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Ismael Rodriguez-Lara and Luis Moreno-Garrido*

Abstract

We expand upon the previous models of inequity aversion of Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004), which assume that dictators get disutility if the final allocation of the surplus deviates from the equal split (egalitarian principle) or from the subjects' production (libertarian principle). In our model, dictators may also account for the way in which the surplus was generated. More precisely, our model incorporates the idea of the liberal egalitarian ethics into the analysis, making it possible for dictators to divide the surplus according to the accountability principle, which states that subjects should only be rewarded for factors under their control. This fairness ideal does not hold subjects responsible for factors beyond their control in the production of the surplus, an idea that is absent in the models of inequity aversion cited above.

Keywords: social preferences, inequity aversion, inequality aversion, egalitarian principle, libertarian principle, accountability principle.

JEL classification: D3, D63.

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1 Introduction

The standard assumption that subjects do only care about their own material payoff is frequently used to solve economic models. However, the overwhelming experimental evidence against this assumption (especially in the dictator experiment) indicates that subjects are willing to sacrifice their own material payoff to achieve fair allocations (Camerer 2003). The fairness argument pervades the design of redistribution mechanisms (see among others Bossert and Fleurbaey 1996, Tungodden 2005, Fleurbaey and Maniquet 2006), the design of contracts (Fehr and Schmidt 2007) and the recent literature on the political economy of redistribution (Alesina and Angeletos 2005). It has also yielded to some attempts to generalize measures of inequality such as the Lorenz curve or the Gini coefficient (Almas et al. 2011).

In the field of experimental economics, the dictator game with production (Cherry, Frykblom and Shogren 2002, Konow 2000, Cappelen et al. 2007) has emerged as the proper tool to investigate fairness attitudes towards redistribution. In this game, subjects do contribute to the production of the surplus before a randomly selected dictator chooses a division of this surplus. The findings of the literature highlight that dictators are willing to reward other subjects' effort, even though this behavior contradicts the selfish hypothesis (Ruffle 1998, Oxoby and Spraggon 2008, Frohlich, Oppenheimer and Kurki 2004).[1] It is also found that subjects exhibit heterogeneous preferences with regard to the distribution of the surplus (Cappelen et al. 2007), what goes in line with a large evidence in the field of empirical social choice starting with Yaari and Bar-Hillel (1984).

Although the importance of the production stage has been noted in the dictator game, almost no studies of social preferences incorporate the source of the surplus into the theoretical analysis. The models of social preferences that have been put forward to explain dictators' deviations from narrow self-interest usually focus on the way in which dictators divide the surplus, while leaving aside the way in which the surplus was generated (see Fehr and Schmidt (2003) for an overview of the literature). One exception is Frohlich, Oppenheimer and Kurki (2004) who generalize the model of inequality aversion of Fehr and Schmidt (1999). Frohlich, Oppenheimer and Kurki (2004) consider that dictators' behavior depends on two different costs. On the one hand, dictators' utility decreases if subjects do not receive exactly the same monetary payoff, as in Fehr and Schmidt (1999). On the other hand, there exists a cost for dictators if the final allocation deviates from subjects' production. By assessing both types of costs, Frohlich, Oppenheimer and Kurki (2004) predict the egalitarian allocation (which divides the surplus in two identical parts) and the libertarian allocation (which assumes that subjects ought to receive exactly what they have produced). Arguably, some factors that determine the subjects' production might be beyond their control, albeit the libertarian allocation holds subjects responsible for all factors determining production.

[1] In a different context, List (2007) showed that the mere presence of effort in the dictator game reduces self-interested behavior.

In this paper, we propose a simple extension of Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004) so as to account for the possibility of dictators dividing the surplus according to the accountability principle. The accountability principle, as first proposed by Konow (1996), combines both equity theory (which makes the final allocation proportional to agents' inputs) and attribution theory (which considers responsibility or control over inputs). This fairness ideal is related to the liberal egalitarian ethics (which assumes that subjects should only be rewarded for factors under their control) and is presented in other articles such as Konow (2000), Konow (2001) or Cappelen et al. (2007). The novelty of our approach is that dictators juggle the trade-off between subjects' inputs and monetary contributions, so that dictators weight three different fairness ideals rather than just one.[2]

