Fairness and Cheating

Daniel Houser, Stefan Vetter, and Joachim Winter

January 2011

Discussion Paper

Interdisciplinary Center for Economic Science
4400 University Drive, MSN 1B2, Fairfax, VA 22030
Tel: +1-703-993-4850 Fax: +1-703-993-4851
ICES Website: http://ices.gmu.edu
ICES RePEc Archive Online at: http://edirc.repec.org/data/icgmuus.html

Fairness and Cheating

Daniel Houser
George Mason University
dhouser@gmu.edu

Stefan Vetter
University of Munich
stefan.vetter@lrz.uni-muenchen.de

Joachim Winter
University of Munich
winter@lmu.de

January 2011

Abstract: We present evidence from a laboratory experiment showing that individuals who believe they were treated unfairly in an interaction with another person are more likely to cheat in a subsequent unrelated game. Specifically, subjects first participated in a dictator game. They then flipped a coin in private and reported the outcome. Subjects could increase their total payoff by cheating, i.e., lying about the outcome of the coin toss. We found that subjects were more likely to cheat in reporting the outcome of the coin flip when: 1) they received either nothing or a very small transfer from the dictator; and 2) they claimed to have been treated unfairly.

Keywords: cheating; fairness; experimental design

JEL classification: C91; D03; D63;

Acknowledgements: We are grateful to Rachel Croson, Armin Falk, Urs Fischbacher, Uri Gneezy, Li Hao, Dirk Hofmann, Martin Kocher, David Laibson, Sandra Ludwig, Klaus Schmidt, Rupert Sausgruber, Daniel Schunk, Sebastian Strasser, Christian Traxler and Erte Xiao, as well as participants of various conferences for comments and suggestions. Financial support was provided by the Deutsche Forschungsgemeinschaft via SFB/TR 15 and MELESSA. For providing laboratory resources we kindly thank MELESSA of the University of Munich. Valuable research assistance by Benedikt Siegler and student assistants of MELESSA is gratefully acknowledged.

1. Introduction

Interestingly, not all people who can improve their situation by lying will actually do so. Indeed, the rapidly growing literature on cheating (e.g., Sutter, 2009; Gneezy, 2005) reveals a robust finding that a substantial proportion of people prefer not to cheat. This preference for honesty endures even in situations when cheating cannot be detected by the experimenter (Fischbacher and Heusi, 2008). We focus on perceptions of fairness as a possible explanation for this behavior.

We ask whether individuals who feel they have been treated fairly in an interaction with others are less likely to subsequently cheat than those who believe they have been treated unfairly. This question is motivated by empirical evidence suggesting that fairness perceptions can affect honesty. Greenberg (1990), for example, showed that when employees were confronted with a pay cut, theft was significantly higher among the employees who were most likely to perceive this measure as unfair. While employee theft involves reciprocity, our goal is to investigate this link in a setting where reciprocity and other confounding motives can be controlled. This paper discusses the laboratory experiments we designed to address this issue and the results we obtained.

In our experiment, cheating occurs when one misreports the outcome of a coin flip to receive a greater payoff. The self-reported outcome of a random event has been used an indicator for cheating in both psychological and economics experiments (e.g., by Batson et al. (1997), in a psychological experiment, and more recently, by Fischbacher and Heusi (2008), as well as Bucciol and Piovesan (2009), in the economics context). While Fischbacher and Heusi studied the outcome of a die roll, Batson et al. and Bucciol and Piovesan also used a coin flip. Our study adds to this experimental device a first stage--the dictator game--to manipulate the objective experience of unequal treatment and perceptions of fairness. We further extend existing studies by proposing a simple, nonparametric estimator of the fraction of cheaters in the underlying population.

In our "fairness" treatment, we investigate whether the amount subjects receive in a dictator game affects the probability that they will cheat in a subsequent task. We consider both an objective measure of fairness (the amount a subject has received) and a subjective measure (the receiver's assessment of the proposer's transfer elicited after the dictator game). To ensure "unfair" dictator decisions are salient, we ask receivers for their fairness assessment.

In order to isolate fairness as an explanation, we implement a “no intentions” treatment where receiver earnings are determined by a random mechanism rather than an intentional dictator decision. Additionally, to keep perceptions of unfairness as low as possible, we do not ask subjects for their fairness opinion. This treatment allows us to assess the importance of other possible cheating motives, such as income-targeting or reducing peer inequality.

We found that in the “fairness” treatment, 74.5% of our subjects reported the better coin flip outcome, which is highly significantly different from the expected outcome of 50%. Assuming that subjects with the better outcome reported honestly, this suggests that 49% of those who flipped the inferior outcome cheated. What we observe is that cheating rates were drastically higher among receivers who earned nothing or who reported feeling like they were treated unfairly. In contrast, we do not observe a significant difference in cheating rates across earnings in the “no intentions” treatment, where earnings were determined randomly. Our results strongly support the idea that experiencing unfair treatment does indeed induce subjects to cheat.

The remainder of this paper is organized as follows. Section 2 reviews related literature. Section 3 describes the experimental design of the “fairness” treatment, and Section 4 presents the results. Section 5 reports design and results for the “no intentions” treatment. Section 6 concludes with a discussion of our findings.

