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High incentives without high cost: The role of (perceived) stake sizes in dictator games

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High Incentives without High Cost - The Role of (Perceived) Stake Sizes in Dictator Games*

by

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Abstract

The external validity of dictator games conducted in a lab is often questioned due to the use of small stake sizes that do not correspond to real-world settings. A potential solution to this problem is based on how participant perceptions of stake sizes are affected by their numerical representation. In this paper, I vary the stake size and its numerical representation to examine whether the illusion of large stakes can be created convincingly by implementing inflated numbers through an experimental currency. The share allocated to the recipient does not differ across treatments in this large-sample online experiment. This finding demonstrates that neither an increase in stake size nor a change in its numerical representation influence the share allocated to the recipient in a dictator game.

JEL classification: C99, D64, D91

Keywords: dictator game, stake size, numerosity

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1 Introduction

The dictator game (DG) is one of the most common experiments for analysing other-regarding behaviour. In this game, participants allocate a fraction of a given amount of money (the pie) to another person. Researchers extrapolate their results on how much of the pie is transferred to the receiver in DGs to e.g. charitable donationts in the real world. One of the factors that raises doubts concerning the external validity of these experiments is the incentive structure in artificial lab situations, where stake sizes are usually negligible compared to real-world settings. If cost are kept at a reasonable level, it is difficult to overcome this limitation at least in high-income countries. This paper analyses one potential solution that is based on a cognitive bias, the numerosity heuristic, i.e. people perceive quantities or values based primarily on their numerical representation. Using an experimental currency that inflates the numbers representing pie sizes, creates the illusion of large stakes for participants applying this heuristic. If the size of the pie matters and if specific exchange rates of experimental currencies create an illusion of large stakes, the external validity of results can easily be improved without losing the control that lab experiments provide.

Despite the many experiments in this field, the question of stake size effects in DG remains unresolved (Karagözoglu & Urhan (2017), Larney et al. (2019)). Many studies fail to identify a significant stake size effect[2], whereas other papers find decreasing generosity with increasing monetary incentives[3]. The two main differences between most of these studies that find different results lies in the sample size and the extent of variation. This raises the question of whether the non-findings of the former studies are caused by their smaller sample sizes and by providing incentive increases that are too small. To provide some evidence that helps to answer this question, I replicate previous studies with a large and close-to-representative sample (708 independent dictator decisions) and a substantial stake size increase from almost 1 % to 10 % of the participants' average monthly household net income (10 to 100 Euros).

Over the last 30 years, several theories were proposed to provide a rationale for other-regarding behaviour that depends on stake sizes.[4] Telser (1995) classified fairness as a normal good, i.e. fair behaviour is exhibited less when its price increases. His fairness definition is based on the relative share that both players receive. With increasing stake sizes, the price of this kind of fairness increases (e. g. following the fifty-fifty rule costs 50 Euros with a stake of 100 Euros, but only 5 Euros with a stake of 10 Euros). This theory predicts a decreasing number of allocated shares when dictators have to forgo more money to obtain a constant relative distribution. In a similar spirit, Rabin (1993) argues in his seminal paper that people are more willing to exhibit fairness if its material cost declines. Smith & Walker (1993) find evidence to support their hypothesis that higher stake sizes induce participants to make decisions that are closer to the predictions of rational models, i.e. giving less in a DG. Furthermore, Fu et al. (2007) suggest that higher stake sizes make the cost of giving more salient to the dictator, and therefore reduce the willingness to behave altruistically.

To examine the question of whether experimental currencies can help to increase the external

[2]See e.g. Forsythe et al. (1994), Camerer & Hogarth (1999), Carpenter et al. (2005), Heinz et al. (2012), Tisserand et al. (2015), Keuschnigg et al. (2016).

[3]See e. g. List & Cherry (2008), Blake & Rand (2010), Engel (2011), Leibbrandt et al. (2015), Schier et al. (2016), Larney et al. (2019).

