

EXPECTED BEHAVIOR AND STRATEGIC SOPHISTICATION IN THE DICTATOR GAME

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July 20, 2012

Abstract

This paper provides novel results for the extensive literature on dictator games: recipients do not expect dictators to behave selfishly, but instead expect the equal split division. The predictions made by dictators are notably different: 45% predicted the zero contribution and 40% the equal split. These results suggest that dictators and recipients are heterogeneous with regard to their degree of strategic sophistication and identify the dictator's decision power in a very different manner.

Keywords: expectations, strategic sophistication, dictator game, equal split, guessing.

JEL codes: C91, D63, D64.

1 Introduction

Many economists, psychologists and sociologists appear united on the importance of the dictator game (DG for short) as a proper tool to measure generosity. The experimental evidence in this game highlights that a large number of individuals deviate from the Nash equilibrium prediction and donate, on average, 30% of the total endowment (see Engel [9]).

Although many theoretical models have been put forward to explain these findings (see Fehr and Schmidt [10]), the extent to which dictators and recipients analyze the structure of the game is largely unexplored in the literature. In particular, we lack experimental evidence investigating whether subjects are aware of the dictator's decision power.¹

In this paper, we study the degree of strategic sophistication eliciting dictators and recipients' expectations on the dictator's behavior. We follow level-k models (e.g., Crawford et al. [7]) and assume that non-strategic individuals ignore the dictator's incentives to keep the entire pie, expecting a focal point: the equal split (see Schelling [17], Levitt and List [15] and List

¹We note that traditional game theory strongly relies on common knowledge assumptions on several aspects (rules of the game, payoffs and rationality of subjects). However, Hoffman et al. [12], [13] suggest that dictators might be unaware that keeping the whole pie is acceptable.

[16]). Subjects with a higher degree of strategic sophistication will further analyze the structure of the game, expecting dictators' behavior to be closer to the Nash equilibrium prediction. Our hypothesis is that dictators and recipients exhibit the same degree of strategic sophistication (i.e., they do not differ in their expectations about dictators' behavior and predict a division of the pie that is independent on their role in the game).

Our experimental design was simple and intuitive. First, dictators completed the typical decision task using a completely anonymous procedure involving envelopes. A question about the behavior of other dictators was included in the questionnaire the subjects filled out at the end of the experiment. Once this group had finished, recipients entered the same room and were given the instructions that the dictators had received and were asked to guess the amount of money they would earn (as recipients). A scoring rule with monetary incentives motivated them to make accurate guesses.

The results are substantive: i) less than 15% of recipients expected the Nash contribution (zero) and roughly 40% of them (the modal value) the equal split; ii) 45% of the dictators predicted the zero contribution and 40% the equal split. As a result, our hypothesis that dictators and recipients exhibit the same degree of strategic sophistication is rejected.

The rest of the paper is organized as follows. The experimental design is explained in section 2, results are shown in section 3 and the discussion is presented in section 4.

2 Experimental design

The experiment was run in September 25, 2006 in the Universidad Autonoma de Baja California Sur (UABCS) at La Paz (Mexico). The main reason to choose La Paz was that, as far as we knew, no one had ever run any experiments at that place. Thus, the whole population was completely inexperienced. Second, we chose this (poor) region of Mexico because we were interested in exploring “high stake effects”. The amount of money we used for the experiment made a difference.

We recruited a total of 56 students the week prior to the experiment. On the day of the experiment, subjects waited in the central plaza of the school near the auditorium. Twenty-eight subjects were randomly selected as dictators, while the remaining subjects were asked to wait for 15 minutes.

Dictators: The dictators received a package including a large brown envelope containing another smaller white envelope inside (for dictators’ pay-

offs), ten 20-mexican peso bills (200 pesos $\simeq$ 15 US\$ $\simeq$ 14 euros in 2006) plus a survey and instructions (read aloud) that explained the division problem.²

Subjects were instructed to do the task privately. They were told to place the money they wished to keep (for themselves) in the small envelope, seal it and put it in their pockets. The money they wished to donate (to the recipients waiting outside) had to remain in the big envelope.