Our model is especially useful in dictator games with production in which subjects' inputs are differently rewarded to determine the size of the surplus (Konow 2000, Cappelen et al. 2007). In this framework, it is plausible to assume that dictators do not only care about the final distribution of payoffs, but it is also important for them to account for the way in which entitlements to the available surplus were generated. Therefore, our theoretical model can be thought as an attempt to incorporate the idea of the equal opportunity ethics into the dictator's utility function. More precisely, our model allows for dictators to evaluate the role of compensation and responsibility, two features that constitute the gist of fairness (see among others Fleurbaey 1994, Fleurbaey 1995, Roemer 1998, Rawls 1999, Cappelen and Tungodden 2009, Fleurbaey and Maniquet 2009). In that vein, our contribution to the literature is to provide a simple utility representation that extends upon the previous models of inequity aversion. Our model of social preferences allow us to predict a larger set of transfers from the part of the dictator and stresses the importance of factors within and beyond the subjects' control, which is being emphasized by the growing experimental evidence that study fairness attitudes towards redistribution. Overall, this experimental evidence suggest that dictators employ (up to some extent) the accountability principle (Konow 2000; Cappelen et al. 2007, 2008; Konow, Saijo and Akai 2009; Cappelen, Sorensen and Tungodden 2010; Rodriguez-Lara and Moreno-Garrido 2011).

The rest of the paper is organized as follows. Section 2 briefly describes the models of Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004) and then presents our theoretical model. In Section 3, we discuss our findings and use a couple of examples so as to clarify when do our model yield different predictions than previous models in the literature. We conclude in Section 4.

[2]Konow (2000) finds that dictators are likely to employ the accountability principle when they do not have a stake in the outcome, whereas they might deceive themselves when they are "part of the problem" so as to increase their own payoffs, leading cognitive dissonance. The assumption in Cappelen et al. (2007) is that dictators have a fairness ideal (e.g., the accountability principle) and suffer a cost if they deviate from it. Konow (2001) also develops a model in which the accountability principle acts as a bridge between dictators' behavior and the context.

2 The Model

Consider the dictator game in which subjects can be labeled $i \in \{d, r\}$ where d represents the dictator and r represents the recipient. The dictator has to divide a certain surplus ($\bar{y} \geq 0$) between herself and her counterpart. The size of this surplus depends on both subjects' monetary contributions, which are denoted by $y_i \geq 0$ for $i \in \{d, r\}$. In particular,

$$\bar{y} = y_d + y_r = p_d q_d + p_r q_r \tag{1}$$

where $q_i \geq 0$ represents subject i's performance in a (previous) production stage and $p_i > 0$ is the weight assigned to this input, for $i \in \{d, r\}$. In what follows, we shall think that $q_i \geq 0$ is under the subject i's control (e.g., exerted effort, time of work, money to be invested in a project, etc...). The value of $p_i > 0$ is assumed to be independent of $q_i \geq 0$ and determines the way in which agent i's input is transformed into money. We shall think that $p_i > 0$ is outside the subject i's control (e.g., reward level, rate of return, productivity, luck, etc...).[3]

The dictator has to choose a division of the surplus $\mathbf{x} = (x_d, x_r)$ that satisfies $x_d + x_r = \bar{y}$, where $x_i \geq 0$ denotes the monetary payoff that subject i receives, for $i \in \{d, r\}$. The model of inequality aversion of Fehr and Schmidt (1999) builds on the assumption that the dictator dislikes unequal outcomes (Nielsen 1984). More specifically, the authors posit the following utility function for the dictator:

$$u(x_d) = x_d - \alpha \max\{x_r - x_d, 0\} - \beta \max\{x_d - x_r, 0\} \tag{2}$$

where α, $\beta \in \mathbb{R}^+$, are nonnegative real numbers. This function accounts for social preferences because the dictator does not only care about her own monetary payoff. The dictator's utility also depends on the recipient's payoffs and the relationship between both subjects' payoffs. Since $x_r = \bar{y} - x_d$, equation (2) can be rewritten as follows:

$$u(x_d) = x_d - 2\alpha \max\left\{\frac{\bar{y}}{2} - x_d, 0\right\} - 2\beta \max\left\{x_d - \frac{\bar{y}}{2}, 0\right\} \tag{3}$$

According to this function it would be costly for the dictator to take more than half of the surplus, but it would also be costly for her to take less. The magnitude of the costs is given by the values of α and β, which are assumed to satisfy $\alpha > \beta \geq 0$. This implies that the dictator cares more for inequality when she

[3] We acknowledge that it might be hard to disentangle which variables are under the subjects' control and which variables are outside their control in some situations. We find, however, that the classification of factors within and beyond individuals' control is beyond the scope of this paper. For further discussion on this topic, the interested readers can see Fleurbaey and Maniquet (2009). Konow (2003) is also an excellent overview of various theories of justice that deals with this feature.