[4]See Karagözoglu & Urhan (2017) for an overview.

validity of experiments, I further analyse the impact of different numerical representations of stake size. Based on Tversky & Kahnemann (1981), many subsequent papers find that decisions are influenced by the way choices or problems are framed. One possible framing of peoples' choices is to represent certain amounts of equal value with different numbers, e. g. by using different units. Experiments have shown that people apply a numerosity heuristic that leads to the fallacy that larger numbers necessarily represent a larger quantity, weight, value etc. (see Pelham et al. (1994) and Bagchi & Davis (2016) for an overview). This phenomenon is also found to play a role in altruistic decision making. Kooreman et al. (2004) and Cannon & Cipriani (2006) explain significant increases in donations after the introduction of the Euro, as resulting from the transition to a new unit of account associated with the new and less numerous currency. Shrivastava et al. (2017) take these findings to the lab and show that participants exhibit less altruistic behaviour in the Cent-treatment (high numerosity) compared to the Dollar-treatment (low numerosity), although the pie size is the same in both treatments. This illusion provides the opportunity for experimenters to increase (perceived) incentives and thus create more realistic circumstances in the lab without bearing higher cost. Manipulating the exchange rate between the experimental currency and real money will enhance the external validity of experiments if participants respond to the face value of the reward rather than its actual value.

I adopt a standard DG design established by Forsysthe et al. (1994). In this game, one subject is the dictator and another is the receiver. The dictator is endowed with a certain amount of money and can allocate any desired share, including zero, to the receiver. The Nash equilibrium with perfectly selfish individuals would be to keep the whole pie and give nothing to the receiver. To examine stake size and numerosity effects in isolation as well as their interaction, I consider pie sizes of 10 and 100 Euros and numerical representations of 10 and 100 Points. Using an experimental currency ('Points') allows for the analysis of numerosity effects and may provide general insights into the effect of implementing different exchange rates in the lab. This design facilitates a clear attribution of changes in giving, to a variation of the pie size and its numerical representation and solves the problem which previous experiments exhibit, that higher stake sizes are automatically associated with higher numerosities.

Building on the aforementioned theoretical arguments and experimental findings on stake-size dependent altriustic behaviour and numerosity heuristics, I propose the following predictions.

P1: Dictators allocate less of the endowment in the treatments with high stake sizes.

P2: Dictators give less of the endowment in high-numerosity treatments than in low-numerosity treatments, holding the stake size constant.

I make two contributions to the literature. First, I am the first to analyse stake size and numerosity variations in a clean four-treatment DG. I thereby shed some light on how experimental currencies affect altruistic behaviour. Second, I replicate previous studies on stake size effects in DGs with a large non-student sample exhibiting diverse socio-demographic characteristics. The remainder of the paper is organised as follows. In the next section, I describe the experimental setup before presenting the results in Section 3. The final section concludes and discusses implications for the use of experimental currencies.

2 Design and sample

The experiment was run online from 7 to 14 December 2020. The subject recruitment and the experiment were conducted in collaboration with a private social research institute, that invited adults aged between 18 and 69, from their panel. I restricted the sample to make the stake-size variation, relative to the participants' monthly income, more comparable across subjects. The only participation requirement was a household net income of less than 2000 Euros per month. A total of 708 subjects (64 % female) participated in the experiment (for details see Table 5 in Appendix 4.2). The subject pool is close to representative of the German population regarding age, sex and federal state, subject to the abovementioned restrictions. Subjects were assigned to one of four treatments after they followed the link in the invitation email and met the participation condition regarding the net income self-declaration. The experiment was double-blind with subject-subject and subject-experimenter anonymity and the median processing time was about 11 minutes.

I use a between-subjects design and implement four DG treatments manipulating the stake size and its numerosity. Participants are randomly and anonymously matched with another subject from the panel with a similar household income. Each dictator has to split the amount between herself and the other person.[5] The combination of stake sizes of 10 Euros and 100 Euros, and the numerical representation of 10 and 100 points, results in the four treatments shown in Table 1. This design allows for an analysis of the stake sizes, controlling for numerosity and vice versa.

	10 points	100 points
10 Euros	Treatment 1 (1:1)	Treatment 2 (10:1)
100 Euros	Treatment 3 (1:10)	Treatment 4 (1:1)

Table 1: Treatment design

According to **P1**, I expect a smaller allocated share in Treatments 3 and 4 where stake sizes are large. Furthermore, **P2** predicts fewer points to be given in Treatments 2 and 4, compared to 1 and 3 respectively.

The number of available points and the exchange rates are displayed to the participants at the beginning, and again shortly before the decision stage. All participants have to read the instructions and solve two control tasks concerning the allocation of points, in order to take part in the main experiment (see Appendix 4.1).[6] After playing the DG, participants fill in a questionnaire on sociodemographic and preference variables. 20 % of the dictators were randomly selected and the money was paid out according to their allocation decisions. All other subjects received a fixed payment for participation.

