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A Theory of Representative Behavior in the Dictator Game

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Abstract

In this paper we present a model of representative behavior in the dictator game. Individuals have simultaneous and non-contradictory preferences over monetary payoffs, altruistic actions and equity concerns. We require that these behaviors must be aggregated and founded in principles of representativeness and empathy. The model results match closely the observed mean split and replicate other empirical regularities (for instance, higher stakes reduce the willingness to give). In addition, we connect representative behavior with an allocation rule built on psychological and behavioral arguments. An approach consistently neglected in this literature.

Key words: Dictator Game, Behavioral Allocation Rules, Altruism, Equity Concerns, Empathy, Self-interest
JEL classification: C91, D03, D63, D74.

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1. Introduction

In the dictator game (Kahneman et al., 1986), the first individual, "the dictator", chooses to consume, from some endowment x, an amount $x_d \in [0, x]$. The second individual, "the receiver", obtains the remained endowment left by the dictator $x_r = x - x_d$. The receiver's role is entirely passive and not strategic. Therefore, the dictator game is not formally a proper game but a zero sum decision problem. The game has been used to test if individuals are only concerned with their own economic well being (dictators allocate the entire endowment to themselves), or if individuals have some concerns about others well being (dictators split the endowment with the receivers). The theory predicts that a rational dictator should consume the total endowment. However, the majority of the participants in economic experiments shared a non-neglectable part of the endowment with the receiver.[1]

There are models in the literature that attempt to explain the behavior observed in the experiments. The most influential are Bolton and Ockenfels (2000) and Fehr and Schmidt (1999). They defend that individuals dislike inequity (inequality aversion theory), measured by absolute payoff deviations and deviation between earnings shares versus equal shares, respectively. In spite that individuals prefer higher payoffs for themselves, they are willing to forgo some monetary payoff to help others that are behind but not ahead of them. Charness and Rabin (2002) suggest that people care about their own payoff and some value between the worst payoff (Rawlsian perspective) and the maximum welfare payoff (utilitarian perspective).

Our approach is not diametrically opposed to the one defended by these authors. It necessarily shares similarities. From our point view, individuals seem to have simultaneous and non-contradictory preferences over monetary payoffs, altruistic actions and equity concerns.[2] An internal conflict between these interests takes place, determining the proposed split.[3] Since individuals are distinct in terms of preferences the distribution of proposals shows great heterogeneity. Consequently, our goal is not to present a new utility function but a theory of representative behavior in the dictator game. We axiomatize the dictator's individual properties. Then, we impose that the representative or mean behavior must be simultaneously self-interested, altruistic and equity concerned. In addition, we introduce the concept of empathy, the capacity to understand another person's point of view. The representative dictator must have this quality. Such is reflected in the consideration of every allocation framed by the two extreme reference allocations, the most

[1] See Engel (2011), and the references therein. In general, communication is not possible, participants are anonymous and the experiment is done only once to avoid potential reciprocation effects.

[2] Sanfey et al (2003) find that low offers distant from the equal split activate emotional brain areas associated with judgement, planning, and conflict resolution. Relative activity in the insula and dorsolateral prefrontal cortex determine whether offers are or not rejected.

[3] Our notion of equity follows the "equity theory" of social psychology, Adams (1963). Edgeworth (1881) and Loewenstein et al. (1989) are examples of other early attempted to formalize the individuals' trade off between their own payoffs and the payoffs of others.

self-interested and the most egalitarian.[4] A general rule that predicts the mean split is presented. We found that the results obtained under the uniform weighting match closely the empirical observed mean split. The model also replicates other empirical regularities, as for example, higher stakes reduce the willingness to give (see Engel (2011) and Sefton (1992), among others). In addition, we connect representative behavior with an allocation rule (specific for the dictator game) built on psychological and behavioral arguments. An approach consistently neglected in this literature.[5]

The paper is organized as follows. Section 2.1 defines through axioms, self-interest, altruism and equity concerns. Sections 2.2 imposes properties on the representative behavior. Section 3 presents the main result of the paper and discusses the uniform weighting case.

