Trust and trustworthiness after negative random shocks*

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ABSTRACT

We experimentally investigate the effect of a negative endowment shock that can cause inequality in a trust game. Our goal is to assess whether different causes of inequality have different effects on trust and trustworthiness. In our trust game, we vary whether there is inequality (in favor of the second mover) or not and whether the inequality results from a random negative shock (i.e., the outcome of a die roll) or exists from the outset. Our findings suggest that inequality causes first-movers to send more of their endowment and second-movers to return more. However, we do not find support for the hypothesis that the cause of the inequality matters. Behavior after the occurrence of a random shock is not significantly different from the behavior in treatments where the inequality exists from the outset. Our results highlight the need to be cautious when interpreting the effects on trust and trustworthiness of negative random shocks in the field (such as natural disasters). Our results suggest that these effects are primarily driven by the inequality caused by the shock and not by any of the additional characteristics of the shock, like saliency or uncertainty.

Keywords: Trust game, endowment heterogeneity, random shocks, inequality aversion, experimental economics.

JEL Codes: C91, D02, D03, D69.

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1. Introduction

It is well established that trust and trustworthiness are important elements that influence the economic performance of a society (Knack & Keefer 1997, Zak & Knack 2001, Guiso et al. 2004, Bjørnskov 2012, Horváth 2013, Algan & Cahu 2013, Batrancea et al. 2019). Trust and trustworthiness are also essential in interpersonal economic interactions, especially those characterized by incomplete contracts (Chen 2000, Anderhub et al. 2002, Engle-Warnick & Slonim 2006). It is therefore essential to study factors that can potentially affect the levels of trust and trustworthiness. For instance, the circumstances in which many economic decisions are made are not always static and stable. Negative random shocks often occur, including human-made calamities (e.g., wars), natural disasters (e.g., earthquakes), or personal shocks (e.g., losing a job during the recent crisis of COVID-19). One significant aspect of these negative shocks is that they can affect the (relative) wealth of decision-makers which, in turn, is likely to influence the levels of trust and trustworthiness. This paper aims to investigate how trust and trustworthiness respond to negative random shocks that affect the wealth of individuals.

Our paper is closely related to other studies that investigate how negative random shocks influence the levels of trust and trustworthiness in the field (Castillo & Carter 2011, Fleming et al. 2014, Veszteg et al. 2015, Andrabi & Das 2017, Cassar et al. 2017, Calo-Blanco et al. 2017). This literature has produced mixed results to date. Cassar et al. (2017) find that villages affected by a tsunami in Thailand exhibit higher levels of trust and trustworthiness than non-affected villages. Fleming et al. (2014) show that trust does not differ between areas that were and were not affected by an earthquake in Chile, but that trustworthiness was indeed lower in the affected regions. An important limitation of these studies is they cannot (and are not intended to) disentangle the effects of the shock itself from the effect this shock generates on the level of inequality. It has been shown that wealth inequalities influence behavior in various settings, including cooperation, pro-social behavior, and social cohesion (Zelmer 2003, Tavoni et al. 2011, Hargreaves-Heap et al. 2016, Camera et al. 2020). If we observe that a negative random shock leads to changes in the levels of trust and trustworthiness, it may be because of the occurrence of the shock or because the shock affected the level of inequality. Because identifying these effects is indeed difficult and unlikely in the field, we investigate this question in a controlled laboratory setting.

We use a variation of the two-person trust game in Berg et al. (1995).[1] In our innovative design, both the first and the second-mover receive initially the same endowment, but the occurrence of a negative random shock – in this case, the roll of a die – can cause the first-mover's endowment to be drastically reduced. First-movers experience this reduction in their endowment before they decide how much to send. We compare the behavior in these two treatments – with and without the occurrence of the shock – with two baseline treatments: one where both players have the same initial endowments, but there is no chance of a shock, and another where the first-mover has a lower endowment but does so from the outset, meaning that in the latter version the difference in the endowments is not the result of a random event. By this design choice, we can separate the effect on trust and trustworthiness of the (possibility of a) shock from the effect of the inequality it generates.[2]

In the trust game, the effect of inequality on trust and trustworthiness will depend on the direction of the inequality. In our experiment it is always the first-mover who is – or is not – going to be comparatively worse off before making their decision. If the second-mover is inequality averse (Fehr & Schmidt 1999, Bolton & Ockenfels 2000), we would expect them to return more if the endowment of the first-mover is lower. The first-mover's decision is influenced by several factors and, therefore, a little bit harder to understand. Cox (2004) shows that in a trust game, the first-mover decision whether to send money (and how much) is influenced by both strategic and altruistic aspects (see also McCabe et al. 2003, Bohnet & Zeckhauser 2004, Ashraf et al. 2006, Espín et al. 2016, Kanagaretnam et al. 2009, Maggioni et al. 2018 and Alós-Ferrer & Farolfi 2019). The strategic consideration depends on the first-mover being aware of the second-mover being more likely to return more in the case of inequality resulting in the first-mover sending more. On the other hand, under the influence of altruistic considerations, a comparatively poorer first-mover is less likely to send money to the second-mover, as any amount sent will increase the inequality.