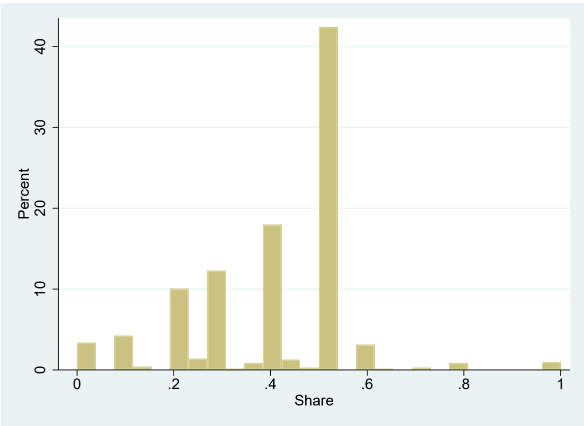
3 Results

Figure 1a shows the distribution of shares allocated from the dictator to the receiver. Only 3.25 % of participants allocated no points at all to the receiver, 42.37 % followed the fifty-fifty rule and 5.37 %

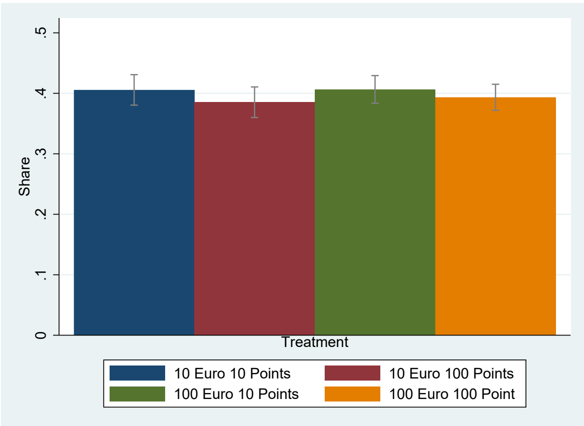
[5] In order to ensure a constant granularity across treatments, I allow one decimal place in the 10 points treatments.

[6] 14 % of participants were not able to answer the control questions correctly at the second attempt and thus did not take part in the experiment.

gave more than half of the endowment. The overall mean of the allocated share is 39.77 %, which is larger than the 28.35 % found in a meta study by Engel (2011). According to Engel (2011) and Walkowitz (2018), it is unlikely that the random payment method is the reason for this difference.[7] Engel (2011) finds a highly significant student dummy coefficient of $-.151$ in his meta analysis.[8] Therefore, this difference may be explained by the participants not being exclusively students.



(a) Distribution of allocated share



(b) Allocated share by treatment

Figure 1: Allocation behaviour.

The share allocated to the receiver is fairly stable across treatments, as presented in Figure 1b.

	T 1 10 - 10	T 2 100 - 10	T 3 10 - 100	T 4 100 - 100	Total
Observations	177	177	177	177	708
Mean allocation	0.41	0.39	0.41	0.39	0.40
Median	0.40	0.40	0.40	0.49	0.4
Minimum allocation	0	0	0	0	0
Maximum allocation	1.0	1.0	1.0	0.70	1.0
Standard deviation	0.17	0.17	0.16	0.15	0.16
Share of 50 : 50	0.42	0.38	0.42	0.47	0.42

Table 2: Summary statistics by treatments

Table 2 summarises the main statistics by treatment. The dictators do not on average respond to the variation in the stake size or its numerical representation. In all treatments the mean (median) of the allocated share is very close to the total sample mean (median) of 0.397 (0.40).

To confirm this result, I aggregate all observations with the same stake size and the same numerical representation respectively, and test for statistical significant differences between these subsamples.

As Table 3 reports, neither stake size nor numerical representation affects the dictator decisions.

[7] See Bolle (1990) and Sefton (1992) for evidence to the contrary.

[8] Another reason could be that the allocation decision was not made in the lab, but at the personal computer via Internet.

All standard test procedures fail to identify significant differences. Moreover, I cannot identify any differences in altruistic behaviour with regard to any socio-demographic factor using OLS and Tobit regression (see Table 6 in Appendix 4.2).