2. Related literature

In economics, cheating has been studied in the context of cheap-talk games (e.g., Sutter (2009); Charness and Dufwenberg (2006); Gneezy (2005)), where subjects send messages that can be used to deceive their counterparts. Experimental evidence on unobserved cheating has only recently begun to accumulate. In the experimental tournament of Freeman and Gelber (2010), subjects cheated by misreporting the number of correctly solved mazes. The misreporting varied according to monetary incentives. Bucchiol and Piovesan (2009) conducted an experiment in which children tossed a coin in private and reported the result, knowing that they would receive a reward only if they reported one of the two outcomes. 86% of the children reported the profitable outcome, suggesting a substantial proportion of them cheated. In a field study, Pruckner and Sausgruber (2008) observed that 2/3 of newspaper readers took advantage of an opportunity to take a newspaper without paying. Moreover, 90 percent of those who did pay actually paid less than the full price. This sort of “incomplete cheating” also occurred in an experiment conducted by Fischbacher and Heusi (2008), wherein subjects reported the result of a private die roll to determine their payoff. Fischbacher and Heusi found that subjects shaded the outcome of the roll favorably, but did not take the maximum earnings advantage offered by the lying opportunity. Note that a possible explanation for incomplete cheating is an individual's desire to preserve a favorable self-concept (Mazar et al., 2008).

Researchers have also become increasingly interested in the cognitive and neuronal processes involved in (dis)honest decision-making. Using functional magnetic resonance imaging, Greene and Paxton (2009) showed that honest individuals do not exhibit significantly more activity in brain regions associated with response conflict and cognitive control when foregoing an opportunity for dishonest gain. They concluded that individuals who made honest decisions were not, for the most part, actively resisting the temptation to cheat, but were simply not tempted. Wang et al. (2010) used video-based eye tracking to infer the individual degree of level-k reasoning from a sender's lookup pattern of payoffs for alternative choices presented on a screen, and showed that this information could be profitably exploited by receivers.

To the best of our knowledge, the only paper to examine how perceived unfairness undermines honesty is Greenberg (1990), which reported a field experiment in which a company subjected its workers to a temporary pay-cut due to the loss of a large contract. The experimental variation was the way in which the company communicated this measure across plants. Workers at one production site perceived the pay-cut to be unfair, while at the other site it was carefully explained so as not to evoke this feeling. Greenberg showed that the workers in the "unfair" condition responded with a substantial increase in employee theft that was not observed in the "fair" condition. This finding is consistent with Fehr et al. (1993) who showed in a laboratory experiment that the degree of co-operation of "workers" declined when they perceived the "employer's" wage offers as unfair. While cheating in Greenberg's experiment occurred at the expense of the party responsible for the "unfair" decision, we investigate whether the perception of unfair treatment erodes honesty even when there is no scope for reciprocity.

3. Design of the experiment

The experiment was conducted in MELESSA, the experimental laboratory at the University of Munich. Participants were recruited from the lab's subject database, which is maintained using software written by Greiner (2004). A total of 502 individuals participated in one of 21 sessions.[1]

[1] 20 sessions comprised of 24 subjects, one session of only 22 subjects.

Most subjects were undergraduates from the University of Munich. Average earnings were €10.5, including a €4-show-up fee, for an average duration of around 35 minutes. The experiment was implemented in paper and pencil format and consisted of two stages: a decision situation (the dictator game) and the coin flip game. Subjects were not aware of the second stage until the dictator game was resolved. While the dictator game took around 25 to 30 minutes, the coin flip stage lasted no more than 5 minutes.

The dictator game was conducted using the strategy method. At first, subjects did not know whether they would be in the role of proposer or receiver. We asked them to decide how they would split an initial endowment of €8 between themselves and another person in the room if it turned out that they were in the role of the proposer. The intended transfer had to be marked on the decision sheet and could range from €0 to €8 in increments of €2. Subjects knew that after they made their decision, half of them would be randomly selected as proposers, and their choice would be implemented. The remaining half would be passive receivers, whose earnings would be determined solely by the decision of the matched proposer. A short quiz ensured that all subjects understood the rules of the dictator game, as well as the experimental procedure.

The randomization of roles and pairs was implemented by means of 24 identical envelopes. Each envelope contained a tag with a code consisting of a letter (from A through L) and a number (either 1 or 2). Thus, a tag might read A1 or A2, B1 or B2, C1 or C2, and so on. The number indicated the role in the game (1 for the proposer, 2 for the receiver) and the letter matched each participant with another person in the room. Those with an identical letter formed a pair, with Player 1 as proposer and Player 2 as receiver. After the randomization procedure, the sheets were collected and matched with the decision sheet of the respective counterpart, and the associated payoffs were recorded. Then subjects were informed of their earnings.

Not computerizing the experiment allowed us to provide receivers with their matched counterpart’s decision sheet. As a result, receivers could read directly how much the proposer had transferred. They could also see the proposer’s tag number, which was written on the sheet as well. This procedure guaranteed full anonymity while allowing receivers to verify that the matching procedure was performed correctly and not manipulated by the experimenter.

Receivers were also given a sheet on which they had to indicate, using a four-point scale, how fair they considered the behavior of the other person. They could rate the matched proposer as “fair,” “rather fair,” “rather unfair,” or “unfair.” In deliberately excluding a neutral category, we sought to avoid having subjects choose this category without further reflection. Proposers received a confirmation that their decision was actually payoff relevant, and an additional blank sheet to ensure that every subject received the same number of sheets, which made it impossible to figure out the roles of other subjects in the lab by counting the number of sheets.

After the dictator game was resolved, subjects were informed that they would get a chance to increase their earnings before the session closed. While the experimenter explained the rules of the coin flip game, an assistant provided each participant with a €1 coin. Subjects were told that they would have to flip the coin and that their payoff would be determined by the upper side of the coin. If the coin landed on heads, their payoff would be €1 (i.e., they could keep the coin); if the coin landed on tails, their payoff would be €3. Then subjects were instructed to flip the coin and to report the outcome by checking the appropriate box on the sheet. Finally, the earnings from the coin flip and the dictator game were paid out and the experiment concluded.

We did not want to invite people to cheat. Indeed, we never mentioned the possibility. We also did not remind them to be honest. Nevertheless, the environment was quite simple, and it likely occurred to most subjects that cheating was a riskless way to earn two additional Euros.