Once dictators finished, they filled out a short survey. They left the instructions and the large envelope (with the donation) on their table. Among other questions contained in the survey, dictators were asked about their expectations regarding other dictators' donations. In particular, item #4 says: *With regard to the division, what do you think the other subjects have done?* We used this hypothetical question to collect information about dictators' expectations instead of an incentivized guess (see recipients section) to speed up the experiment. In addition, dictators are not matched with other dictators in the DG, what makes impossible the payment of their guesses.³

²We used neutral instructions (available upon request) in which subjects were told that even keeping the whole pie was acceptable. The whole size of the endowment (200 Mexican pesos $\simeq$ 15 US\$) is not only 50% larger than in the general framework (10 US\$), but it makes a difference in terms of individual income plus cost of living in this (poor) region of Mexico. At that time, 200 pesos was enough to buy 25 beers at any canteen in La Paz. In Spain, this would cost no less than 37.5 euros (over 40 US\$).

³One important feature of our design choice concerns anonymity (e.g., Frohlich et al. [11]). We did not want that dictators knew what others in the same room have done.

When recipients were asked to come in, the dictators left by the back door. Communication among them was impossible.

Recipients: Each of the twenty-eight recipients was seated 2 meters away from the place where their respective dictator had been seated (and where he or she left the big envelope). Recipients received the instructions that their corresponding dictators had left. We explained that these instructions belonged to the previous participants and then read them aloud carefully. They also received additional written instructions for their specific task.

Recipients were informed that they would get the money in the envelope for sure. They could earn 80 additional pesos if they guessed correctly the number of bills in the envelope, 20 pesos if they fail by just one unit, and 0 additional pesos otherwise.⁴

Once they had finished guessing and put their choices aside we opened each envelope in front of each subject separately, and then we solved the game giving them the donation plus 80, 20 or 0 additional pesos.

Replications: To check the robustness of the recipients' expectations, we compare the Mexican results with Spanish data. A total of 27 students

⁴Notice that recipients may not want to say zero (ten) bills when asked how much the dictator will give because of the way the incentives are structured. However the distance between 80 and 20 does not incentive this "safe" behavior.

at the University of Granada were recruited by standard procedures in May 2008. When subjects arrived at the lab they found the experimental instructions and the donations made by Spanish students during a previous DG (we use the data in Brañas-Garza [4]).⁵ Subjects were asked to guess the donation contained in the envelope using the same scoring rule (5 euros for right answers, 1 euro if they fail by just one unit, 0 otherwise), after which they received the donation.

3 Results

Figure 1 displays the relative frequency of guesses made by the 28 recipients involved in the experiment in Mexico (Mex) and the Spanish replication (Spa) with 27 subjects.⁶ The mean, median and mode are given below the figure.

Figure 1. Recipients' Guesses

⁵In this experiment, dictators were provided with 10 coins of 0.50 Euros to make their donations, so the amount of money is clearly smaller. In addition, subjects are familiar with experimental economics at the University of Granada, where the session was conducted in the lab.

⁶In Figure 1, we grouped the cases in which dictators donate more than half of the pie. In Mex (Spa) one of the recipients expected 8 (6), and two recipients (one recipient) expected to receive the entire pie.

First, we observe that the Spanish results do not differ substantially from the Mexican results: the modal, median and mean are practically identical. In consequence, the Mann-Whitney test ($Z = 0.026$; $p\text{-value} = 0.98$) shows that both samples arise from the same population. Recall that there are major differences in terms of experience and real size of the pie, but these variations do not affect recipients' expectations.