has less than half of the surplus than the dictator does when she has more. Indeed, the value of β determines whether dictators divide the surplus in two identical parts (egalitarian allocation) or keep the entire surplus for herself (selfish allocation). It can be shown that the dictator who maximizes (3) chooses the egalitarian allocation $\mathbf{x}^e := (\bar{y}/2, \bar{y}/2)$ if $\beta > 0.5$. Otherwise, the dictator behaves selfishly, $\mathbf{x}^s := (\bar{y}, 0)$.[4]

The prediction of Fehr and Schmidt (1999) goes in line with the observed behavior in many laboratory experiments, where the equal split is a modal outcome (see Camerer 2003). The model is especially well-suited when the surplus to be divided is "manna from heaven" because it predicts an allocation that ignores the source of the surplus or its size. However, the underlying idea of Fehr and Schmidt (1999) contrasts with fairness ideals that plead for a solution in which entitlements to the available surplus are directly determined by subjects' contributions (Cherry, Frykblom and Shogren 2002, Oxoby and Spraggon 2008, Ruffle 1998). The libertarian ethics indeed pursue the idea that subjects ought to receive exactly what they have contributed to surplus (Nozick 1974). The model of Frohlich, Oppenheimer and Kurki (2004) incorporates this idea by adding two terms to the dictator's utility function:

$$u(x_d) = x_d - 2\alpha \max\left\{\frac{\bar{y}}{2} - x_d, 0\right\} - 2\beta \max\left\{x_d - \frac{\bar{y}}{2}, 0\right\} - \gamma \max\{y_d - x_d, 0\} - \psi \max\{x_d - y_d, 0\} \qquad (4)$$

where α, β, γ, $\psi \in \mathbb{R}^+$, are nonnegative real numbers. The utility function (4) expands upon the previous one so as to include what the authors call "just desserts". Frohlich, Oppenheimer and Kurki (2004) consider that the dictator suffers a cost $\gamma \max\{y_d - x_d, 0\}$ if she does not take her own production, whereas $\psi \max\{x_d - y_d, 0\}$ represents the cost of taking more than what she produces.[5] The new parameters are assumed to satisfy $\gamma \geq \psi > 0$ and affect the dictator's choice when $\gamma + \psi > 1$, if α and β are both zero. The authors note that if α and β are not zero, two different contexts are at stake: when the dictator accumulates less money than the recipient ($y_d < y_r$), and when the dictator accumulates more ($y_d > y_r$). In either case, when $2\beta + \psi < 1$ the dictator behaves selfishly and keeps the entire surplus, $\mathbf{x}^s = (\bar{y}, 0)$. If the dictator accumulates less money than the recipient and $2\beta + \psi > 1$, the model predicts that the dictator either keeps half of the surplus or her own production depending on whether $\psi - 1 > 2\alpha$ or $\psi - 1 < 2\alpha$. Both the egalitarian allocation, $\mathbf{x}^e = (\bar{y}/2, \bar{y}/2)$ and the libertarian allocation $\mathbf{x}^l := (y_d, y_r)$ can also be predicted if the dictator accumulates more money than the recipient.

The model of Frohlich, Oppenheimer and Kurki (2004) generalizes the model of Fehr and Schmidt (1999) and predicts that recipients might receive any payoff $x_r \leq \max\{\bar{y}/2, y_r\}$. Arguably, the prediction of this

[4] As Fehr and Schmidt (1999) argue, the nonlinear versions of their model lead to predictions $\mathbf{x} = (x_d, x_r)$ that satisfy $x_d \in [\bar{y}/2, \bar{y}]$ and $x_r = \bar{y} - x_d \geq 0$. Bolton and Ockenfels (2000) also assume that dictators dislike payoff differences.

[5] We note that we have rewritten the original equation in Frohlich, Oppenheimer and Kurki (2004) so as to follow our reasoning in equation (3). In particular, because $y_d + y_r = x_d + x_r$, the latter term in equation (4) can also be though as the cost of not giving to the recipient her production, $\psi \max\{y_r - x_r, 0\}$.

model contrasts with the liberal egalitarian ethics, which state that subjects should only be rewarded for factors under their control. In that vein, the accountability principle as first proposed by Konow (1996) states that the dictator chooses a division that gives to each subject the amount of money that is generated by her input. We denote this amount predicted by the accountability principle as $a_i = \left(\frac{q_i}{q_d+q_r}\right)\bar{y}$, for $i \in \{d, r\}$, so that if the dictator ignores those factors beyond subjects control, she chooses the allocation $\mathbf{x}^a := (a_d, a_r)$. We propose to model the dictator's utility function as follows:

$$\begin{aligned} u(x_d) \quad = \quad & x_d - \alpha \max\{x_r - x_d, 0\} - \beta \max\{x_d - x_r, 0\} - \gamma \max\{y_d - x_d, 0\} - \psi \max\{x_d - y_d, 0\} \\ & -\rho \max\{a_d - x_d, 0\} - \omega \max\{x_d - a_d, 0\} \end{aligned} \tag{5}$$

where α, β, γ, ψ, ρ, $\omega \in \mathbb{R}^+$, are nonnegative real numbers. Our specification assumes that the dictator cares about her own monetary payoff but juggles the trade-off between subjects' inputs and monetary contributions. This implies that the dictator suffers a cost $\rho \max\{a_d - x_d, 0\}$ if she free-rides on the recipient's effort, but she also suffers a cost $\omega \max\{x_d - a_d, 0\}$ if she takes less money than what corresponds to her input, where $\rho \geq \omega > 0$ is assumed to be satisfied.

The utility function in (5) allows for the dictator to take into account the way in which inputs are transformed into money so as to "compensate" for those factors outside the subjects' control. Our prediction is that dictators might (i) behave selfishly $\mathbf{x}^s = (\bar{y}, 0)$ (ii) choose the egalitarian allocation and divide the surplus in two identical parts $\mathbf{x}^e = (\bar{y}/2, \bar{y}/2)$, (iii) choose the libertarian allocation that is based on subjects' production $\mathbf{x}^l = (y_d, y_r)$ or (iv) behave according to the accountability principle that is based solely on factors under the subjects control $\mathbf{x}^a = (a_d, a_r)$.[6] We summarize our results in Table 1. As we argue, the dictator's choice depends on the relationship between factors within and beyond subjects control (which determine the relationship between $\bar{y}/2$, y_d and a_d) as well as on the values of the parameters.

		Dictators' Allocation Choice		
		$x^e = \left(\bar{y}/2, \bar{y}/2\right)$	$x^l = \left(y_d, y_r\right)$	$x^a = \left(a_d, a_r\right)$
$p_d > p_r$	$a_d < y_d < \bar{y}/2$	$\omega < 1+2\alpha-\psi$	$\omega \in \left(1+2\alpha-\psi, 1+2\alpha+\gamma\right)$	$\omega > 1+2\alpha+\gamma$
	$a_d < \bar{y}/2 < y_d$	$\omega \in \left(1-2\beta+\gamma, 1+2\alpha+\gamma\right)$	$\omega < 1-2\beta+\gamma$	$\omega > 1+2\alpha+\gamma$
	$\bar{y}/2 < a_d < y_d$	$2\beta > 1+\gamma+\rho$	$2\beta < 1+\gamma-\omega$	$2\beta \in \left(1+\gamma-\omega, 1+\gamma+\rho\right)$
$p_d < p_r$	$\bar{y}/2 < y_d < a_d$	$2\beta > 1+\gamma+\rho$	$2\beta \in \left(1-\psi+\rho, 1+\gamma+\rho\right)$	$2\beta < 1-\psi+\rho$
	$y_d < a_d < \bar{y}/2$	$\psi < 1+2\alpha-\omega$	$\psi > 1+2\alpha+\rho$	$\psi \in \left(1+2\alpha-\omega, 1+2\alpha+\rho\right)$
	$y_d < \bar{y}/2 < a_d$	$\psi \in \left(1-2\beta+\rho, 1+2\alpha+\rho\right)$	$\psi > 1+2\alpha+\rho$	$\psi < 1-2\beta+\rho$

Note: In all the cases above, it is assumed that $2\beta+\psi+\omega > 1$. Otherwise, the dictator behaves selfish, $x^s = \left(y, 0\right)$

[6] We note that nonlinear versions of our model predict interior results that lead to compromises between these fairness ideals, which are frequently used to describe the dictator's behavior in laboratory experiments (e.g., Cappelen et al. 2007, Rodriguez-Lara and Moreno-Garrido 2011)