Laboratory experiments that study the effects of inequality in the trust game often vary the initial endowments of the first and/or the second-movers or the amount that is available to the first-movers to examine how the behavior of people respond to differences in wealth (Johansson-Stenman et al. 2005, Anderson et al. 2006, Ciriolo 2007, Lei & Vesely 2010, Xiao & Bicchieri 2010, Smith 2011, Brülhart

[1] In this game, first-movers decide how much of their endowment to send to a second-mover. The amount sent is tripled by the experimenter. The second-mover receives the tripled amount and has to decide how much of this to return to the second-mover.

[2] Our experimental approach allows us to address also the usual problems of information and beliefs about the wealth of other individuals, which might be confounding factors in the field; e.g., when a shock occurs in the field, individuals may be unaware of the wealth of others and whether or not they have been affected by the shock. In our experiment, there is common information regarding the endowment of other participants and whether or not they have experienced the shock.

& Usunier 2012, Hargreaves-Heap et al. 2013, Calabuig et al. 2016, Rodriguez-Lara 2018). In our study, we vary the endowment of the first-movers, but we allow for this endowment to depend on the occurrence of a negative random shock.

Our results suggest that first-movers send more, and second-movers return more when there is inequality in favor of the second-mover. Our findings are in line with previous literature, which shows that first-movers send proportionally more when their endowment decreases. Thus the level of trust increases in the case of disadvantageous inequality, i.e., when first-movers have a smaller endowment than second-movers (Lei & Vesely, 2010, Smith 2011, Hargreaves-Heap et al. 2013, Calabuig et al. 2016, Rodriguez-Lara 2018). However, some papers find no significant effects of disadvantageous inequality (Anderson et al. 2006, Brülhart & Usunier 2012). Richer second-movers in these studies generally send back less, except in Smith (2011), where these second-movers actually return more (see also Ciriolo (2007), Xiao & Bicchieri 2010, or Jordahl (2009) for other papers that look at the effect of endowment heterogeneity on the levels of trust and trustworthiness).

Our unique contribution is to show that the effects of inequality take place regardless of the *source* of the inequality, a factor that has been ignored by previous work. The only papers we know that examines how trust and trustworthiness respond to the occurrence of random negative shocks refer to field studies, but those cannot disentangle the effect of the shock itself from the effect this shock has on the inequality. Our findings provide support for the hypothesis that trust and trustworthiness increase when a random negative shock occurs (e.g., Veszteg et al. 2015, Cassar et al. 2017). Our results, however, suggest that the effect of the shock may not differ from the effect of the inequality these shocks generate. Thus, the main contribution of our study is to highlight that we need to be cautious when interpreting the effect that negative random shocks (e.g., natural disasters) have on behavior in the field because the effect of the shock can be due to the inequality this shock generates, nor to the occurrence of the shock itself.

Our paper is also related to Fehr et al. (2020) in that they also vary the source of the inequality in the trust game. However, they reward first- and second-movers differently depending on their performance in a real-effort task; thus one crucial aspect that makes our approach distinct from theirs is that we deliberately focus on a setting in which subjects are never responsible for the inequality; i.e., the endowments are initially given or the result of a random shock in our environment.[3] We build

[3] The extent to which subjects are held responsible for the level of inequality can have an effect, for instance in prosocial behavior. See, among others, Konow (2000), Cherry et al. (2002), Cappelen et al. (2007, 2013), Rodriguez-Lara & Moreno-Garrido (2012), Durante et al. (2014), Deffains et al. (2016), Akbaş et al. (2019).

on Bejarano et al. (2018) to examine how the possibility of a negative random shock that affects the endowment of the first-mover can affect behavior in the trust game. Bejarano et al. (2018) study this question when the negative random shock can decrease the endowment of the second-mover and find that first-movers send less to second-movers who have a lower endowment, but only when the inequality is the result of a negative random shock. The authors argue that people may respond differently to inequalities that are initially given than to inequalities caused by a shock because the latter may be more salient than the former.

While the idea of inequality is central to our research question, our research also draws on the literature on risk preferences and reference points. Several studies investigate whether prior events influence subsequent risk-taking, in particular if people exhibit more or less risky behavior after suffering a loss (Thaler & Johnson, 1990). According to standard economic theory, small losses should not affect individuals' risk preferences (Rabin 2000). However, there are numerous examples of people exhibiting more risk-averse behavior after suffering a loss (Weber & Zuchel 2005, Cameron & Shah 2015, Imas 2016, Deng et al. 2018), and there are also examples of people exhibiting more risk-seeking behavior after suffering a loss or other types of negative shocks. Liu et al. (2010) observe this effect in Taiwanese stockbrokers. Page et al. (2014) find evidence for it in Australian homeowners affected by a flood, while Herrmann & Stewart (1957) and Andrade & Iyer (2009) confirm that after observing losses, subjects were more prone to take risks in lab experiments.

In the trust game, there is little empirical support for the hypothesis that trust is a risky decision, as most of the studies conclude that risk preferences do not predict behavior in the trust game (see, among others, Eckel & Wilson (2004), Ashraf et al. (2006), Kanagaretnam et al. (2009), Fehr (2009), Houser et al. (2010), Slonim & Guillen 2010, Ben-Ner & Halldorsson (2010).[4] The lack of relation between risk attitudes and behavior might be due to the fact that first-movers do not know the probability that second-movers will reciprocate their choice; thus behavior in the trust game might be associated to *ambiguity* aversion rather than *risk* aversion (Corcos et al. 2012, Li et al. 2019). Yet, some authors think about the decision of the first-mover in terms of *social* risk (see Alos-Ferrer & Farolfi (2019) for various references). This would result in two different predictions regarding the behavior of first-movers when they experience a negative random shock that affects their endowment.