It is important to emphasize that cheating was understood by the subjects to be riskless. Indeed, all seats in the laboratory were separated and view-protected; it was clear that cheating could not be detected. Furthermore, we explicitly instructed subjects to flip their coin in such a way that no one else could observe the outcome.

4. Results

4.1 Dictator Game and Reported Fairness Perceptions

We begin with the dictator game. Table 1 shows the distribution of those transfers that were actually implemented after random assignment of roles (the allocation decisions of assigned proposers) and the hypothetical transfers of assigned receivers (recall that we used the strategy method). A chi-2 test confirms that both distributions are not significantly different (p-value= 0.942). On average, €1.90 were transferred, meaning that proposers retained about 76% for themselves, which is within the usual range of outcomes in dictator games (see Camerer, 2003, Chapter 2).

We use the amount transferred as an indicator of how fair the receiver was treated. Evidence from a large number of ultimatum games presented in Camerer (2003) demonstrates that on average, one-third of the receivers reject offers between 20% and 30% of the endowment, indicating that a substantial proportion of subjects perceives such a division as unfair. Camerer also shows that the rejection rate of offers between 0% and 10% is usually far above 50%, and in many experiments close or equal to 100%. We therefore interpret proposer decisions with a transfer below an equal split – €0 or €2 – as potentially unfair.

Table 2 shows the distribution of receivers' subjective fairness ratings. Almost 44% of receivers perceived that they had been treated "fairly." The response options "rather fair," "rather unfair," and "unfair" were all chosen by less than one fifth of our sample. In Table 3, we combine the responses "fair" and "rather fair" (62.6%), as well as "unfair" and "rather unfair" (37.5%) in a cross-tabulation with the amount received (also combined into three categories of about equal size). There is a statistically significant association (χ^2=97.01, p-value<0.001) between the two variables: subjects who received a larger amount were more likely to say that they had been treated (rather) fairly. In no case was an equal split rated as "unfair" or "rather unfair."[2]

4.2 Reported Coin Flip Outcomes

Next, we turn to the outcome of the coin flip. 374 of the 502 subjects (74.5%) reported the high-payoff outcome (tails), which is significantly different from the outcome of a fair coin (p-value<0.001). This finding shows that cheating occurred on a broad basis. The proportion of tails is higher among receivers (76.49%) than among dictators (72.51%). Among receivers, those who earned a positive amount in the dictator game were significantly less likely to report tails than those receivers who earned nothing (p-value = 0.088). However, the proportion of tails reported is a highly conservative estimate of cheating in the population since the majority (asymptotically 50%) obtained this result without resorting to cheating.

Therefore, we can go one step further and nonparametrically estimate the fraction of cheaters in the population from which our sample of subjects was drawn. The identification problem can be described by a simple mixture model with two types: cheaters and non-cheaters. With fair coins and a large sample, half of the subjects should have flipped tails, and the other half heads. The fifty percent of subjects who flipped tails (the high-payoff outcome) had no monetary incentive to lie; thus, it seems reasonable to assume that they reported the true

[2] Interestingly, Table 3 also reveals that 28.13% of respondents regard a transfer of zero as (rather) fair. However, this claim was only made by respondents who would have acted similarly if they had been a proposer; 25 out of 27 would have transferred €0 and the remaining 2 persons would have transferred only €2. A possible interpretation is that their fairness rating reflects their desire to ex-post justify their own selfish behavior rather than their true opinion about the proposer's action.

outcome.[3] However, among the other half who flipped heads (the low-payoff outcome), some might have lied.

From the observed sample proportion of tails, we can estimate the implied proportion of cheaters in the population nonparametrically. The mixture model assumes (quite naturally) that the population from which the subjects were drawn consists of two types: cheaters and honest subjects. We can characterize the observed proportion of tails *p* in the population by

$$p = \gamma \cdot 1 + (1 - \gamma) \cdot 0.5 = 0.5(1 + \gamma).$$

A fraction γ of the members of the population cheats and reports tails with a probability of 1, while honest members of the population report tails only with probability 0.5. We will call γ the cheating rate. After solving for γ, we can use the sample analog of *p* (i.e., the observed fraction of tails) to obtain a consistent estimate of the population cheating rate γ as 2·(74.5% – 50%) = 49%. By the same logic, cheating rates can be computed for subsamples of our subjects. Figure 1 illustrates that the proportion of tails in a (sub)population maps directly into the implied fraction of cheaters via a linear function.

Table 4 contains information about the proportion of subjects who reported tails, and a comparison of cheating rates by experimental outcomes and demographic background variables. The proportion of tails is significantly different from 50% for all sub-groups.

The implied cheating rate is higher among receivers than among proposers (53% vs. 45%). Interestingly, this difference is almost entirely due to the high cheating rate of those receivers who earned nothing. When comparing only proposers and receivers with a positive payoff (at least €2), the fraction of cheaters is almost identical – even though proposers earned roughly twice as much as receivers with non-zero earnings (€6.12 vs. €3.08). The fact that the cheating rates are similar, despite a huge earnings gap, seems to weigh against an "income-targeting" explanation for cheating. If subjects have an individual income target in mind when they come to the experiment, and if those who have not yet reached their income target have a higher propensity to cheat, groups with different income levels should also exhibit markedly different cheating rates.

The self-reported fairness rating helps to explain cheating among receivers. The cheating rate of those who rated their counterpart as "fair" or "rather fair" is 46.5%, compared to 64%

[3] We cannot, in principle, exclude the possibility that some subjects reported the bad outcome despite obtaining the good outcome, perhaps to make certain that nobody suspected them of cheating, or because they exhibited altruism towards the experimenter. However, we believe it is reasonable to assume, in the context of our laboratory experiment, that such behavior did not occur.

among those who perceived to have been treated “unfairly” or “rather unfairly” (p-value=0.0078).