	10 Points	100 Points	10 Euros	100 Euros
Observations	354	354	354	354
Mean allocation	0.40	0.39	0.40	0.40
Median	0.41	0.43	0.4	0.49
Standard deviation	0.16	0.16	0.17	0.15
Share of 50 : 50	0.42	0.43	0.40	0.45
t-test	$t = -1.38; Pr = 0.16$		$t = 0.37; Pr = 0.71$	
Wilcoxon	$z = -1.15; p = 0.25$		$z = 1.17; p = 0.26$	
Kolmogorov-Smirnov	$KS = 0.06; p = 0.50$		$KS = 0.05; p = 0.69$	
Equality-of-medians test	$Pr = 0.76$		$Pr = 0.18$	

Table 3: Summary statistics by stake size and numerosity

Next, I regress the allocated share on treatment dummies and interaction terms that enable the distinction of all four treatments. Let i be the index of individuals, and j the index of a treatment. In order to control for heterogeneity in socio-demographic characteristics, I apply the following equation.

$$Share_i = a_0 + a_1 Stakesize10_j + a_2 10points_j + Stakesize10_j \times 10points_j + \mathbf{bX}_i + \varepsilon$$

where $\mathbf{X}_i$ denotes the vector of player-specific socio-demographic variables. The dummy variable 'Stakesize10' ('10 points') turns 1 if the stake size (numerical representation) equals 10 Euros (points). Table 4 reports the regression results. Controlling for all socio-demographic variables, I cannot identify any significant differences between the four treatments (columns (3) to (6)). Aggregating treatments with the same stake size/numerosity yields the same result (columns (1) and (2)). Consequently, all results support the hypothesis that other-regarding preferences are not stake-size dependent, when it comes to a stake-size variation of almost 1 % to 10 % of the mean disposable income. Additionally, the numerical representation of the stake sizes does not alter allocation decisions, i.e. participants do not respond to different exchange rates. Therefore, both predictions **P1** and **P2** are rejected.

	Dependent variable: Share					
	(1)	(2)	(3)	(4)	(5)	(6)
	Tobit	*Tobit*	*OLS*	*OLS*	*Tobit*	*Tobit*
Stake size 10	-0.0070		-0.0082	-0.0125	-0.0081	-0.0125
	(0.0127)		(0.0169)	(0.0176)	(0.0178)	(0.0180)
10 points		0.0162	0.0131	0.0119	0.0121	0.0109
		(0.0126)	(0.0160)	(0.0162)	(0.0178)	(0.0178)
Stake size 10			0.0073	0.0095	0.0086	0.0106
$\times$ 10 points			(0.0242)	(0.0248)	(0.0252)	(0.0253)
Age	0.0006	0.0006		0.0005		0.0006
	(0.0006)	(0.0006)		(0.0005)		(0.0006)
Income	-0.0052	-0.0049		-0.0046		-0.0049
	(0.0069)	(0.0069)		(0.0060)		(0.0069)
Sex	0.0129	0.0122		0.0109		0.0126
	(0.0137)	(0.0136)		(0.0132)		(0.0136)
Constant	0.3232***	0.3161***	0.3934***	0.3236***	0.3922***	0.3211***
	(0.0554)	(0.0554)	(0.0110)	(0.0511)	(0.0126)	(0.0560)
Sigma/ Adjusted R^2	0.0277***	0.0277***	-0.0012	-0.0063	0.0279***	0.0276***
	(0.0015)	(0.0015)			(0.0015)	(0.0015)
Observations	708	708	708	708	708	708

Standard errors in parentheses. Standard errors clustered at the individual level.
In regressions (1), (2), (4) and (6), further controls are the number of children, family status, school education, qualification, job status, household members, number of siblings.
* $p < .1$, ** $p < .05$, *** $p < .01$

Table 4: Effect of treatment on given share in total sample

4 Conclusion

I measure the effect of different stake sizes and their numerical representation in four dictator game treatments using a between-subject design. Neither the stake size nor the numerosity affect the share allocated to the receiver. The former finding is often attributed in the literature to small sample sizes. This criticism does not apply to the present study as 708 participants with a wide variety of socio-demographic characteristics participated in the experiment. A second argument against the validity of this finding concerns the degree of stake-size variation. Although I increase the stake size substantially, this variation may be too small to have an impact on participant behaviour.