2. The Dictator Characteristics

In order to present a theory that predicts the mean allocation observed in the dictator game we need to characterize the dictators possible behavior, which will frame the set of requirements imposed to the allowed proposals.

2.1. Self-interest, altruism and equity concerns

The starting point is to relax full rationality to contexts in which individuals are altruist and equity concerned, without ignoring self-interest.

Dictators are characterized by some of the following qualities.

Axiom 1. *A dictator is altruist if* $x_d < x$.

The definition of altruism is wide and allows for extreme forms of altruism as for example $x_d = 0$. This behavior might be rational in some contexts. For example, it can be easily justified that an individual with a large income chooses $x_d = 0$ if the total endowment to be split is relatively small. However, without information of this kind such behavior it is harder to justify. Fortunately, we do not have to find a justification for it if we assume

[4]Our reference allocations result from the axioms that we have imposed. Contrary to the reference-dependence models like Koszegi and Rabin (2006) we do not specify an explicit utility function, rather, we axiomatize its construction.

[5]For a survey, see Thomson (2001) and the references therein.

that the individual is simultaneously self-interested.[6] Specifically, altruism reflects the dictator's willingness to give some part of the endowment to the receiver.

We follow Adams's (1963) definition of equity. Therefore, since the ratio of inputs to outcomes is the same for both individuals, each individual should be treat in the same way. Equity in the dictator game is the 50/50 split. Equity concerns has a different meaning, that is, individuals acknowledge the equity allocation and would like to be as close as possible from this point. Therefore, individuals are worried about how the distribution of the endowment is done, and not so much about who receives the awards. For instance, if $x = 10$, the allocations $x_d = 0$ and $x_d = 10$ must be equivalent in terms of equity. Similarly, the allocations $x_d = 4$ and $x_d = 6$ are equivalent. However, for an equity concerned individual, any of the two allocations in the latter pair it is strictly prefered to any of the two allocations in the former pair.

Axiom 2. *A dictator is equity concerned if* $x_d = x/2 + \varepsilon \sim x_d = x/2 - \varepsilon$ *and* $x_d = x/2 \pm \varepsilon \succeq x_d = x/2 \pm \varepsilon'$ *with* $\varepsilon \leq \varepsilon'$.

Note that the equity concerns definition does not contradicts Fehr and Schmidt (1999) and Bolton and Ockenfels (2000), in the sense that leaves open the possibility that individuals are willing to help the others that are behind but not ahead of them. Argument is complete when we consider the concept of self-interest.

Axiom 3. *A dictator is self-interested if* $x_d \in (x/2, x]$.

If we do not consider behavioral factors, the utility from material payoffs must be positive and strictly increasing. Specifically, self-interest states that the dictator always bias the allocation in its favor.

Finally, note that Axioms 1, 2 and 3, are sufficiently flexible to allow for different levels of altruism, equity concerns and self-interest. Therefore, the distribution of dictators in terms of their characteristics can be very heterogenous.

[6] Axiom 3 below combined with Axiom 1 rules out extreme forms of altruism.

2.2. ***The representative dictator***

Our objective is to construct a theory that predicts the mean allocation. In order to achieve it, we assume the existence of a representative dictator, whose behavior aggregates all the other individuals behavior. The mean allocation is the allocation proposed by this individual.

Definition 1. *The representative dictator is simultaneously self-interested, altruist and equity concerned.*

Therefore, the representative allocation is a choice in the intersection of self-interested, altruistic and equity concerned behaviors. Consequently, the representative dictator mean split must be in the representative set $X_d = (x/2, x)$. The fact that the distribution of contributions in the dictator game is left skewed suggests a self-serving bias.[7] This fact is present in the representative behavior. Therefore, we rule out from being representative unusual behavior observed in real data as $x_d < x/2$, but also behavior with some persistence, as strictly self-interest $x_d = x$, and the most equity proposal $x_d = x/2$.