Cheating seems to be correlated with distributional preferences in the sense that subjects who revealed stronger other-regarding preferences in the dictator game were more likely to be honest. In particular, proposers who shared half of their endowment with the receiver cheated significantly less than their more selfish peers (cheating rates are 37.5% vs. 48.5%). The same finding emerges when considering the hypothetical transfers of receivers. Those who would have implemented an equal split were significantly more honest than those who would have retained a larger share for themselves.

We also find that men cheated more often than women (p-value = 0.000), with cheating rates of 60% vs. 40%. This result is in line with Dreber and Johannesson (2008) who also observed that men are more dishonest when they can employ a lie to their own advantage.[4] Moreover, experienced subjects (defined as having participated in more than one previous experiment in the MELESSA lab) were significantly less honest than subjects who participated in no more than one previous experiment (61% vs. 39%). Cheating rates by subjects’ major field of studies are similar and we do not find significant differences, with the exception that students in mathematical fields tend to be slightly more dishonest. However, sample sizes become relatively small when testing for differences across study fields.

5. “No Intentions” Treatment

In this section, we present a treatment designed to disentangle motives for cheating. Unfair dictator behavior may not be the only reason why receivers with a low payoff perceive it as legitimate to seek compensation via cheating. Our design creates two types of inequality – hierarchical inequality (between a dictator-receiver pair) and peer inequality (among receivers). Hierarchical inequality is created by the intentional decision of the dictators. In contrast, peer inequality is the recognition by receivers that the decisions of different dictators are likely to induce inequality among receivers. While a receiver cannot observe the earnings distribution among his peers, he will likely believe that his earnings are higher than average if the dictator has implemented an equal split, but lower than average if the dictator has transferred nothing to him. Therefore, it might be argued that subjects not only cheated because they were treated unfairly by

[4] In contrast, evidence from psychology (De Paolo et al. (1996)) suggests that women lie more often than men when the lie is intended to flatter or benefit the other person and is not linked to harmful consequences (a “white lie”).

the dictator or fell short of their income target, but also because they believed that some (or most) of their peers were likely doing better.

5.1 Experimental Design

We investigate alternative motives for cheating by implementing a treatment that preserves earnings inequality across receivers but where unfair dictator intentions are absent. To do this while preserving the timing and procedures in the lab, we replaced the dictator game with a neutral task of the same length. This avoided distortion due to a correlation between the cheating propensity of subjects and the time spent in the lab. The task consisted of answering a questionnaire which was unrelated to issues about fairness or cheating.[5] As with the dictator game, the questionnaire was completed using paper-and-pencil. After completing the alternative task, subjects were informed of their earnings. However, they were also informed that others earned either more, less or the same as they did. By implementing this earning inequality via a random mechanism, we captured the dictator game's peer-inequality among receivers, while avoiding acts that might be viewed as particularly fair or unfair. Likewise, we avoided asking subjects to report their feelings regarding the fairness of the random earnings allocation. The reason is that doing this could have introduced an intentions confound by evoking perceptions of unfairness in relation to the experimenter. Finally, it is worthwhile to note that an attractive feature of this "no-intentions" design is that it also provides evidence on an income-targeting explanation for differences in cheating rates.

We implemented these sessions in the following way. When subjects entered the lab, they followed the usual procedure of drawing a seat number. Although they did not know it, this procedure also determined their earnings for the experiment. On their seat they found a sealed envelope which had been prepared before the experiment and randomly placed. Subjects were instructed not to open the envelope until told to do so. Each envelope contained a note stating how much a subject would earn for participating in the experiment. After all subjects finished the questionnaire, they were told that they would receive either 4, 6, or 8 Euros. We chose the distribution of payoffs to reflect the distribution of the most frequent receiver earnings in each session of the "no intentions" treatment.[6] We then instructed subjects to open their envelope to

[5] The questionnaire contained hypothetical choice questions about housing demand and mobile phone use, as well as the same demographic background questions elicited in the dictator game.
[6] We did not match earnings above the equal split in the dictator game due to the low number of observations with 6 or 8 Euros in the dictator game.

find out how much they had earned and proceeded with the coin flip game just as in the "fairness" treatment. Total earnings consisted of the amount specified in the note plus the payoff associated with the coin flip.

5.2 Results

We ran 10 sessions of this condition with a total of 238 subjects. Results are summarized in Table 5.[7] The aggregate cheating rate is 42.86%, which is slightly, and insignificantly, lower than the overall cheating rate in the "fairness" treatment (49.00%). It is comparable to the cheating rate among proposers, which is 45.02%, but significantly lower than the cheating rate across receivers (52.98%). This is consistent with our initial hypothesis that cheating is higher among subjects who feel treated unfairly.

Unlike the fairness treatment, implied cheating rates are not monotonically related to amounts earned. In particular, the implied cheating rate among those with €4 earnings (41.30%) is lower than among those who earn €6 (52.12%), while the implied cheating rate among €8 earners is 36.00%. Moreover, cheating rates are statistically identical between those who earned the minimum amount and those who earned more (see Figure 2). This result is evidence against both peer inequality and income-targeting as motives for cheating. Our data suggest, rather, that experiencing unfair treatment leaves one more likely to cheat on a subsequent decision.

The same conclusion emerges from a regression framework. Table 6 reports average marginal effects for a probit regression where the dependent variable is 1 if a subject reports tails. Thus, positive marginal effects correspond to an increased likelihood of cheating. Column 1 contains results for receivers in the "fairness treatment" and shows that the probability of reporting tails is significantly higher for those subjects who received zero in the dictator game vs. those who received a positive amount. Male subjects and those with more lab experience were also significantly more likely to report tails, while none of the dummies for major subject was significant.