If first-movers perceive that trusting is a risky decision (Bohnet & Zeckhauser 2004, Bohnet et al. 2008, Schniter et al. 2020), we will expect the negative random shock to decrease the level of trust to

[4] The papers of Schechter (2007) and Chetty et al. (2021) are only two exceptions we know in this literature.

minimize the possibility of “betrayal aversion.” This result would be in line with evidence from survey data; e.g., Alesina & La Ferrara (2002) show that recent traumatic experiences and income disparity are associated with lower trust. Similarly, Kristoffersen (2018) finds that negative financial shocks lead to lower trust, while Ananyev & Guriev (2019) find that trust was lower in regions in Russia that were more affected by a decrease in GDP (see Jordahl 2009 for a survey).[5] A second possibility that we consider to be important to predict the behavior of first-movers is related to the idea of “principled trustfulness” (Fetchenhauer & Dunning 2012). If first-movers refrain from sending money to second movers, there is a negative signal of distrust; thus people may be more willing to take risk in trust games than in lotteries (Fetchenhauer & Dunning 2012, Dunning et al. 2019, Fetchenhauer et al. 2020). As Bejarano et al. (2018) argue, the occurrence of the shock can indeed make the inequality more salient. Thus first-movers may want to show signs of "principled trustfulness" after being decreased their endowment. This, in turn, would imply that first-movers will trust more after experiencing the negative random shock, a behavior that is also consistent with the idea that first-movers would expect for second-movers to return relatively more after they have experienced the shock because the inequality becomes more salient.

Overall, our paper seeks to answer the following questions: how do negative random shocks affect trust and trustworthiness? And, given that the occurrence of negative random shocks can result in inequality, does the source of inequality matter? The rest of the paper is organized as follows. Section 2 describes the experimental design and procedures, including our power analysis. Section 3 presents our hypotheses. We report our findings in Section 4. Section 5 concludes with a summary and discussion.

2. Methods

2.1. Experimental design and procedures

Subjects participated in a paper-and-pen version of the trust game in Berg et al. (1995). At the beginning of each session, participants were welcomed and located in two different rooms (A and B). Once all the students were seated, they were asked to read the instructions at their own pace (see

[5] We study behavior in the trust game, but the interested reader can consult, among others, Glaeser et al (2000), Aksoy et al. (2018) or Alos-Ferrer & Farolfi (2019) for the relationship between the behavior in this game and survey-based measures of trust.

Appendix A). The experimental material on the table of each participant contained a closed envelope with their initial endowment. First-movers (in room A) were asked to decide the amount of money they wanted to send (if anything) to the second-mover they were randomly matched with. The amount sent by first-movers was tripled by the experimenter in a separate room and then given to the second-movers (in room B). After receiving the resulting amount, second-movers were asked to decide how much of the amount they received to send back (if anything) to their matched first-mover. We used Experimental Dollars (E$) in our experiment. These were converted to actual dollars at the end of each session at a rate of 1 E$ to $0.50.

In the experiment we use a 2x2 between-subject design, varying the level of endowments (Equal vs. Unequal) and the source of the inequality (Baseline vs. Shock). In the Baseline-Equal treatment both first- and second-movers started with an endowment of 21 E$. In the Baseline-Unequal treatment first-movers started with 7 E$ and the second-movers with 21 E$. In the treatments where a shock was possible both players started with an endowment of 21 E$. After they received their endowment, but before they decided, the experimenter rolled a die in front of each first-mover individually. If the number was odd the first-mover kept their total endowment (Shock-Equal). If it was even, 14 E$ were deducted from their endowment, leaving them with 7 E$ (Unequal-Shock). First-movers decided how much to send (in private) after learning the outcome of the die roll. When first-movers observed the outcome of the die roll, they were asked to record it in an “Outcome card” in front of the experimenter. This “Outcome card” was placed in the envelope that second-movers received from first-movers with the tripled amount, therefore both players knew whether or not first-movers experienced the negative shock before making their decisions. Table 1 summarizes our treatments.

	N	**First-mover Endowment**	**Second-mover Endowment**
Baseline-Equal	52	21 E$	21 E$
Baseline-Unequal	53	7 E$	21 E$
Shock-Equal	42	Starts with 21 E$ and keeps all of this because the die rolled an odd number	21 E$
Shock-Unequal	54	Starts with 21 E$ but loses 14 E$ and ends up with an endowment of 7 E$ because the die rolled an even number	21 E$

Note. N refers to the number of pairs in each treatment.

Table 1. Summary of the treatments.

A total of 402 students (with no previous experience in similar experiments) participated in our (double-blind) experiment. The experimental sessions were conducted at the Economic Science Institute (ESI) Chapman University between May 2014 and May 2018.[6] We ran 17 sessions with 24 participants (i.e., 12 pairs) in most of the sessions. Baseline sessions lasted about 45 minutes, while shock sessions lasted about an hour. The average earnings across all sessions were $18.7, including a $7 show-up fee.