We derive these results in the Appendix. Our model predicts that the dictator behaves selfishly, if $2\beta+\psi+\omega<1$. If it is not the case, the dictator's decision depends on the subjects' inputs ($q_i \geq 0$) as well as on the weight that is assigned to these inputs ($p_i > 0$). Consider that the dictator is at a relative advantage with regard to the accumulation of money ($p_d > p_r$) so that the dictator's production in terms of money y_d would be greater than her production in terms of inputs a_d. The values of $q_i \geq 0$ and $p_i > 0$ determine in this framework whether these contributions (y_d and a_d) are above half of the surplus ($\bar{y}/2$) or not. Assume that $a_d < y_d < \bar{y}/2$ is satisfied. It is clear that the dictator gets the highest monetary payoff by choosing the egalitarian allocation $\mathbf{x}^e = (\bar{y}/2, \bar{y}/2)$. The dictator chooses this division of the surplus as long as the cost of deviating from the accountability principle (that yields the smallest payoff) is small enough. More precisely, $\mathbf{x}^e = (\bar{y}/2, \bar{y}/2)$ is chosen if $\omega < 1 + 2\alpha - \psi$. If the cost is very high and the condition $\omega > 1 + 2\alpha + \gamma$ holds, the dictator chooses to divide the surplus according to the accountability principle $\mathbf{x}^a = (a_d, a_r)$ that yields the dictator the smallest monetary payoff. If $\omega \in (1 + 2\alpha - \psi, 1 + 2\alpha + \gamma)$ then the libertarian allocation is chosen because it would be very costly to divide the surplus according to the egalitarian allocation but the cost is not sufficiently high to enforce the use of the accountability principle. We can follow this reasoning so as to explain the prediction of our model in Table 1. We observe that there exists always a trade-off between a higher monetary payoff and the cost of deviating from the fairness ideal that yields the smallest payoff.

3 Applications of our Model

Overall, our model in Section 2 relies on the liberal egalitarian ethics, which states that subjects should be only rewarded for factors under their control. The model is especially useful for those cases in which the dictator is at a relative advantage with regard to the accumulation of money ($p_d > p_r$), because in this case our model predicts a larger set of transfers from the part of the dictator. In this section, we present a couple of examples so as to illustrate this feature. We also mention at the end of this section, some experimental papers that produce behavior that is consistent with our model.

To start with, let us consider a numerical example. Imagine that subjects solve a questionnaire during the production stage. In particular, assume that $q_d = 10$ and $q_r = 15$ are the number of correct answers, which are rewarded at $p_d = 1.5$ and $p_r = 1$ respectively.[7] In that case, the surplus to be distributed is $\bar{y} = 30$ and the subjects' contributions to the surplus is given by $y_d = y_r = 15$. Since both subjects contribute the same (i.e., $y_d = y_r = \bar{y}/2$) the models of Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki

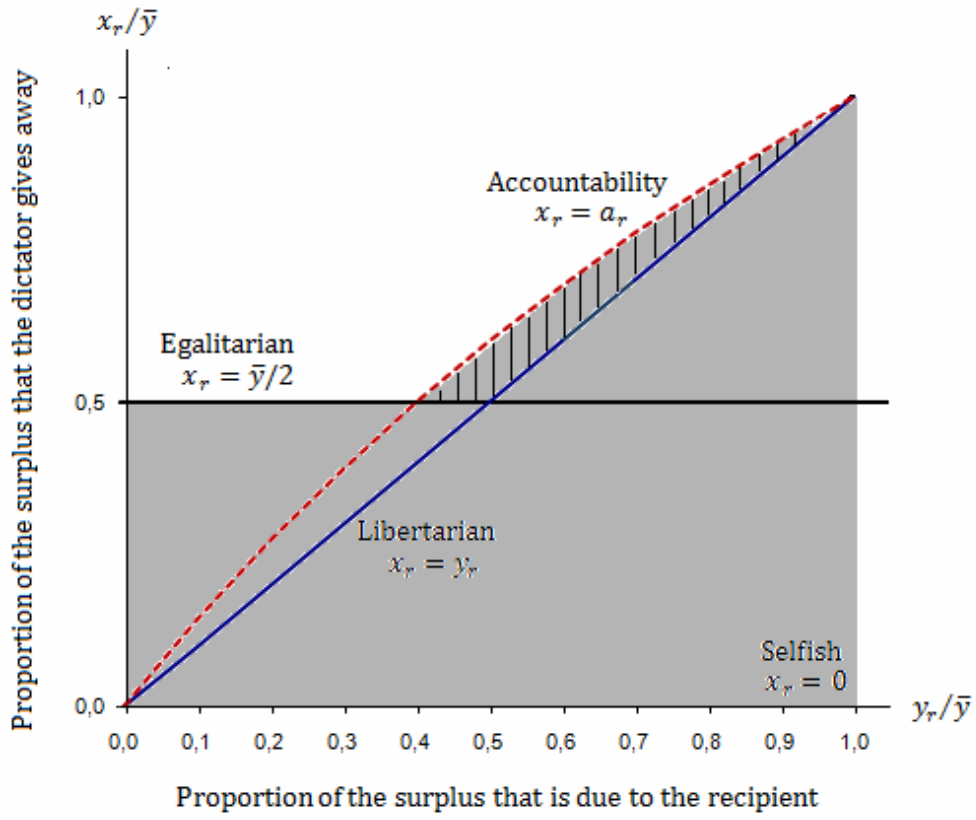
[7] Rodriguez-Lara and Moreno-Garrido (2011) consider this production stage. In Konow (2000) subjects are differelty rewarded for a real-effort task that involves stuffing letters into envelops. In Cappelen et al. (2007), subjects choose how much money to invest in a investment game in which the rate of return is exogenously determined.