Column 2 of Table 6 reports the results of the same specification for the "no intentions" treatment. If income-targeting or peer inequality are to explain the variation in cheating rates across earnings, the dummy for earning the minimum amount should continue to be a significant predictor of reporting tails. However, column 2 shows that this is not the case; the marginal effect

[7] Due to the smaller sample size in the "no intentions" treatment, some comparisons of cheating rates, e.g., across study major, suffer from a low number of subjects per category.

is insignificant and very close to zero. Being male is again positively associated with reporting tails, but not significantly so, and the strong experience effect from the fairness treatment vanishes completely.

Since the proportion of inexperienced subjects was much lower in the "no intentions" treatment, we wanted to ensure that differences in sample composition were not driving our main result. Therefore, as a robustness check, we repeated the analysis using only subjects who had not previously participated in more than seven experiments (the number corresponding to the most experienced subject in the fairness treatment (Column 3)). We further estimated a weighted regression where we weighted lab experience so that it corresponded to the distribution in the fairness treatment (Column 4). Neither of these robustness checks changed our result that randomly assigned earnings are uncorrelated with the decision to report tails in the "no intentions" treatment.

6. Conclusion

Substantial recent progress has been made in understanding the importance of lying and cheating for economic decision making (see, e.g., Gneezy (2005), Fischbacher and Heusi (2008), Mazar et al. (2008), Sutter (2009), Wang et al. (2010)). In this paper we reported data from an experiment designed to investigate how unfair treatment in a dictator game affects individuals' propensities to cheat in a subsequent task. We used two approaches to measure fairness in the dictator game: 1) the amount transferred; and 2) the receiver's subjective fairness perception of the amount received. Our analysis shows that both measures significantly predict cheating. We reported a 'no-intentions" treatment that rules out natural alternative explanations for our data, including income-targeting or a desire to reduce inequality in relation to peers.

Our data argue that the perception of being treated unfairly by another person significantly increases an individual's propensity to cheat. One way to interpret our findings is that individuals might be more likely to violate a social norm (the no-stealing norm) when they perceive that others do not adhere to a different, unrelated norm (the fairness norm). This interpretation is consistent with Keizer et al. (2009) who documented such a "cross-norm inhibition effect" in a series of field experiments. They showed that an envelope hanging out of a mailbox with a €5 note attached was stolen twice as often when the area around the mailbox was covered with graffiti than when the area was clean. Remarkably, general disorder seems to induce a violation of the no-stealing norm, which is not only widely accepted but even legally protected.

This is an extension of the well-known Broken Window Theory of Wilson and Kelling (1982), which suggests that when individuals observe frequent violations of a social norm, the probability that they themselves conform to this norm declines.

The causal link between fairness and cheating suggested in this paper might be important for understanding decisions such as whether to evade taxes. A tax system may be perceived as unjust if tax rates are excessively high or if it contains loopholes which allow certain segments of the population to substantially reduce their tax burden. An experimental study by Spicer and Becker (1980) showed that in a situation that was specifically framed in a taxation context, subjects indeed tried to evade taxes more often when they were exposed to higher than average tax rates. Our study suggests that this connection may be generalized to other sources of unfairness.

Methodologically, our experimental design creates an environment that allows us to study how interaction with others affects individuals’ propensity to cheat. The limitation, however, is that individual cheating cannot be observed. Thus, inferences must be based on aggregate statistics that characterize differences between observed and predicted distributions of self-reported outcomes of a random event. This approach requires large sample sizes to find significant effects. Nevertheless, we did find significant effects, namely that subjects who perceive they have been treated unfairly by their respective dictators cheat more often in a subsequent coin flip game.

References

Batson, D. C., D. Kobrynowicz, J.L. Dinnerstein, H.C. Kampf, and A.D.Wilson (1997): "In a Very Different Voice: Unmasking Moral Hypocrisy." *Journal of Personality and Social Psychology*, 72(6), 1335-1348.

Bucciol, A., and M. Piovesan, (2009): "Luck or Cheating? A Field Experiment on Honesty with Children." mimeo.

Camerer, C. (2003): *Behavioral Game Theory: Experiments in Strategic Interaction*. Princeton University Press.

Charness, G., and M. Dufwenberg (2006): "Promises and Partnership." *Econometrica*, 74(6), 1579-1601.

De Paolo, B. M., D. A. Kashy, S. E. Kirkendol, M. M. Wyer, J. A. Epstein (1996): "Lying in everyday life.“ *Journal of Personality and Social Psychology*, 70, 979-995.

Dreber, A. and M. Johannesson (2008): "Gender Differences in Deception." *Economics Letters*, 99, 197-199.

Fehr, E., G. Kirchsteiger, and A. Riedl (1993): "Does Fairness Prevent Market Clearing? An Experimental Investigation." *The Quarterly Journal of Economics*, 108(2), 437-459.

Fischbacher, U., and F. Heusi (2008): "Lies in Disguise – An experimental study on cheating.“ Thurgau Institute of Economics Working Paper.

Freeman, R., and A. Gelber (2010): "Prize Structure and Information in Tournaments: Experimental Evidence." *American Economic Journal: Applied Economics*, 2(1), 149-164.

Gneezy, U. (2005): "Deception: The Role of Consequences." *American Economic Review*, 95(1): 384-394.

Greiner, B. (2004): "An Online Recruitment System for Economic Experiments." In K. Kremer and V. Macho, eds., *Forschung und wissenschaftliches Rechnen*. Göttingen: Gesellschaft für Wissenschaftliche Datenverarbeitung, pp. 79–93.

Greenberg, J. (1990): "Employee Theft as a Reaction to Underpayment Inequity: The Hidden Cost of Pay Cuts." *Journal of Applied Psychology*, 75(5), 561-568.

Greene, J. D., and J. M. Paxton (2009): "Patterns of neural activity associated with honest and dishonest moral decisions." *Proceedings of the National Academy of Sciences*, 106(30), 12506-12511.