2.2. Power analysis

The main question we want to answer is whether trust and trustworthiness are influenced by the occurrence of negative random shocks that cause inequality. To this end, we look at whether trust and trustworthiness are different in unequal situations where inequality is the consequence of a shock (Shock-Unequal) and compare this with cases where inequality exists from the outset (Baseline-Unequal). We rely on a power analysis to determine the sample size (Vasilaky & Brock 2020).

We use the data in Bejarano et al. (2018) to determine the effect size (Cohen's *d*). Bejarano et al. (2018) consider a setting where first and second-movers initially receive the same endowment of 21E$, but second-movers can experience a negative shock that decreases their endowment to 7E$. Bejarano et al. (2018) find that first-movers send less to second-movers when they experience a negative shock compared with the case in which second-movers initially received a lower endowment ($p = 0.035$). Their sample size in the two treatments is 87 pairs, and the effect size using G*Power 3 (Faul et al., 2007) is $d = 0.45$. As it is the first-mover the one who experiences the shock in our setting, we expect a bigger effect size of $d = 0.60$.

To obtain power of 0.80 with $\alpha = 0.05$ to detect an effect of $d = 0.60$, the projected sample size is of at least 94 pairs (i.e., 47 pairs in each treatment). As shown in Table 1, our study was carried out on 107 pairs for these treatments.

[6] We wanted to have unexperienced subjects and it was not always possible to conduct the sessions at the beginning of the academic year. This delayed the data collection.

3. Hypotheses

From a theoretical viewpoint, with participants assumed to be selfish profit-maximizers, no second-mover would return anything and, using backward induction, nor would a first-mover send anything. This prediction is in sharp contrast with the observed behavior in the experimental literature (see, among others, Berg et al. 1995, Cox 2004, Johansson-Stenman et al. 2005, Chaudhuri & Gangadharan 2007, Eckel & Wilson 2011, Johnson & Mislin 2011, Cooper & Kagel 2013, Maggioni et al. 2018, Trussell 2018, Alós-Ferrer & Farolfi 2019, Schniter et al. 2020).

One central idea in the literature of pro-social behavior concerns the possibility that subjects are inequality-averse and dislike payoff differences (Fehr & Schmidt 1999, Bolton & Ockenfels 2000). To allow for this possibility, let $e_1 \geq 0$ denote the endowment of the first-mover and $e_2 \geq 0$ denote the endowment of the second-mover. The first-mover decides the amount $X \in [0, e_1]$ to send to the second-mover, who has to choose the percentage $y \in [0, 1]$ of the available funds (=3X) to return. As a result, the final payoffs of the first and the second-mover can be written as follows:

(1) $\pi_1 = e_1 + X\,(3y - 1)$
(2) $\pi_2 = e_2 + 3X(1 - y)$

We solve the model by backward induction and assume that second-movers are inequality-averse and have the following utility function:

(3) $u_2 = \pi_2 - \alpha\,(\pi_2 - \pi_1)^2$

where π_1 and π_2 are given by equations (1) and (2) and $\alpha \geq 0$ measures the extent to which second-movers are concerned about inequality. If we solve for the optimal behavior of second-movers, we find that inequality-averse second-movers will return:

(4) $y^* = \frac{2}{3} - \frac{1}{24\,X\,\alpha_2} + \frac{e_2 - e_1}{6X}$

This, in turn, implies that inequality-averse second-movers will return more in situations where they start out with a higher endowment than first-movers; i.e., when $e_2 - e_1 > 0$. Furthermore, assuming that first-movers are strategically aware of this, this would suggest that first-movers will send a bigger proportion of their endowment when there is inequality in favor of the second-mover. This would lead to the prediction in Smith (2011) that inequality in favor of the second-mover will make the first-movers send more and the second-movers return more. On the other hand, there is also the possibility that altruistic motives explain the decision of first-movers (Cox 2004, Brülhart & Usunier 2012, Espín et al. 2016). In particular, first-movers may derive utility from the final payoff of the second-mover and their own payoffs. As a result, first-movers may send a positive amount to second-movers (e.g., to reduce any existing inequality) even if they expect to receive nothing back from second-movers. In our setting, the inequality is in favor of the second-mover; thus (altruistic) first-movers may decide to send less when their endowment is lower than the endowment of second-movers because any amount sent by first-movers in the unequal treatments will increase the existing inequality.[7] We posit our first hypothesis in its null form as follows:

Hypothesis 1: *Inequality does not affect the proportion sent by first-movers or the proportion returned by second-movers.*

We expect to reject our Hypothesis 1, that inequality does not affect the level of trust and trustworthiness. While the prediction is clear-cut for second-movers (i.e., inequality in their favor will lead to more trustworthiness), the decision of first-movers will depend upon their altruism and their strategic considerations (e.g., McCabe et al. 2003, Bohnet & Zeckhauser 2004, Ashraf et al. 2006, Kanegaretman et al. 2009, Maggioni et al. 2018 and Alós-Ferrer & Farolfi 2019). Thus, altruistic first-movers aiming to reduce the inequality will send less if their endowment is lower than that of the second-mover. However, if first-movers act strategically (and anticipate that the second-mover will be inequality-averse), first-movers are expected to send more when their endowment is lower than that of the second-mover

Our main goal is to compare behavior in unequal situations where the first-mover has a smaller endowment than the second mover conditional on whether the inequality results from a negative shock that decreased the endowment of the first-movers or whether this inequality existed from the outset. One possible way of thinking about the effect of the negative shock is to assume that first-movers use their initial endowment as a reference-point (r) (e.g., Kőszegi & Rabin 2006, 2009), and evaluate any loss in utility from this initial endowment using the function:

[7] Our definition of altruistic first-movers follow the idea in Brülhart & Usunier (2012) that they want to reduce inequality under the assumption that they will receive nothing from second-movers. There are other reasons to send money in the trust game such as efficiency motives that would predict no differences in the behavior of first-movers across treatments.

