instructions (originally in Spanish) were read aloud by experimenters so subjects could follow up them carefully. In addition, participants were provided a copy of the instructions on a piece of paper.

WELCOME TO THE EXPERIMENT! (Spanish translation)

This is an experiment to study decision making, so we're not interested in your particular choices but on individual's average behavior. Thus, all through the experiment you'll be treated anonymously. Neither the experimenters nor the people in this room will ever know your particular choices. No particular behavior is expected from you. But take into account that your behavior will affect how much money you can earn in this experiment.

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 because it is important that you understand the experiment before starting.

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

THE EXPERIMENT

First phase (*Instructions are read aloud*)

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.

Now, you will 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, because 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, but only with the experimenters. (*Figure 3 shows the computer screen that participants faced*).

-Figure 3 here -

Second phase (*Instructions in the computer screen. To be read aloud*)

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. The computer screen that they faced was similar to Figure 4 below*).

Now, you will be assigned a type, namely 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. Remember that your choices will be treated anonymously. Neither during the experiment nor after the experiment you will know the identity of the person you are matched with.

- Figure 4 here -

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Figures

Figure 1

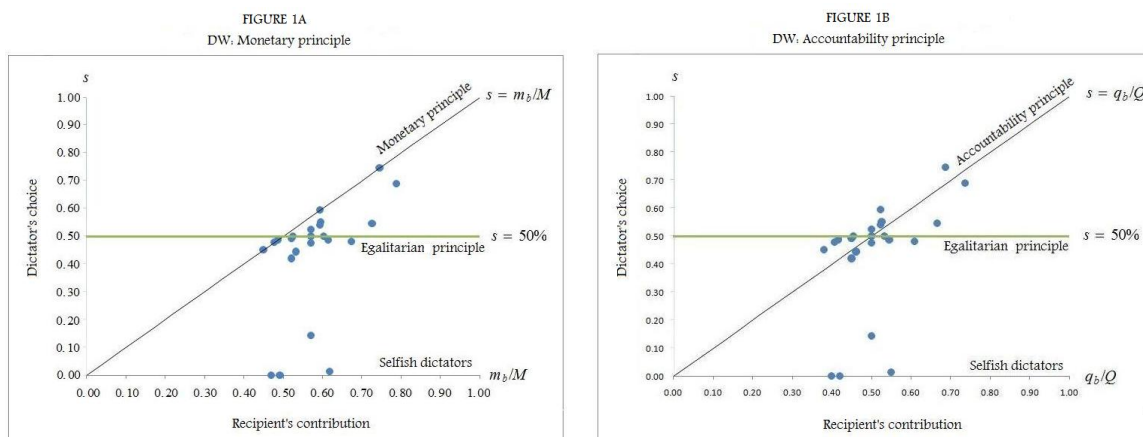


Figure 2

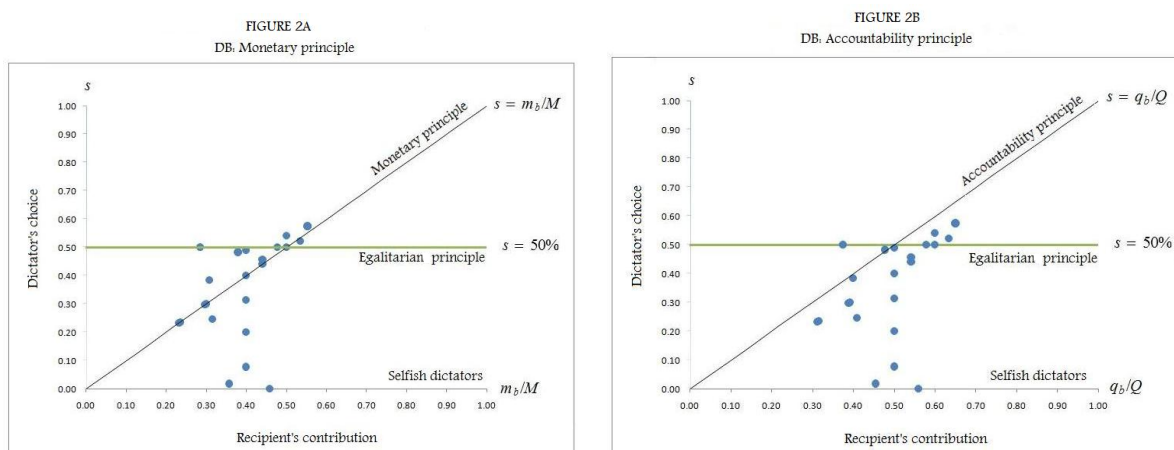


Figure 3

Remaining Time (sec): 50

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

You have answered 12 questions correctly. Since each question is paid at price 150 pesetas, you have contributed 1800 pesetas to the total amount.

Player B have answered 11 questions correctly. Since her/his questions are paid at price 200 pesetas, she/he has contributed 2200 pesetas to the total amount.