Hoffman, E., K. McCabe, K. Shachat, V. Smith (1994): "Property Rights, and Anonymity in Bargaining Games." *Games and Economic Behaviour*, 7, 346-380.

Keizer, K., S. Lindenberg and L. Steg (2009): "The Spreading of Disorder." *Science*, 322, 1681-1685.

Mazar, N., O. Amir, and D. Ariely (2008): "The Dishonesty of Honest People: A Theory of Self-Concept Maintenance." *Journal of Marketing Research*, 45(6), 633-644.

Pruckner, G., and R. Sausgruber (2008): "Honesty on the Streets: A Natural Field Experiment on Newspaper Purchasing." Mimeo.

Spicer M.W. and L.A. Becker (1980): "Fiscal inequity and tax evasion: An experimental approach." *National Tax Journal*, 33(2), 171-175.

Sutter, M. (2009): "Deception through telling the truth?! Experimental evidence from individuals and teams, *Economic Journal*, 119, 47-60.

Wang, J. T., M. Spezio, and C. F. Camerer (2010): "Pinocchio's Pupil: Using Eyetracking and Pupil Dilation to Understand Truth Telling and Deception in Sender-Receiver Games." *American Economic Review*, 100(3), 984-1007.

Wilson, J.Q., and G.L. Kelling (1982): Broken Windows, *The Atlantic Monthly*, March, 29-38.

Tables and Figures

Table 1: Hypothetical and actual transfers in the dictator game

	Proposers: actual transfers		Receivers: hypothetical transfers	
Amount	Frequency	Percentage	Frequency	Percentage
0	96	38.25	122	48.61
2	75	29.88	53	21.12
4	77	30.68	68	27.09
6	2	0.80	2	0.80
8	1	0.40	6	2.39
Total	251	100.00	251	100.00

Table 2: Subjective perception of the fairness of transfers made (receivers)

Perceived Fairness	Frequency	Percentage
Rather fair	110	43.82
Fair	47	18.73
Unfair	45	17.93
Rather Unfair	49	19.52
Total	251	100.00

Table 3: Association between transfer received and subjective fairness rating (receivers)

Perceived Fairness	Amount received			Total
	0	2	≥ 4	
(Rather) Unfair	69 (71.88%)	25 (33.33%)	0 (0.00%)	94 (37.45%)
(Rather) Fair	27 (28.13%)	50 (66.67%)	80 (100.00%)	157 (62.55%)
Total	96	75	80	251 (100.00)

Table 4: Comparison of cheating rates

variable	values	N	% tails	implied % of cheaters	p-value from test for equality of proportions
All subjects		502	74.50	49.00	
Role	Proposer Receiver	251 251	72.51 76.49	45.02 52.98	0.0745*
Earnings (Proposers)	≤ 4 6 8	80 75 96	68.75 74.67 73.96	37.50 49.34 47.92	≤4 vs. 6: 0.1370 6 vs. 8: 0.9400 ≤4 vs. >4: 0.1014
Earnings (Receivers)	0 2 ≥ 4	96 75 80	82.29 70.67 75.00	64.58 41.34 50.00	0 vs. 2: 0.0025*** 2 vs. ≥4: 0.2795 0 vs. >0: 0.0038***
Hypothetical Transfer (Receivers)	0 2 ≥ 4	122 53 76	78.69 79.25 71.05	57.38 58.50 42.10	0 vs. 2: 0.8904 2 vs. ≥4: 0.0668* 0 vs. >0: 0.1755
Fairness rating	(rather) fair (rather) unfair	157 94	73.25 81.91	46.50 63.82	0.0078***
Gender	Male Female	215 287	80.47 70.03	60.94 40.06	0.0000***
Lab experience	0 or 1 >1	279 223	69.53 80.72	39.06 61.44	0.0000***
Major field of study	Economics Business Law Medicine Education Maths etc. other	35 77 34 56 62 62 176	68.57 75.32 76.47 71.43 77.42 82.26 72.16	37.14 50.64 52.94 42.86 54.84 64.52 44.32	Econ vs. Maths: 0.0093* Maths vs. other: 0.0062* all other pairwise comparisons insignificant

“Maths etc.” equal 1 if major subject is Mathematics, Physics, or Engineering.
*** p<0.01, ** p<0.05, * p<0.10

Table 5: Comparison of cheating rates in the "no intentions" treatment

variable	values	N	% tails	implied % of cheaters	p-value from test for equality of proportions
All subjects		238	71.43	42.86	
Earnings	4 6 8	92 71 75	70.65 76.06 68.00	41.30 52.12 36.00	4 vs. 6: 0.1694 6 vs. 8: 0.0498 ** 4 vs. 8: 0.4847
Gender	Male Female	102 136	74.51 69.12	49.02 38.24	0.0963 *
Lab experience	0 or 1 >1	39 199	71.79 71.36	43.58 42.72	0.9210
Major field of study	Economics Business Law Medicine Education Maths etc. other	26 24 18 10 33 21 97	80.77 75.00 77.78 80.00 63.64 70.00 69.07	61.54 50.00 55.56 60.00 27.28 40.00 38.14	