There are four impressive results: *i*) the expected Nash equilibrium is predicted only in 3 cases (4 in Spain). *ii*) in sharp contrast 3 individuals expected to get more than half (2 in Spain); *iii*) 10 subjects guessed the equal split (16 if we include those who expected 4) [similar findings for Spanish data]; and *iv*) on average, recipients expected to get 41% of the endowment (roughly 39% of the endowment in Spain).

Result *i*: **a)** The modal recipient expects the equal split. **b)** 70% of the recipients expect more than 40% of the pie (donation ≥ 4). **c)** Changes in rewards do not vary recipients' guesses dramatically in the DG.

According to these findings, it seems obvious that recipients expect a division which is compatible with the equal split, but not with the Nash equilibrium. Our data suggest that recipients do not internalize the dictators'

decision power or simply disregard their incentives to keep the entire pie for themselves. We therefore conclude that recipients are non-strategic subjects, who consider a focal point when making their predictions.⁷

The 28 dictators involved in the Mexican experiment were asked to guess what the other dictators would do, that is, to reveal their expectations about dictator's behavior. Nine dictators did not provide any answer. Figure 2 plots the guesses for the 19 valid predictions.

Figure 2. Dictators' Guesses

A total of 16 dictators expected that other dictators would donate either half of the endowment or nothing. The remaining 3 dictators guessed 1, 3 and 10, respectively.

Result ii: Dictators expect either a zero contribution or the equal split.

Although these beliefs are hypothetical is clear that this picture is com-

⁷Schelling [17] argues that subjects might have a psychological propensity to play particular strategies by default. Levitt and List [15] and List [16] discuss how the properties of the situation might trigger these "salient" strategies in the DG. The literature on coordination games frequently assumes that these strategies are likely to be chosen by non-strategic subjects, who do not take the other subjects' incentives or actions into account. Subjects with a higher degree of sophistication, however, further analyze the structure of the game and form beliefs about other subjects' actions and best response to them (see Crawford et al. [7] for the application of this concept to different games and Brañas et al. [5] for recent research on the ultimatum game that explores this issue).

pletely different from what we found in both Figure 1 (result *i*). Unlike recipients, roughly 50% of dictators believe that other dictators will keep the complete pie. Thus, dictators seem to exhibit a higher degree of strategic sophistication than recipients as their guesses frequently include the Nash equilibrium prediction.

For the sake of completeness, we report dictators' behavior in Figure 3. Although we observe some differences between donations in Mexico and Spain (for instance, the modal (median) value is 1 (2) for the Mexican sample and 2/3 (3) for the Spanish sample), the averages are nearly identical and no dictator donates more than half of the pie, neither in Mexico nor in Spain. The Mann-Whitney test ($Z = 0.043$; $p - value = 0.96$) supports that Mexicans and Spanish behave as if arising from the same population.

Figure 3. Dictators' Donations

The results in Figure 3 are in line with previous experimental evidence and support two clear ideas:

Result *iii*: **a)** On average, dictators donate 25% of the endowment. **b)**

Changes in rewards and different experimental conditions do not vary

dictators' behavior dramatically in the DG.

If we compare recipients' guesses (Figure 1) and dictators' giving (Figure 3), the Mann-Whitney test rejects that these distributions are equal both in Mexico ($Z = -2.611$; $p - value = 0.0090$) and Spain ($Z = -2.937$; $p - value = 0.0033$). Although dictators systematically offer a minimal part of the pie, recipients do not expect that dictators will behave selfishly!

In addition, the observed donations are completely different to dictators' guesses. This result suggests that dictators do not use their own behavior to form expectations about the behavior of other dictators ($LR-test = 14.09$; $p - value = 0.82$).

4 Discussion

We have investigated whether dictators and recipients exhibit the same degree of strategic sophistication with regard to the division of the pie. Along the paper, we have found two interesting results: i) recipients expect the equal split, ii) dictators expect both the Nash prediction and the equal split. As a result, our hypothesis that subjects predict a division that is independent of their roles is clearly rejected.