(5) $f(e_1 | r) = e_1 + \eta\, (e_1 - r)$

where $\eta \geq 0$ denotes the importance of the initial endowment as a reference point to the first-mover when it is possible that they will experience a negative shock, and $e_1 < r$. Next, we can solve the problem in equation (3) for inequality-averse second-movers who take into account the loss in the utility of first-movers. This results in the following optimal return:

(6) $y^* = \frac{2}{3} - \frac{1}{24\, X\, \alpha_2} + \frac{e_2 - f(\, e_1 | r)}{6X} = \frac{2}{3} - \frac{1}{24\, X\, \alpha_2} + \frac{e_2 - e_1}{6X} + \frac{\eta\, (r - e_1)}{6X}$

This equation highlights that the shock makes the inequality more salient. And, with greater salience, we expect a bigger effect of the inequality aversion; i.e., second-movers will return relatively more to compensate first-movers from their loss in the utility (note that $\eta\, (r - e_1) > 0$). As for the behavior of first-movers, we expect the negative shock to have a decreasing effect on the proportion sent if they are altruistic because any amount sent would increase the inequality. On the other hand, first-movers will send more after experiencing the negative random shock if they act strategically because first-movers will expect a higher return from second-movers when a shock occurs.[8] We posit our second hypothesis in its null form as follows:

Hypothesis 2: *Inequality caused by a shock makes no difference in the proportion sent by first-movers or the proportion returned by second-movers, compared with the same inequality if it existed from the outset.*

We expect to reject Hypothesis 2, that the shock does not affect the level of trust and trustworthiness. The occurrence of the negative random shock is expected to make the inequality more salient. Inequalities that result from a negative random shock will have a greater effect on behavior than inequalities that are initially given. This will result in more trustworthiness from second-movers, while the behavior of first-movers depends on whether or not they anticipate a higher return from second-movers.

It is worth noting that our model predicts no differences in the behavior of first- and second-movers in treatments with equality (Baseline-Equal and Shock-Equal). This is because the endowment of first-

[8] As we noted in the introduction, these predictions can also be related to social risk; e.g., the occurrence of the negative shock can decrease the proportion sent by first-movers who want to avoid the risk of betrayal, but first-movers may also want to send more after experiencing the shock to show signs of “principled trustfulness”.

movers (e_1) coincide with their reference point (r) in these treatments, and first and second-movers are not expected to react to shocks that did not occur.

4. Results

4.1. Summary statistics and non-parametric analysis

We follow previous literature and look at the proportion sent by first-movers and the proportion returned by second-movers to measure the levels of trust and trustworthiness (e.g., Cox 2004, Johansson-Stenman et al. 2005, Chaudhuri & Gangadharan 2007, Eckel & Wilson 2011, Johnson & Mislin 2011, Cooper & Kagel 2013, Alos-Ferrer & Farolfi 2019). Figure 1 displays the behavior of first-movers (left-hand side) and second-movers (right-hand side) in each treatment. Table 2 presents the descriptive statistics for first-movers (top panel) and second-movers (bottom panel). The distribution for the proportion sent and the proportion returned is relegated to Appendix B.

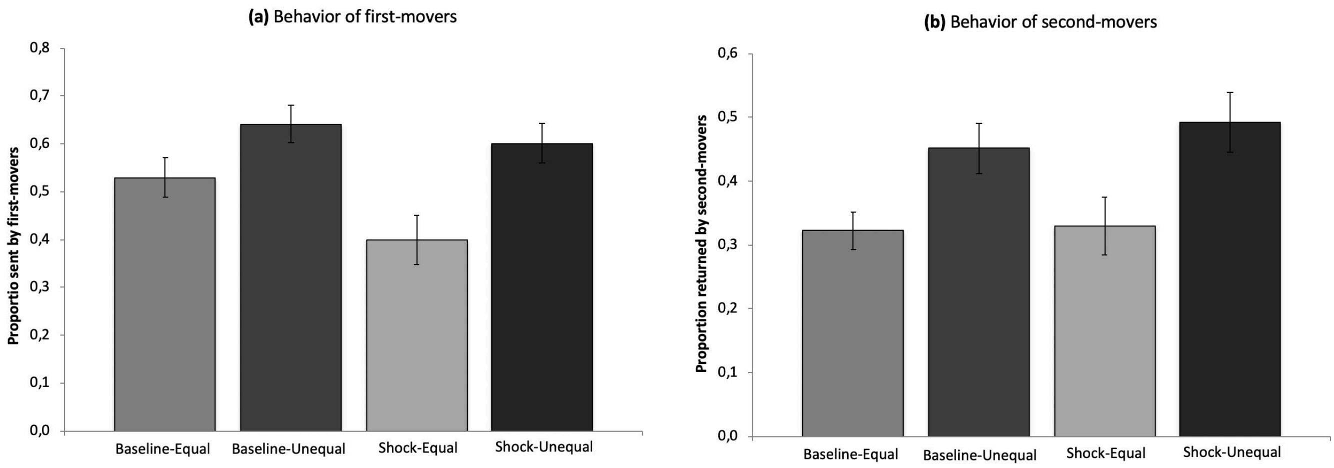

Figure 1. Behavior of first-movers and second-movers in each treatment.