(2004) predict that the recipient receives at most half of the surplus. It is worth noting, however, that the dictator might consider this allocation as *unfair* because the recipient has more questions correctly at a lower reward level. The liberal egalitarian ethics states that the recipient ought to receive the part of the surplus that is due to her performance. In our example, $a_r = \left(\frac{q_r}{q_d+q_r}\right)\bar{y} = 18$. This amount represents 60 percent of the surplus. Importantly, our model in equation (5) is able to predict this allocation, albeit this behavior cannot be predicted by equations (3) or (4). In fact, the nonlinear versions of our model can predict any dictator's giving x_r in $[15, 18]$, which are above the equal split allocation.

To further illustrate that our model extends upon the previous ones we consider Figure 1. Along the horizontal axis, we plot the proportion of the surplus that is due to the recipient's production ($y_r/\bar{y}$). We use the vertical axis to represent the proportion of the surplus that the dictator gives away to the recipient ($x_r/\bar{y}$). As a consequence, the 45-degree line represents the appropriate theoretical prediction in Frohlich, Oppenheimer and Kurki (2004) because observations on this line indicate that recipients are being transferred exactly the proportion of the surplus that they have contributed, i.e., the libertarian allocation $x_r = y_r$. In Figure 1, we also plot the horizontal line ($x_r/\bar{y} = 0.5$), which represents the egalitarian allocation $x_r = \bar{y}/2$ (Fehr and Schmidt 1999). The dotted curve depicts the accountability principle $x_r = a_r$, therefore allocations on this curve indicate that recipients are being transferred exactly the proportion of the surplus that is due to their effort.[8] The difference between p_d and p_r establishes the concavity of the dotted curve $x_r = a_r$ and determines those allocations that cannot be predicted by Fehr and Schmidt (1999) or Frohlich, Oppenheimer and Kurki (2004). In particular, the nonlinear version of these models predict no allocations above both just dessert and the horizontal line $x_r = \bar{y}/2$. Graphically, this implies that the models predict any giving in the shadowed area, except the striped area (i.e., the models predict $x_r \leq \max\{\bar{y}/2, y_r\}$). However, our model takes into account the accountability principle so that our prediction includes the striped area (i.e., our model predict $x_r \leq \max\{\bar{y}/2, y_r, a_r\}$)

[8] Recall that we focus on the case in which the dictator is rewarded at a higher rate, therefore the recipient's monetary contribution to the surplus will be below her contribution in terms of inputs ($a_r > y_r$). Graphically, this implies that the dotted curve (the accountability principle) is above the 45-degree line (the libertarian principle). Both principles coincide when $y_r/\bar{y} = 0$ and $y_r/\bar{y} = 1$. In the first case, all the available surplus is due to the dictators' inputs ($q_r = 0$). The contrary is true if $y_r/\bar{y} = 1$. We also note that we represent ($y_r/\bar{y}$) on the horizontal line and assume that $p_d = 1.5$ and $p_r = 1$. Thus, the egalitarian principle and the libertarian one coincide when $y_r/\bar{y} = 0.5$ (i.e., when $y_r = \bar{y}/2$), whereas the egalitarian principle and the accountability one coincide if $a_r/\bar{y} = 0.5$ (i.e., when $a_r = \bar{y}/2$). In order to satisfy this latter condition, both subjects should have exactly the same number of correct answers ($q_d = q_r$) what implies that $y_r/\bar{y} = 0.4$.

Figure 1. Graphical representation of our predictions if $p_d > p_r$



All the allocations on the striped area give some weight to the accountability principle, so that these allocations cannot be explained with the models of inequity aversion of Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004), in which $\rho = \omega = 0$ is assumed. We find that our model generalizes the previous ones and can be used to explain dictators' behavior, especially when the production stage involves factors within and beyond subjects control. In that context, the accountability principle is likely to lead dictators' behavior, especially when dictators act as a third party in the distributional problem (Konow 2000, Croson and Konow 2009, Konow, Saijo and Akai 2009). The results in Konow (2001), Cappelen et al. (2007) and Rodriguez-Lara and Moreno-Garrido (2011) produce behavior that is also consistent with the idea of subjects who endorse the accountability principle. In particular, Cappelen et al. (2007) consider a dictator game with production and estimate that 38 percent of dictators are closest to satisfy the accountability principle, 43 percent to being egalitarians and 18 percent to being libertarians when dividing the surplus. If we use the data in Cappelen et al. (2007) and focus the analysis on the cases in which dictators are at relative

advantage with regard to the accumulation of money ($p_d > p_r$), we find that 15 percent of the dictators behave according to the accountability principle. In Figure 1, these observations would lie on the striped area, therefore these allocation choices cannot be predicted by the previous models of inequity aversion. Similar results can be derived from the reported results in Rodriguez-Lara and Moreno-Garrido (2011). When $p_d > p_r$, roughly 17 percent of the data is incompatible with Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004). We note, however, that all observations in these papers are compatible with the current model.