Axiom 4. *An individual is* $\Omega-$*empathic if considers every allocation profile in the set* Ω.

In our setting the $\Omega-$empathic set is composed of all possible allocations that are simultaneously self-interested, altruistic and equity concerned. In other words, $\Omega = X_d$.

Empathy is the capacity to understand another person's point of view. The representative dictator must reflect this quality. Therefore, it receives as input every allocation and proposes a distribution that considers all these allocations, implying that each allocation receives a strictly positive weight.

Definition 2. *The representative dictator is* X_d-*empathic.*

Note that empathy is a behavior that show some degree of correlation with altruism and equity concerns, but on same time does not exclude self-interest. An aspect that we do not want to remove from the representative behavior.

[7] The self-serving biases are common and considered to be the source of multiple problems as for instances difficulties to reach agreements, see Babcock et al. (1995) and Babcock and Loewenstein (1997) among others.

3. The mean allocation

In order to express these concepts mathematically we consider a discrete action space in $\mathbb{N}_1$. It makes easier the account for all representative allocation profiles because this set is countable (countable infinite in the limit).[8] Moreover, since the bounds on the action space depend on the endowment, we can measure the endowment effect on the mean allocation. Therefore, we define $x^m = 2m + 1$ with $m = 1, 2, ...,$ as the discrete endowment.[9] The mathematical representation of Definition 1 implies that the representative dictator discrete set of payoff is defined as $X_d^m = \{m + 1, ..., 2m\} \subseteq \mathbb{N}_1$ with $i = 1, ..., m$. A particular payoff is denoted as $x_{d,i}^m \in X_d^m$.

The mathematical representation of Definition 2 implies that the representative dictator attributes to each payoff allocation a non-zero weight $w_i^m > 0$ with $i = 1, 2, ..., m$, and $\sum_{i=1}^m w_i^m = 1$.

In order to get a better intuition on the diversity of possible allocations suppose that $x^3 = 7$. In this case, we consider allocations that are associated with a more self-interest dictators, for instance $(6, 1)$, but we also consider allocations that are associated with more altruistic and equity concerned dictators, for instance $(4, 3)$. Empathy is the expression of this representativeness.

Subsequently, we derive the general expression for the weighted sum of the dictator's payoffs for general m, denoted as $x_d^m = \sum_{i=1}^m w_i^m x_{d,i}^m$. We can do the same for the receiver, which may also be obtained by difference. After having characterized these sums, we define the mean share of the dictator's weighted sum over the total endowment as $s_d^m = x_d^m / x^m$.

Proposition 1. *The representative dictator mean share on the total endowment is*

$$s_d^m = \frac{\sum_{i=1}^m w_i^m (2m + 1 - i)}{2m + 1}, \tag{1}$$

[8]In a continuous action space, between two profiles there is an uncountable set of possible allocations. The the associated weights are restricted to distributions with support on $(x/2, x)$.

[9]Note that we consider $x^m = 3, 5, ...,$ instead of $x^m = 1, 2, 3, ...,$ that is, the discrete endowment grows two units per unit increment on m. We do it in order to always consider in the representative set, the allocation that is most close to the equity profile (m, m), i.e., the profile $(m + 1, m)$. Asymptotically, for $m \to \infty$, both approaches are equivalent.

where $w_i^m > 0$ is the weight associated with the payoff profile $(2m+1-i, i)$ for each $m = 1, 2, ...,$ and $i = 1, 2, ..., m$.

The result is a unique distribution that by empathy depends on every representative allocation chosen under self-interested, altruistic and equity concerned arguments.