The total amount of money that both have accumulated is 4000 pesetas.

How do you decide to split it?

For me

For her/him

OK

Figure 4

Remaining Time (sec): 50

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

You have answered 12 questions correctly. Since each question is paid at price 150 pesetas, you have contributed 1800 pesetas to the total amount.

Player B have answered 11 questions correctly. Since her/his questions are paid at price 200 pesetas, she/he has contributed 2200 pesetas to the total amount.

The total amount of money that both have accumulated is 4000 pesetas.

How do you decide to split it?

For me

For her/him

OK

Tables

Table 1

Table 1. Data description

Treatment	N	p_a	p_b	q_a		q_b		s		$s - m_b/M$		$s - q_b/Q$	
				Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
DW	24	150	200	9.92	2.94	10.17	2.38	0.44	0.19	-0.14	0.17	-0.07	0.17
DB	24	150	100	10.75	2.41	10.5	3.13	0.37	0.37	-0.03	0.16	-0.12	0.16
BL	24	150	150	9.83	3.47	11.96	3.38	0.36	0.21	-0.18	0.25	-0.18	0.25

Table 2

Table 2. Linear estimates correcting for heteroskedasticity and F test

Treatment	Dependent variable	Linear regression		F-test		
		$s_i = \alpha + \beta x_i + e_i$		Monetary principle	Accountability principle	Egalitarian principle
		$\hat{\alpha}$	$\hat{\beta}$	$H_0 : \alpha = 0, \beta = 1$	$H_0 : \alpha = 0, \beta = 1$	$H_0 : \alpha = 0.5, \beta = 0$
DW	$x_i = (q_b/Q)_i$	-0.084 (0.668)	1.029 (0.008)	-	2.04 (0.153)	4.50 (0.023)**
	$x_i = (m_b/M)_i$	0.183 (0.444)	1.076 (0.009)	7.93 (0.0025)***	-	4.28 (0.027)**
DB	$x_i = (q_b/Q)_i$	0.330 (0.786)	0.68 (0.010)	-	7.50 (0.003)***	13.42 (0.0002)***
	$x_i = (m_b/M)_i$	0.077 (0.460)	0.734 (0.008)	0.88 (0.4278)	-	13.32 (0.0002)***

The null hypothesis is rejected at (*) 10%, (**) 5% or (***) 1% significance level.

Table 3

Table 3. Mann-Whitney-Wilcoxon test

Treatment	Median			Monetary principle	Accountability principle	Egalitarian principle
	s	m_b/M	q_b/Q	$H_0 : s = m_b/M$	$H_0 : s = q_b/Q$	$H_0 : s = 0.5$
DW	0.49	0.57	0.5	4.095 (0.0000)***	0.929 (0.3529)	1.060 (0.2889)
DB	0.42	0.40	0.5	0.290 (0.7719)	3.257 (0.0011)***	3.067 (0.0022)***

The null hypothesis is rejected at (*) 10%, (**) 5% or (***) 1% significance level.