*** p<0.01, ** p<0.05, * p<0.10

Table 6: Probit regression for reporting the better outcome

	(1)	(2)	(3)	(4)
	"fairness treatment" only receivers	"no intentions" treatment	"no intentions" treatment; only subjects with lab experience < 7	"no intentions" treatment; weighted regression
Received zero	0.0901 *	-0.0087	0.0184	-0.0826
	(0.0535)	(0.0604)	(0.0682)	(0.0615)
Male	0.1371 ***	0.0558	0.1027	0.1060 *
	(0.0528)	(0.0632)	(0.0691)	(0.0591)
Lab experience > 1	0.1120 **	-0.0061	-0.0155	0.0049
	(0.0523)	(0.0781)	(0.0792)	(0.0580)
Major Econ	-0.1343	0.1061	0.1272	0.1939 ***
	(0.1211)	(0.0881)	(0.0907)	(0.0683)
Major Business	0.0155	0.0421	0.0340	-0.0313
	(0.0762)	(0.0985)	(0.1090)	(0.0889)
Major Law	-0.0128	0.0788	0.1517	-0.0654
	(0.1123)	(0.1059)	(0.1063)	(0.1854)
Major Medicine	-0.0691	0.1175	0.1145	0.1377
	(0.0998)	(0.1219)	(0.1262)	(0.1293)
Major Education	0.0663	-0.0527	-0.0094	-0.1386
	(0.0743)	(0.0933)	(0.0984)	(0.0936)
Major Maths	-0.0279	-0.0146	-0.1751	-0.2380 **
	(0.0975)	(0.0981)	(0.1327)	(0.1112)
Log-likelihood	-130.0347	-140.2994	-106.5333	-126.7586
# observations	251	238	184	236

Notes: Average marginal effects reported. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.10

Figure 1: Relationship between the proportion of tails and the implied fraction of cheaters

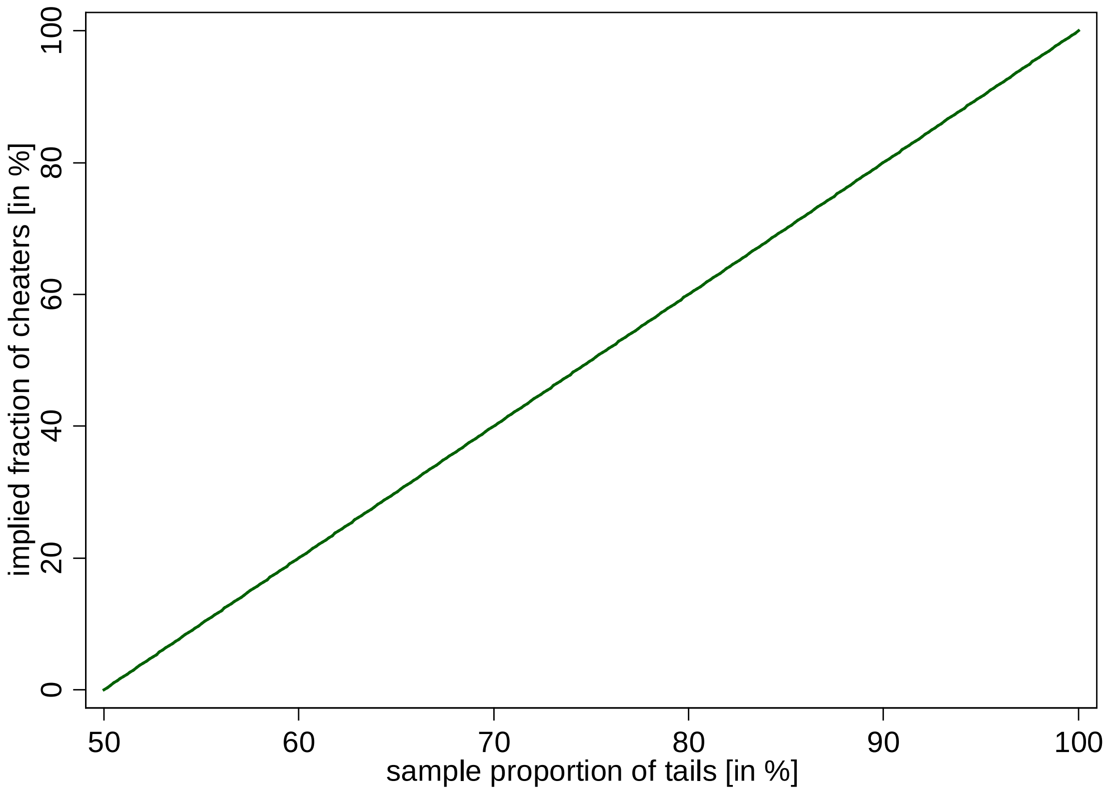
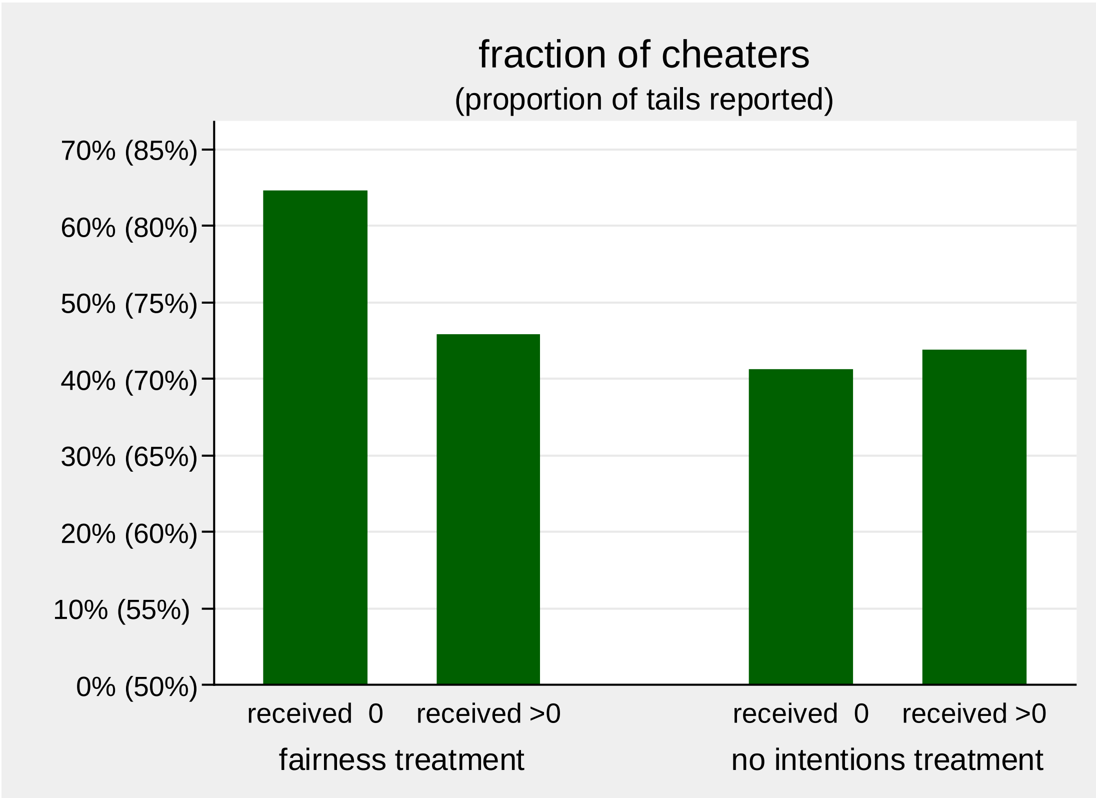