These results enrich our understanding of the DG by showing that dictators and recipient evaluate the dictators' incentives to keep the entire pie in a very different manner.

Our findings complement recent research in the DG, which investigates the role of expectations. Aguiar et al. [1] show that recipients prefer to receive donations from women than from men, so the former ones are expected to be more generous. Ellingsen et al. [8] ask recipients to reveal the amount that they expect to receive and pass this information to dictators. The authors find that the amount that dictators donate is not correlated with the amount that recipients expect to receive, what suggests no evidence for guilt aversion (e.g., Charness & Dufwenberg [6] and Battigalli & Dufwenberg [2] and [3]). Iriberri and Rey-Biel [14] investigate how dictators believe that other dictators will behave, showing that selfish dictators are likely to see other dictators as selfish. Our contribution to this literature is to compare dictators' and recipients' expectations to show that subjects differ with regard to their degree of strategic sophistication. Our data seem to suggest that recipients are non-strategic agents and predict a focal point: the equal split. In sharp contrast, dictators exhibit a higher degree of strategic sophistication and predict that other dictators will keep the entire pie for themselves.

Although this paper investigates how subjects expect dictators to behave in the DG, we consider that analyzing higher order beliefs would be an excellent avenue for future research. In particular, it would be interesting to see whether dictators are aware that recipients expect to receive the equal split or whether recipients' expectations will converge to the Nash equilibrium prediction in a repeated-game context.

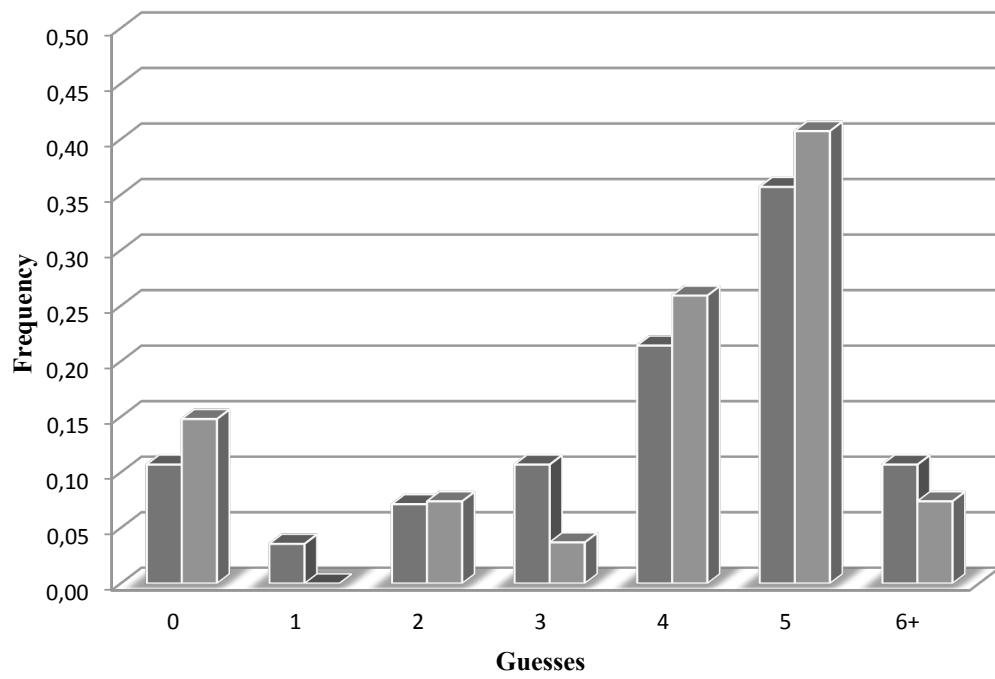
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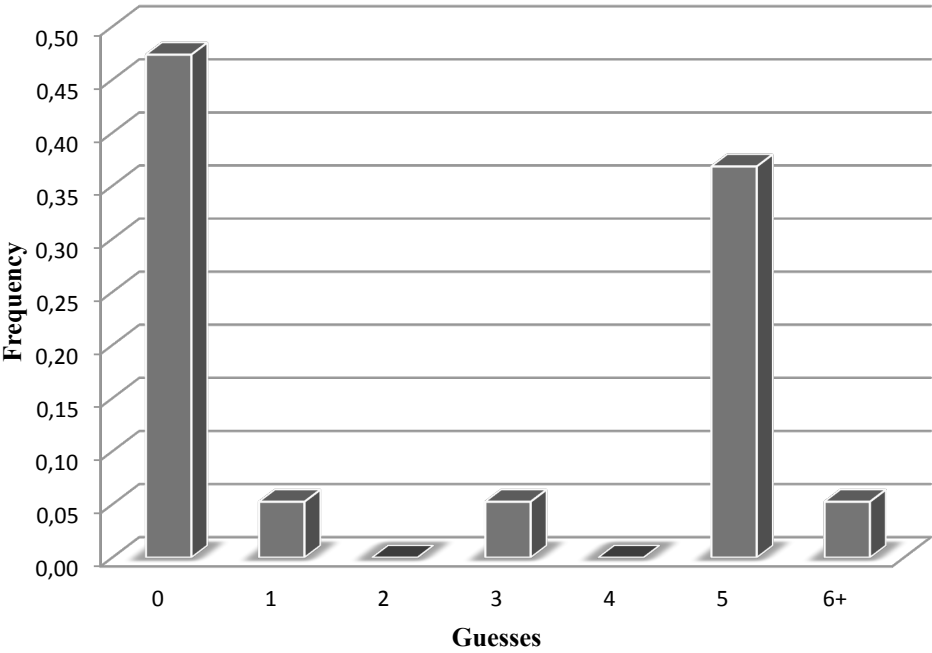
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Figure 1. Recipients' Guesses