The lack of significance of numerosity effects may be due to the design of the DG, as the allocation choice makes people focus on relative shares rather than absolute values. The large number of participants following the fifty-fifty rule (42 %) may support this hypothesis. Another explanation may be that the value of the experimental currency is fairly salient due to the 'simple' exchange rates. Furthermore, given that stake sizes as such do not impact behaviour, one would not expect an effect of its numerical representation. Therefore, participant sensitivity to numerical representations may be higher in other kinds of experiment. Consequently, it seems promising to apply this cost-saving method to other games.

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Appendix

4.1 Instructions

Section 1 – Introduction
You are attending an economic experiment. This experiment is funded by the Westphalian Wilhelms University of Muenster. In addition to your fixed participation compensation, you may earn additional money in the course of the experiment. Your compensation depends on your decisions. Additionally, your decisions affect the compensation of other players. Therefore, please read the instructions carefully. During the experiment, all calculations are made in Points rather than Euros. Your pay-off will initially be displayed in Points. 1 Point corresponds to 1 Euro.

Section 2 – Procedure
In this experiment you are randomly and anonymously matched with one other subject from the subject pool, with a similar monthly income. You receive an endowment of 10 Points. You can send any share of this endowment to the other subject. The share must range between 0 and 10 Points and has to be rounded to one decimal place. The other subject does not receive any endowment and does not make any decision.

Section 3 – Allocation of points and control task
The distribution of Points between you and the other subject after your decision will be calculated as follows:

- Your number of Points: 10 Points minus sent Points
- The other subject's number of Points: sent Points

If you were endowed with 10 points and you decided to send 3 Points to the other subject, the following allocation would occur:

- Your number of points: 7 (10 Points − 3 Points = 7 Points)
- The other subject's number of Points: 3 (sent Points)

The following control questions are designed to check your understanding of the rules. Please state how many points you and the other subject would take home if you sent 5 Points to the other subject. The maximal number of disposable Points is 10.

- Your number of points:
- The other subject's number of Points:

Please state how many points you and the other subject would take home if you sent 7 Points to the other subject. The maximal number of disposable Points is 10.

- Your number of points:
- The other subject's number of Points:

You must answer all of these control questions correctly to enter the next part of this experiment.

Section 4: Pay-off probablities
After all participants have made their decisions and the experiment is finished, one fifth of all pairs are randomly chosen, and the respective payments will be realised. The other participants' decisions will not be realised. The probability that your decision will be implemented is therefore 20 %. Consequently, every fifth participant will receive a payment according to her decision. 1 Point corresponds to 1 Euro. Hence, it is worth making a careful decision.

All decisions will be kept confidential. No other subject will be informed about the payment you receive. Neither during nor after the experiment will participants receive any information on whom you were matched with.

Section 5: Your decision

You were endowed with 10 Points. Please choose how many Points you want to send to the other subject.

4.2 Tables

	Mean	Median	Max	Min	Std. dev.
Age	44	47	69	18	15.7
Income (groups)	1131.4	1160.5	2000	<500	-
Children	0.7	0	6	0	1.1
Household member	1.6	1	7	1	0.99
Siblings	1.5	1	7	0	1.4

Table 5: Sample characteristics

	Dependent variable: Share	
	(1)	(2)
	OLS	*Tobit*
Age	0.0005	0.0006
	(0.0005)	(0.0006)
Income	-0.0050	-0.0053
	(0.0060)	(0.0069)
Sex	0.0108	0.0125
	(0.0131)	(0.0136)
State	0.0006	0.0005
	(0.0014)	(0.0014)
Number of children	-0.0022	-0.0018
	(0.0064)	(0.0071)
Family status	0.0048	0.0043
	(0.0047)	(0.0050)
School education	-0.0005	-0.0011
	(0.0071)	(0.0068)
Qualification	0.0026	0.0028
	(0.0028)	(0.0028)
Job status	0.0016	0.0015
	(0.0023)	(0.0024)
Household members	0.0013	0.0011
	(0.0080)	(0.0083)
Siblings	0.0031	0.0032
	(0.0043)	(0.0047)
Constant	0.3240***	0.3213***
	(0.0501)	(0.0553)
Adjusted R^2/Sigma	-0.0054	0.0277***
		(0.0015)
Observations	708	708

Standard errors in parentheses

Standard errors clustered at the session level

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 6: Effect of sociodemographics on given share in total sample