Figure 2: Cheating rates (proportion tails reported) by earnings in both treatments



Appendix: Instructions

The Experiment

In this experiment there will be two roles, which will be referred to as **Person 1** and **Person 2**, respectively. You will be randomly assigned to one of these roles. In the course of the experiment you will be randomly and anonymously matched with another participant, who will be in the opposite role. As mentioned above, you will not receive any information about the other participant's identity.

Procedure

At the beginning, Person 1 receives an initial endowment of $8. Then Person 1 has to divide the $8 between himself and Person 2.

The **payoff to Person 1** is €8 minus the amount sent to Person 2.

The **payoff to Person 2** is the amount that Person 1 has sent.

When deciding about how much to send, Person 1 can choose **one** of the following options:

- Send €0 to Person 2 and keep €8; or
- Send €2 Euros to Person 2 and keep €6; or
- Send €4 to Person 2 and keep €4; or
- Send €6 to Person 2 and keep €2; or
- Send €8 to Person 2 and keep €0.

We will ask you to indicate your preferred option **before you know if you actually are Person 1**.

Whether you will be Person 1 or Person 2 will be determined randomly. Therefore you will have to pick an envelope later. Inside there will be a tag with a combination of a letter and a number (either 1 or 2). So at tag might read A1 or A2, B1 or B2, C1 or C2, and so on. The number indicates whether you will be Person 1 or Person 2. The letter matches you with another participant in the opposite role. For example, the person who gets A1 is matched with the person who gets A2.

So, if you have a "1" you will be Person 1. Your earnings will correspond to the option which you chose. If you have a "2" you will be Person 2. Then your earnings will be the amount sent by your matched Person 1.

Quiz

This short quiz ensures that you understand the features of the experiment. You cannot earn anything in the test, but it might help you to make a good decision afterwards.

Question 1:

Imagine you have chosen to send €4 to Person 2 **in case that it turns out that you are Person 1**, and to keep €4 for yourself.

Then you pick an envelope which contains the tag **X2**. This means that your role is Person 2.

Your matched counterpart (i.e. the person with the tag **X1**) has indicated that he would keep €6 and send only €2.

a) How much do you earn in this case? ___

b) How much does your matched counterpart in the role of Player 1 earn? ___

Question 2:

Now imagine that you have chosen to keep €8 and send nothing to Person 2. Then you pick an envelope with the tag **X1**. This means that your role is Person 1.

a) How much do you earn in this case? ___

b) How much does your matched counterpart in the role of Player 2 earn? ___

Your Choice

So far you do not know if you are Person 1 or Person 2. Now you have to decide what you will do **if it turns out you will be Player 1.**

Please decide now how much you want to give to Person 2 by ticking the appropriate box.

IMPORTANT: Think carefully about your decision! Once you ticked the box, you cannot change it any more.

How much of the €8 would you send to Person 2?

€0 ☐

€2 ☐

€4 ☐

€6 ☐

€8 ☐

We will continue after all subjects have made their decisions. Please wait quietly.

Questionnaire

Please answer the following questions about yourself. Your anonymity remains guaranteed.

1) Are you Male or Female
   - o Male
   - o Female

2) What is your major?

   ____

3) What is your age?

   ____

4) In how many MELESSA experiments did you participate so far? If you are not sure please give an approximate number.

   ______

Only dictators:

You have been randomly assigned to the role of Person 1.

Your payoff is €8 minus the amount that you decided to send to Person 2.

Please wait for a moment until you receive further instructions.

Only receivers:

You have been randomly assigned to the role of Person 2.

You received a sheet with the choice of the person who has been matched with you. On this sheet you can see how much Person 1 has sent to you. This is your payoff from this experiment, which we will pay out to you later.

Now we would like to know your opinion about the fairness of Person 1. How would you rate the behavior of Person 1?

- Fair □
- Rather Fair □
- Rather Unfair □
- Unfair □

Please wait for a moment until you receive further instructions.

All subjects:

Now you have the chance to increase your earnings.

You will get a €1 coin from us. We will ask you to flip the coin and to report the result below. Depending on how lucky you are you can earn the following:

If you flip **heads** on the upper side, you have earned €1. In this case you keep the €1 coin.

If you flip **tails** on the upper side, you have earned €3. In this case you keep the €1 coin and you will receive a further €2 at the end.

Now please flip the coin.

Flip the coin at your seat and make sure that the coin doesn't fall to the ground and that none of the other participants can see the result of the coin flip!

Please mark what was on the upper side of the coin:

- o **Heads**
- o **Tails**

Thank you for your participation!

For the payment we will now call you person by person. Please take all sheets with you.