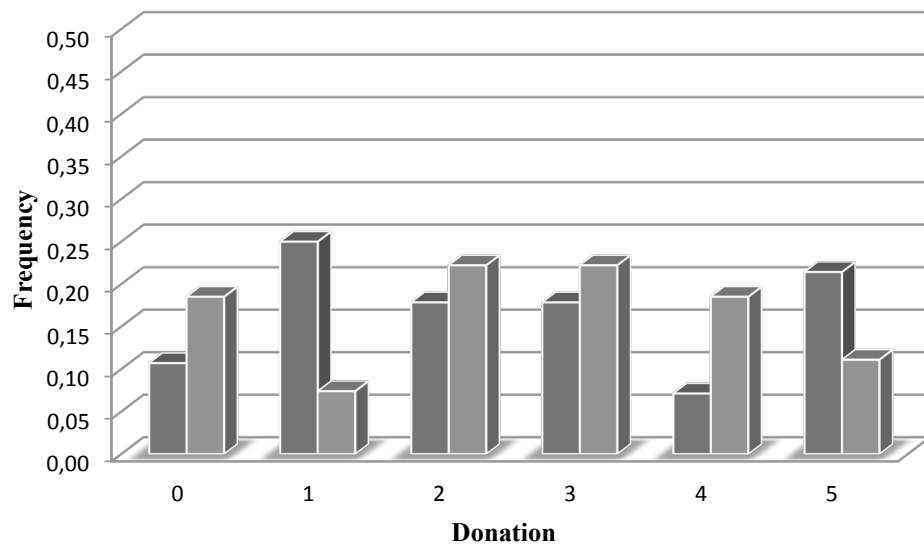
	MEX	SPA
MEAN	4.14	3.92
MEDIAN	4	4
MODE	5	5
N	28	27

Figure 2. Dictators' Guesses



	MEX
MEAN	2.58
MEDIAN	1
MODE	0
N	19

Figure 3. Dictators' Donations



	MEX	SPA
MEAN	2.50	2.48
MEDIAN	2	3
MODE	1	2/3
N	28	27