4 Conclusion

We have presented a theoretical model of social preferences that expands upon Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004). The underlying idea of our model is that dictators who are involved in a dictator game with production care about three different features. First, dictators get disutility if the final allocation deviates from the equal division. Second, dictators consider that subjects should receive exactly what they have produced. Finally, dictators account for the way in which entitlements are generated and try to compensate for factors beyond subjects' control. The novelty of our model is that it predicts the accountability principle in Konow (1996), which states that subjects should only be rewarded for factors under their control. This behavior is in accordance with the liberal egalitarian ethics and cannot be predicted by the models of inequity aversion of Fehr and Schmidt (1999) and Frohlich, Oppenheimer and Kurki (2004), although it is observed in many laboratory experiments.

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Appendix

Supplementary material to this article is available on request.

We derive in this appendix the predictions of our model:

$$\begin{aligned} u(x_d) &= x_d - \alpha \max\{x_r - x_d, 0\} - \beta \max\{x_d - x_r, 0\} - \gamma \max\{y_d - x_d, 0\} - \psi \max\{x_d - y_d, 0\} \\ &\quad -\rho \max\{a_d - x_d, 0\} - \omega \max\{x_d - a_d, 0\} \end{aligned}$$

First, we note that this utility function is a particular case of a more general function

$$u(x_d) = x_d - \sum_{i=1}^{n} \mu_i \max\{\phi_i - x_d, 0\} - \sum_{i=1}^{n} \lambda_i \max\{x_d - \phi_i, 0\}$$

that represents single-peaked preferences, what implies that for an ordered set of outcomes $\Phi := \{\phi_1, \phi_2, .., \phi_n\}$ there exists a unique $\phi^* \in \Phi$ such that

(i) $\phi_i < \phi_j \leq \phi^* \Rightarrow u(\phi_i) < u(\phi_j)$

(ii) $\phi_i > \phi_j \geq \phi^* \Rightarrow u(\phi_i) < u(\phi_j)$

The consequence of our utility function representing single-peaked preferences is that for any set of outcomes $\{\phi_1, \phi_2, \phi_3\}$ that satisfy $\phi_1 < \phi_2 < \phi_3$ it is not possible to have $u(\phi_2) > u(\phi_1)$ and $u(\phi_2) > u(\phi_3)$ at the same time.[9] This result does simplify our analysis in Table 1, where we report the conditions on the parameters that lead to each possible division of the surplus. In principle, the dictator has to choose between (i) the selfish allocation, $\mathbf{x}^s = (\bar{y}, 0)$ (ii) the egalitarian allocation $\mathbf{x}^e = (\bar{y}/2, \bar{y}/2)$, (iii) the libertarian allocation $\mathbf{x}^l = (y_d, y_r)$ or (iv) the allocation that bases on the accountability principle $\mathbf{x}^a = (a_d, a_r)$.

		Dictators' Allocation Choice		
		$x^e = (\bar{y}/2, \bar{y}/2)$	$x^l = (y_d, y_r)$	$x^a = (a_d, a_r)$
$p_d > p_r$	$a_d < y_d < \bar{y}/2$	$\omega < 1+2\alpha-\psi$	$\omega \in (1+2\alpha-\psi, 1+2\alpha+\gamma)$	$\omega > 1+2\alpha+\gamma$
	$a_d < \bar{y}/2 < y_d$	$\omega \in (1-2\beta+\gamma, 1+2\alpha+\gamma)$	$\omega < 1-2\beta+\gamma$	$\omega > 1+2\alpha+\gamma$
	$\bar{y}/2 < a_d < y_d$	$2\beta > 1+\gamma+\rho$	$2\beta < 1+\gamma-\omega$	$2\beta \in (1+\gamma-\omega, 1+\gamma+\rho)$
$p_d < p_r$	$\bar{y}/2 < y_d < a_d$	$2\beta > 1+\gamma+\rho$	$2\beta \in (1-\psi+\rho, 1+\gamma+\rho)$	$2\beta < 1-\psi+\rho$
	$y_d < a_d < \bar{y}/2$	$\psi < 1+2\alpha-\omega$	$\psi > 1+2\alpha+\rho$	$\psi \in (1+2\alpha-\omega, 1+2\alpha+\rho)$
	$y_d < \bar{y}/2 < a_d$	$\psi \in (1-2\beta+\rho, 1+2\alpha+\rho)$	$\psi > 1+2\alpha+\rho$	$\psi < 1-2\beta+\rho$