	Baseline-Equal	Baseline-Unequal	Shock-Equal	Shock -Unequal
First-movers				
Proportion sent (std. dev)	0.53 (0.29)	0.64 (0.28)	0.40 (0.32)	0.60 (0.30)
Median proportion sent	0.38	0.57	0.33	0.57
Proportion sending nothing	0	0	0.09	0.02
Proportion sending everything	0.21	0.28	0.17	0.28
Number of obs.	52	53	42	54

Second-movers				
Proportion returned (std. dev)	0.32 (0.214)	0.45 (0.286)	0.33 (0.278)	0.49 (0.347)
Median proportion returned	0.33	0.38	0.31	0.50
Share returning nothing	0.11	0.09	0.10	0.09
Share returning everything	0	0.11	0.05	0.19
Number of obs.	52	53	38	53

Table 2. Summary statistics in each treatment.

Using the pooled data, we can compare the proportion sent by first-movers in the equal treatments with the proportion sent in the unequal treatments (0.47 vs. 0.62). A Mann-Whitney test suggests that the proportion that first-movers sent is significantly higher when the endowment of first-movers is relatively lower ($Z = 3.78$, $p < 0.001$).[9] First-movers are also more likely to trust fully by sending their whole endowment in the unequal treatments (see Table 2). These findings show that inequality that is disadvantageous for the first-mover results in higher trust, which suggests that first-movers do not behave altruistically (to reduce the inequality), but instead behave strategically and send more when there is inequality because they (may) expect to receive a higher return from second-movers. The behavior of second-movers appears consistent with the idea of inequality aversion, in that they return a higher proportion in the unequal treatments (0.47 vs. 0.62, Z = 3.14, $p = 0.002$).

To compare first-mover behavior across different treatments, we perform a non-parametric analysis using the Mann-Whitney test. The results are presented in Table 3.

	First-mover	Second-mover
Baseline-Equal *vs.* Baseline-Unequal	2.525 *	2.089*
Shock-Equal *vs.* Shock-Unequal	3.142**	2.196*
Baseline-Unequal *vs.* Shock-Unequal	0.846	0.637
Baseline-Equal *vs.* Shock-Equal	2.421*	0.344

Notes. We report the Z-scores for the Man-Whitney (MW). We adjust for multiple comparisons using the Holm-Bonferroni correction. The results are robust if we use the procedure in List et al. (2019). *** p < 0.001, ** p < 0.01, * p < 0.05 (for two-tailed analysis).

Table 3. Non-parametric analysis for the proportion sent by first-movers and the proportion returned by second-movers.

[9] Unless otherwise noted, the results reported in this section refer to the Mann-Whitney test. All our findings are robust when considering the rank-order test (Fligner & Pollicello 1981, Feltovich 2003) or the median test. The econometric analysis using OLS or Tobit regressions lead to the same results (see Section 4.2).

Table 3 displays the general effect of inequality in trust and trustworthiness. Furthermore, the effect is general given that the differences on the proportions sent by poorer first-movers and returned by richer second-movers are always significative for both comparisons irrespectively of the source of the inequality. The difference between the proportion sent by first-movers in the Baseline-Equal and the Baseline-Unequal is statistically significant (p = 0.024). Likewise, the difference between the proportion sent in the Shock-Equal and the Shock-Unequal treatments is also statistically significant (p = 0.004). Second-movers return more in Baseline-Unequal than Baseline-Equal (p = 0.046) and also in Shock-Unequal than Shock-Equal (p = 0.044).

Result 1: *Inequality, irrespective of its source, leads to higher levels of trust and trustworthiness. First-movers send a bigger proportion of their endowment in the unequal treatments. Second-movers return a bigger proportion in the unequal treatments.*

Next, we look at our main question, whether the effect of inequality is different when it is caused by a negative shock or when it existed from the outset. We do this by comparing the proportion sent in the Baseline-Unequal and the Shock-Unequal treatments. This difference is not statistically significant at any common significance level (p = 0.400). Similarly, the source of the inequality does not seem to matter for second-movers. When we distinguish treatments according to whether the inequality results from a shock or not, our findings are in line with those observed for first-movers: the proportion returned in the Baseline-Unequal treatment is not statistically different from the proportion returned in the Shock-Unequal treatment (p = 0.524).[10]

Result 2: *We find no evidence that the negative random shocks affect the levels of trust and trustworthiness in a different way than inequalities that exist from the outset. First-movers affected by a negative shock that decreases their endowment do not send a bigger or smaller proportion than those that started with a smaller endowment. Second-movers with a first-mover who is affected by a negative shock that decreases their endowment do not return a bigger or smaller proportion than those with a first-mover that started with a smaller endowment.*

Finally, we can also compare the behavior of first- and second-movers in different situations of equality. The model we presented in Section 3 predicts no difference in the Baseline-Equal and the Shock-Equal treatments. However, we find that first-movers send more in the Baseline-Equal than in

[10] The reported results in Table 2 may suggest that the median return is higher in the Shock-Unequal than the Baseline-Unequal treatment, but this difference is not statistically significant at any common significance level using the median test (Pearson $\chi_1^2 = 2.415$, p = 0.120).

the Shock-Equal treatment (*p* = 0.015). This difference presents an interesting result that we did not predict and suggests that those who keep their endowment intact prefer not to send it to second-movers. In the next section, we speculate on possible reasons to explain this behavior from first-movers. If we look for the effect of general uncertainty for the second-movers, by comparing the proportions returned in the Baseline-Equal and Shock-Equal treatments, we find that this difference is not statistically significant at any common significance level (*p* = 0.733); thus, the results for second-movers are in line with our theory.