Table 4

Table 4. F test and Mann-Whitney-Wilcoxon test for pooled data (non-selfish dictators)

Test	N	Monetary principle	Accountability principle	Egalitarian principle	Minimum principle
		$H_0 : s = m_b/M$	$H_0 : s = q_b/Q$	$H_0 : s = 0.5$	$H_0 : s = \min\{m_b/M, q_b/Q, 0.5\}$
F-test after WLS estimation $s_i = \alpha + \beta x_i + e_i$	62	17.86 (0.0000)***	15.36 (0.0000)***	24.48 (0.0000)***	0.69 (0.5064)
Paired-data Mann-Whitney-Wilcoxon test	62	3.34 (0.0014)***	4.13 (0.0001)***	2.91 (0.0000)***	0.84 (0.4038)

The null hypothesis is rejected at (*) 10%, (**) 5% or (***) 1% significance level.

Table 5

Table 5. Robust regression analysis (Biweight function)

Treatment	Dependent variable	$s_i = \alpha + \beta x_i + e_i$		F-test		
		$\hat{\alpha}$	$\hat{\beta}$	Monetary principle $H_0 : \alpha = 0, \beta = 1$	Accountability principle $H_0 : \alpha = 0, \beta = 1$	Egalitarian principle $H_0 : \alpha = 0.5, \beta = 0$
DW	$x_i = (q_b/Q)_i$	0.200 (0.0008)	0.616 (0.000)	-	4.29 (0.0276)**	11.49 (0.0004)***
	$x_i = (m_b/M)_i$	0.141 (0.101)	0.644 (0.000)	17.89 (0.000)***	-	11.18 (0.0004)***
DB	$x_i = (q_b/Q)_i$	-0.077 (0.192)	0.989 (0.000)	-	25.97 (0.0000)***	70.09 (0.0000)***
	$x_i = (m_b/M)_i$	-0.0041 (0.934)	1.0398 (0.000)	0.55 (0.5836)	-	70.02 (0.0000)***

The null hypothesis is rejected at (*) 10%, (**) 5% or (***) 1% significance level.

Table 6

Table 6. WLS estimation for non-selfish dictators

Treatment	N	Justice principle	$s_i = \alpha + \beta x_i + e_i$			Test procedure	
			Dependent variable	$\hat{\alpha}$	$\hat{\beta}$	F-test	Paired-data test
DW	21	Monetary principle	$x_i = (m_b/M)_i$	0.089 (0.468)	0.714 (0.000)	8.55 (0.002)***	3.786 (0.000)***
		Accountability principle	$x_i = (q_b/Q)_i$	0.146 (0.134)	0.687 (0.001)	1.69 (0.212)	0.070 (0.944)
		Egalitarian principle	-	-	-	6.87 (0.006)***	0.087 (0.030)**
DB	22	Monetary principle	$x_i = (m_b/M)_i$	0.080 (0.316)	0.8096 (0.000)	0.68 (0.518)	1.108 (0.268)
		Accountability principle	$x_i = (q_b/Q)_i$	0.027 (0.766)	0.761 (0.000)	10.43 (0.001)***	2.939 (0.003)***
		Egalitarian principle	-	-	-	14.71 (0.000)***	2.722 (0.006)***

The null hypothesis is rejected at (*) 10%, (**) 5% or (***) 1% significance level.

Table 7

Table 7. Self-interested behavior and gender: Women's behavior

Justice principle	Null hypothesis	Pooled data (38 obs.)	Unselfish data (35 observations)	
		Biweight function	WLS	Paired data
Monetary principle	$H_0 : s = m_b/M$	13.80 (0.0000)***	14.60 (0.0000)****	3.497 (0.0013)***
Accountability principle	$H_0 : s = q_b/Q$	12.02 (0.0001)***	14.09 (0.0000)***	4.317 (0.0001)***
Egalitarian principle	$H_0 : s = 0.5$	8.51 (0.0009)***	8.73 (0.0009)***	1.422 (0.1642)
Minimum principle	$H_0 : s = \min\{m_b/M, q_b/Q, 0.5\}$	1.18 (0.32)	0.41 (0.6641)	0.201 (0.8421)