Note: In all the cases above, it is assumed that $2\beta+\psi+\omega > 1$. Otherwise, the dictator behaves selfish, $x^s = (y, 0)$

While considering each possible allocation choice, the dictator evaluates her utility function. As noted in Section 3, the value of $u(x_d)$ depends in each case on the relationship between a_d, y_d and $\bar{y}/2$. Assume that

[9] The proof that these conditions cannot be satisfied because our utility function represents single-peaked preferences is available upon request.

$a_d < y_d < \bar{y}/2$ is satisfied. Then,

$$\begin{aligned} u(a_d) &= a_d - 2\alpha(\bar{y}/2 - a_d) - \gamma(y_d - a_d) \\ u(y_d) &= y_d - 2\alpha(\bar{y}/2 - y_d) - \omega(y_d - a_d) \\ u(\bar{y}/2) &= \bar{y}/2 - \psi(\bar{y}/2 - y_d) - \omega(\bar{y}/2 - a_d) \end{aligned}$$

1.1 Since the utility function represents single-peaked preferences and $a_d < y_d < \bar{y}/2$ is satisfied, the dictator behaves according to the accountability principle as long as $u(a_d) > u(y_d)$. That is,

$$a_d - 2\alpha(\bar{y}/2 - a_d) - \gamma(y_d - a_d) > y_d - 2\alpha(\bar{y}/2 - y_d) - \omega(y_d - a_d)$$

$$a_d + 2\alpha a_d - \gamma y_d + \gamma a_d > y_d + 2\alpha y_d - \omega y_d + \omega a_d$$

$$a_d(1 + 2\alpha + \gamma - \omega) > y_d(1 + 2\alpha + \gamma - \omega)$$

$$(y_d - a_d)(1 + 2\alpha + \gamma - \omega) < 0$$

Since $(y_d - a_d) > 0$, the dictator chooses $\mathbf{x}^a = (a_d, a_r)$ if

$$\omega > 1 + 2\alpha + \gamma$$

1.2 In a similar vein, the dictator chooses the libertarian allocation if $u(y_d) > u(a_d)$ and $u(y_d) > u(\bar{y}/2)$ are both satisfied.

The condition $u(y_d) > u(a_d)$ is satisfied if $\omega < 1 + 2\alpha + \gamma$.

The condition $u(y_d) > u(\bar{y}/2)$ is satisfied if

$$y_d - 2\alpha(\bar{y}/2 - y_d) - \omega(y_d - a_d) > \bar{y}/2 - \psi(\bar{y}/2 - y_d) - \omega(\bar{y}/2 - a_d)$$

$$y_d - 2\alpha\bar{y}/2 + 2\alpha y_d - \omega y_d + \omega a_d > \bar{y}/2 - \psi\bar{y}/2 + \psi y_d - \omega\bar{y}/2 + \omega a_d$$

$$y_d(1 + 2\alpha - \psi - \omega) > \bar{y}/2(1 + 2\alpha - \psi - \omega)$$

$$(\bar{y}/2 - y_d)(1 + 2\alpha - \psi - \omega) < 0$$

Since $(\bar{y}/2 - y_d) > 0$, then

$$\omega > 1 + 2\alpha - \psi$$

The dictator chooses $\mathbf{x}^l = (y_d, y_r)$ if

$$\omega \in (1 + 2\alpha - \psi, 1 + 2\alpha + \gamma)$$

1.3 Finally, the dictator chooses the egalitarian allocation if $u\left(\bar{y}/2\right) > u\left(y_d\right)$. This condition is satisfied if $\omega < 1 + 2\alpha - \psi$.

We follow this reasoning so as to derive the results in Table 1. We note that we focus our analysis on the relationship between $\bar{y}/2$, y_d and a_d because these amounts are always below the total size of the surplus $\bar{y}$. Trivially, the dictator behaves selfishly if $u(\bar{y}) > u(\phi_{\max})$, where $\phi_{\max} = \max\{\bar{y}/2, y_d, a_d\}$. This condition is satisfied if $\omega + 2\beta + \gamma < 1$, regardless of the value of $\phi_{\max}$. As a result, the dictator always chooses $\mathbf{x}^s = (\bar{y}, 0)$ if

$$\omega < 1 - 2\beta - \gamma$$

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