4.2. Summary of econometric analysis

This section replicates our previous analyses using an econometric approach. Table 4 reports the results of two different models: a Tobit regression and Ordinary Least Squares (OLS). Specifications (1) and (2) present the analysis for the proportion sent by first-movers, while the analysis for the share of the available funds returned by the second-movers is presented in equations (3) and (4). These later regressions control for the amount that second-movers receive from first-movers. The rest of the independent variables includes a dummy variable *Unequal* for the treatments in which first and second-movers receive different endowments (i.e., Unequal = 1 for the Baseline-Unequal and the Shock-Unequal treatments), and a dummy variable *Shock* for the possibility that a shock occurs (i.e., Shock =1 in the Shock-Equal and the Shock-Unequal treatments where the shock is possible). The interaction of these dummy variables, *Unequal x Shock*, takes the value 1 for the Shock-Unequal treatment where the shock is possible, and it occurs. The robust standard errors reported in Table 4 (in parenthesis) are clustered at the session level. The results of the econometric analysis are presented at the bottom of the table (*p*-values are presented in parenthesis).

First, we look at the effect of the inequality on the behavior of first- and second-movers. We test the null hypothesis H_0: $\beta_U = 0$ to see if the inequality has an effect on the treatments where shocks are not possible (Baseline-Unequal and Baseline-Equal treatment). We reject this hypothesis for first movers at any common significance level (Tobit: *p* = 0.035, OLS: *p* = 0.050), which suggests that first-movers send proportionally more in the Baseline-Unequal, compared with the Baseline-Equal treatment. The results for second movers are also significant when using the Tobit regression (Tobit: *p* = 0.032, OLS: *p* = 0.079). As for the effect of the inequality when shocks are possible, we can test H_0: $\beta_u + \beta_I = 0$ to assess whether there is any difference in the proportion sent (returned) in the

Shock-Equal and the Shock-Unequal treatments. We reject this null hypothesis for first-movers (Tobit: *p* = 0.004, OLS: *p* = 0.009) as well as for second-movers (Tobit: *p* = 0.016, OLS: *p* = 0.013). Overall, we interpret these findings as supporting evidence in favor of our Result 1 that inequality has an effect on the behavior of first- and second-movers.

	Proportion sent		Proportion returned	
	(1) Tobit	(2) OLS	(3) Tobit	(4) OLS
Constant (β_0)	0.529***	0.529***	0.306***	0.332***
	(0.036)	(0.037)	(0.068)	(0.060)
Unequal (β_U)	0.112*	0.112*	0.149*	0.123
	(0.053)	(0.051)	(0.069)	(0.066)
Shock (= 1 if possible) (β_S)	-0.143*	-0.129	0.015	0.005
	(0.064)	(0.062)	(0.067)	(0.049)
Shock x Unequal (β_I)	0.100	0.088	0.039	0.036
	(0.089)	(0.086)	(0.102)	(0.086)
Amount received			-0.0002	-0.0003
			(0.002)	(0.001)
Log-likelihood	-51.606		-105.919	
Prob > chi^2 (*p*-value)	0.001	0.001	0.013	0.024
(Pseudo) R^2	0.145	0.079	0.058	0.065
Hypothesis testing (*p*-value)				
H_0: $\beta_U + \beta_I = 0$	8.67 (0.004)	8.82 (0.009)	5.85 (0.016)	7.70 (0.013)
H_0: $\beta_S + \beta_I = 0$	1.25 (0.266)	1.05 (0.320)	0.15 (0.699)	0.17 (0.686)
Observations	201	201	196	196

Notes. *** p < 0.001, ** p < 0.01, * p < 0.05.

Table 4. Econometric analysis for first- and second-movers behavior

We use our econometric model to test whether the inequality in the (non-shocked) unequal treatment is different from the one produced by the shock by testing H_0*:* $\beta_S + \beta_I = 0$*;* i.e., this allows us to assess whether the behavior in the Baseline-Unequal treatment is different from the behavior in the Shock-Unequal treatment. This hypothesis can be rejected at any common significance level for the first-movers (Tobit: *p* = 0.266, OLS: *p* = 0.320) as well as for second-movers (Tobit: *p* = 0.699, OLS: *p* = 0.686), thereby suggesting that negative random shocks do not affect the levels of trust and trustworthiness in a different way than inequalities that exist from the outset. In fact, we can also examine whether the difference produced by the inequality in the Baseline treatments is different from the difference produced by the inequality in the Shock treatments by looking at the estimates for the interaction term. We cannot reject the null hypothesis H_0*:* $\beta_I = 0$ for first-movers (Tobit: *p* = 0.035, OLS: *p* = 0.050) nor for second-movers (Tobit: *p* = 0.035, OLS: *p* = 0.050). Our econometric analysis therefore lends support for the hypothesis that the *source* of inequality does not matter for the behaviour of first- and second-movers (Result 2).