Proof. We weight and sum of all representative payoffs for $m = 1, 2, ...,$ until a pattern emerges. Let x_d^m and x_r^m denotes the dictator and the receiver weighted sum of payoffs, respectively. For $m = 1$ we have a unique profile $(2,1)$. Therefore, $x_d^1 = w_1 2$ and $x_r^1 = w_1 1$. For $m = 2$ we have two profiles profiles $(4,1)$ and $(3,2)$. Therefore, $x_d^2 = w_1 4 + w_2 3$ and $x_r^2 = w_1 1 + w_2 2$. For $m = 3$ we have three profiles $(6,1)$, $(5,2)$ and $(4,3)$. Therefore, $x_d^3 = w_1 6 + w_2 5 + w_3 4$ and $x_r^3 = w_1 1 + w_2 2 + w_3 3$. Consequently, the general expressions for the dictator and receiver weight sum of payoffs over all profiles are $x_d^m = \sum_{i=1}^m w_i (2m+1-i)$ and $x_r^m = \sum_{i=1}^m w_i i$, respectively. The aggregate weighted sum of payoffs equals the total endowment, $x^m = x_d^m + x_r^m = 2m+1$. Therefore, the dictator's mean share of the total endowment is given by expression (1). The receiver fraction is obtained by difference. ■

3.1. ***Uniform weighting***

The choice of the weights distribution has implications on the model predictions. We abstain from claiming the superiority of a particular distribution. However, the uniform distribution seems focal not only because of its simplicity but it also has implicitly an impartial treatment for every allocation. In other words each representative allocation receives the equal weight $w_i^m = 1/m$.

Definition 3. *The uniform representative dictator considers every allocation profile equally important.*

Therefore, we have the following result.

Corollary 1. *The uniform representative dictator mean share on the total endowment is*

$$s_d^m = \frac{3m+1}{2(2m+1)}.$$

Corollary 2. *The uniform representative dictator mean share on the total endowment is strictly increasing and concave in $m = 1, 2, ...,$ from $s_d^1 = 2/3$ to $s_d^\infty \uparrow 3/4$.*

In order to get a better intuition on the obtained results it is important to discuss further the role of m. Note that every participant in a experiment has a finite wealth. The experimenter can vary the endowment but not the wealth. Therefore, given a constant wealth, the larger it is the total endowment the more important are the stakes of the experiment in relative terms. In our case, $m = 1$ implies that the stakes of the experiment have relatively little importance while $m \uparrow \infty$ implies the opposite.

Corollary 2 predicts that higher endowments reduce the willingness to give. This observation is empirically supported by Engel (2011) and Sefton (1992) among others. In our view the increase in the endowment imply a relative increase in its relevance on the dictator overall wealth. Moreover, since receivers improve in absolute terms, it creates on the dictator the sense that the altruistic objective of the split has been achieved. These two forces combined imply a reduction in the share passed to the receivers.

In spite of some potential critiques, meta-analyses are particularly powerful to estimate mean values. Engel (2011) aggregate information of 129 published papers and found that dictators on average keep 71.65% of the endowment. A value that is very closed to the 75% predicted in our model for $m \uparrow \infty$, the case in which the payoffs of the experiment are very relevant for the dictator. Actually, for moderate and more realistic values, around $m = 3$ or $m = 4$, the model perfectly match the empirical mean.

Note that the result is asymptotically robust. For example, if we relax Axiom 3 and/or 1 the payoffs values considered in the X_d-empathic set of Definition 2 would change, but we would still have $s_d^\infty \uparrow 3/4$.

One interesting question is what would be the allocation that a social planner could propose instead of the dictators game that would get the maximal consensus among a countable infinite population of half dictators and half receivers. In our view the asymptotic allocation $(3/4, 1/4)$ is the strongest candidate. The proposed allocation not only expresses the mean behavior, but it was constructed under the ideas of representativeness and empathy. Moreover, it does not ignore the existence of self-interest, altruistic and equity concerns present in the population. Therefore, from this perspective the representative dictator robust split of Corollary 2 is an allocation rule (specific for the dictator game) built on psychological and behavioral arguments.[10]

[10] For a survey, see Thomson (2001) and the references therein.

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