Finally, our econometric analysis for the first-mover provides some evidence that there may be a difference in the behavior of fist-movers who are exposed to the shock (but do not experience it) compared with the behavior of first-movers who have no possibility of experiencing the shock. In particular, the null hypothesis H_0: $\beta_S = 0$ can be rejected in the Tobit regression (*p* = 0.026) but not in the OLS regression (*p* = 0.052).

5. Discussion

This paper was motivated by the relative lack of experimental evidence regarding the effects of negative random shocks on trust and trustworthiness. While there are several studies that investigate this question in the field (see, e.g., Castillo & Carter 2011, Fleming et al. 2014, Veszteg et al. 2015, Andrabi & Das 2017, Cassar et al. 2017, Calo-Blanco et al. 2017), these papers cannot (and are not intended to) disentangle the effect of shock and the inequality it generates. We examine this question in a controlled laboratory environment, where previous literature has shown that inequalities may have an effect on behavior (see, among others, Johansson-Stenman et al. 2005, Ciriolo 2007, Lei & Vesely 2010, Xiao & Bicchieri 2010, Smith 2011, Hargreaves-Heap et al. 2013, Calabuig et al. 2016, Rodriguez-Lara 2018).

Using a version of the trust game, we find that inequality – in the form of the first-mover having a smaller endowment than the second-mover – leads to the first-mover sending more and the second-mover returning more. We find that inequality in favor of the second-mover results in an increase in both trust and trustworthiness. These findings lend support for the hypotheses that second-movers are inequality-averse and first-movers behave strategically, in line with Smith (2011). We also find that the source of the inequality does not matter for the behavior of first and second-movers. The occurrence of a random shock influences trust and trustworthiness, but the effect may not be different from the effect of the inequality it generates. This is a crucial result that indicates that we need to be cautious when interpreting the effects that negative random shocks (e.g., natural disasters) have on behavior.

Our results complement a recent paper by Bejarano et al. (2018), who examine how negative random shocks affect trust and trustworthiness in a setting where second-movers may experience a shock that decreases their endowment. They find that the inequality decreases the trustworthiness (second-movers return less) but that this effect does not depend on the cause of the inequality. On the other hand, with regards to trust they observe that first-movers send less but only when the inequality is caused by the shock. So, in contrast to the current study, where the cause of the inequality does not appear to play a role, in Bejarano et al. (2018) it does. Comparing the two studies suggests that the nature of the inequality – where it is caused by a shock or not – plays a role when the shock happens to someone else and not when the shock happens to the decision-maker themselves. We believe that a fruitful direction of future research would be to look at the attitudes and expectations of both a decision-maker who is not personally affected by the shock and a decision-maker who is.

It may be worth investigating the effect that negative random shocks have in other domains as well. For example, some papers look at the effects of natural disasters on prosocial behavior (Castillo & Carter 2011, Rao et al. 2011, Calo-Blanco et al. 2017). In the light of the current results, it seems important to investigate how the occurrence of negative random shocks (or the mere possibility that they occur) influences trusting behavior once we account for the possibility that these shocks may have effects on inequality and influence pro-social behavior. In this regard, it may be worth using the design in Cox (2004) where players are confronted with both the dictator and the trust game to tease apart the effect that inequalities and random negative shocks have on altruism and trusting behavior.

Our result that first-movers who experienced the die roll but did not experience a negative shock showed less trust than first-movers in some of the other treatments was unexpected, and we believe that this finding deserves further investigation. One possibility is that subjects who observe the die roll think that there may be “another surprise” in the experiment and prefer to keep their endowment. We believe that our design minimizes this possibility because subjects receive the instructions for the whole experiment, and it is common knowledge that the die will be rolled only once. We conjecture that maybe first-movers who did not experience the negative random shock may be perceived as lucky and that second-movers will be less likely to reciprocate them if there is equality, compared with second-movers who were initially given the same endowment as first-movers. If *lucky* first-movers who do not experience the negative shock expect to receive less from second-movers, they will send less as a result. In this regard, we share the view in Frank (2016) that external chance events do not always refer to negative consequences, but positive random events (or luck) also matter for economic success. Hence, another avenue for future research would be to empirically assess how positive random shocks shape behavior in the trust game when these positive shocks can affect the level of inequality. Bejarano et al. (2021) is a paper in that direction.

Finally, we did not collect demographic information of the participants of the experiment, which can be seen as a limitation of our study. There is a line of research that examines gender differences in the trust game, and it generally finds that men trust more than women, but also that they are less trustworthy (see, among others, Croson & Buchan 1999, Chaudhuri & Gangadharan 2003, 2007 Buchan et al. 2008, Eckel & Grossman 2008, Slonim & Guillen 2010, Eckel & Wilson 2011, Chaudhuri et al. 2013, Van Den Akker et al. 2020). In our trust games, we vary the initial endowment of the first-movers across treatments, and there is evidence that women dislike inequality more than men do, which could affect their behavior, for instance, in dictator games (Eckel & Grossman 1998, 2008, Miller & Ubeda 2011). We also vary the source of the inequality in our game, and Croson and Gneezy (2009) argue that men and women may react differently to the context. As a result, it may be worth investigating whether men and women react differently to the occurrence of the negative random shock.

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