The title

|  |
| --- |
| Sebastian Simon1 & Jörg A. J. Gross1 |
| 1 Social, Economic, and Organizational Psychology, Leiden University |
|  |

# Author note

Correspondence concerning this article should be addressed to Sebastian Simon, Postal address. E-mail: [my@email.com](mailto:my@email.com)

Abstract

Abstract goes here.

*Keywords:* Rule-following behavior, partner choice, social environments

The title

Complex social norm systems are rules and standards that guide human behavior in groups (Cialdini, 2001; Pepitone, 1976) and are unique to human beings (Fehr & Fischbacher, 2003; Fehr & Rockenbach, 2004; Gintis, 2003; Ostrom, 2000; Sethi & Somanathan, 1996; Tomasello & Rakoczy, 2003). Importantly, abiding to social norms is generally considered desirable as doing so is associated with good character (Freud, 1977; Hoffman, 1977) which, in turn, helps building and maintaining functioning societies. For example, policymakers and legislators set guidelines and rules for societies that individuals should adhere to and in response to such structures, rule-following behavior then reflects moral character signaling trustworthiness (Baumard, Osiurak, Lesourd, & Le Gall, 2014; Everett, Pizarro, & Crockett, 2016; Freud, 1977; Hoffman, 1977).

Yet, people often choose to violate norms (Köbis, Prooijen, Righetti, & Van Lange, 2016) and engage in corrupt collaborations (Weisel & Shalvi, 2015) such as bribery (Rose-Ackerman & Palifka, 2016), trafficking (Nieto, 2012), crime and fraud (Ades & Tella, 1996) by definition among many others. For example, Mexico has been the center of drug violence, killing thousands of people, and exposing the Mexican society to torture and impunity (Nieto, 2012). Also, the terrorist organization Islamic State in Iraq and Syria (ISIS) caused numerous organized terrorist attacks across Europe over recent years (Farwell, 2014). The consequences of such corruption can be fatal including hindrance of economic growth (Mauro, 1995) as well as undermined legitimacy and capacity of governments (Rothstein, 2011), hence, harming the functioning of societies. We, therefore, need to determine under which circumstances people abide or break rules.

Previous research highlighted the importance of interpersonal variables in predicting cooperative behavior through morality goals. As people like to think of themselves as moral beings (Abeler, Becker, & Falk, 2014; Abeler, Nosenzo, & Raymond, 2019; Jordan, Mullen, & Murnighan, 2011; Mazar, Amir, & Ariely, 2008) and care about what others think of them (Gausel & Leach, 2011; Lacetera & Macis, 2010; Utikal & Fischbacher, 2013), moral traits dominate (Cottrell, Neuberg, & Li, 2007; Landy, Piazza, & Goodwin, 2016; Landy & Uhlmann, 2018; Peeters, 1992; Wojciszke, Abele, & Baryla, 2009). For example, besides traits such as being sociable and warm (Goodwin, 2015), people prefer to interact with others who signal their trustworthiness (Freud, 1977; Hoffman, 1977) because doing so signals being a ‘good’ interaction partner.

Humans are social beings and when in groups, people prefer others they can rely on, where cues of morality such as rule-following behavior are a good indicator of this (Abele & Wojciszke, 2014; Baumard et al., 2014; Cottrell et al., 2007; Landy et al., 2016; Landy & Uhlmann, 2018; Peeters, 1992; Wojciszke et al., 2009). In this regard, people typically perform costly behaviors that signal trust (Jordan, Hoffman, Nowak, & Rand, 2016). For example, companies in the free market such as Fairtrade and Tony’s Chocolonely use logos with moral appeals to signal their trustworthiness to both their customers and other companies, all of which aim to facilitate cooperation. But companies do not often function in isolation, rather in a market with competitors and partners, and it is this competition that can make companies and individuals more cooperative. For example, Barclay and Willer (2006) found that when people have the opportunity to be selected as a partner and benefit from this interaction, people competed against others to signal they were more generous than their competitors. The most generous therefore signaled to be better interaction partners than others as an indicator of moral character. Biological markets and the pressures that arise along with them can, therefore, facilitate cooperation.

The effects of partner choice have mainly been investigated in cooperation settings using economic games in which providing people with the freedom to seek out trustworthy partners and abandon free-riders have been shown to develop and safeguard cooperation (Efferson, Roca, Vogt, & Helbing, 2016; Rand, Arbesman, & Christakis, 2011). Therefore, cooperation is usually more lucrative than defection. For example, in hunter-gatherer networks, those who share their spoils form more profitable relationships than those who do not (Gurven, Allen-Arave, Hill, & Hurtado, 2000). Also, the European Union (EU) and the United Nations (UN) represent international alliances where nations collaborate. However, which agents are chosen as interaction partners, depends on how able and inclined these agents are to benefit others (André & Baumard, 2011; Barclay, 2013; Baumard, André, & Sperber, 2013). Benefits can take on the form of wealth, mutual gain, talents, and resources (Hirschman, 1987; Montesquieu, 1951).

Yet, in other settings, people choose to be corrupt as a collective, where corrupt collaboration is defined as attaining personal profits as the result of joint acts of rule violations (Weisel & Shalvi, 2015), and depends on the moral goals people have (Baumard et al., 2014; Everett et al., 2016) and the context people are in (Melnikoff & Bailey, 2018). Example for such corruption is the Volkswagen scandal from 2005 where the employees of the company manipulated software to pass key emission tests in the face of limited time and budget and hence likely personal benefits (Goodman, 2015). However, as if corrupt collaboration itself was not enough, corruption breeds corruption. For example, countries that are plagued by more corruption have been found to have a higher black market premium (Bahmani-Oskooee & Goswami, 2005), and higher inflation rates (Cukierman, Edwards, & Tabellini, 1989), all of which go at the expense of the poor (Gupta, Davoodi, & Alonso-Terme, 1998). As these examples demonstrate, we have to research the determinants that benefit societies and those that destroy them.

# The Present Experimentp

We argue that a) divergent selective pressures of the social environments people are in determine behaviors that signal ‘being a good partner’ and that b) cooperation is not prosocial per se but critically depends on both the social environment and having the mere option to choose one’s social interaction partners.

*Hypothesis 1*: Norms of rule-following behavior will establish specific to the two settings. Specifically, over time, we expect rule-following scores to decrease in the corrupt environment (H1a) and to increase in the prosocial environment (H1b).

*Hypothesis 2*: Across environments, rule-following behavior is anchored in setting A and modifies the trend in environment B. Specifically, we expect that if the corrupt environment is shown second, the trend of rule-following scores will decline but less than if the corrupt environment is shown first (H2a). Also, we expect that if the prosocial environment is shown second, the reverse will occur (H2b).

*Hypothesis 3*: In a biological market, partner choice shapes rule-following behavior. Specifically, we expect that in the corrupt environment, those with a low rule-following score will be selected more than those with a high score. We expect the reverse in the prosocial environment.

To test these hypotheses, we conducted an experiment with a series of game-theoretic tasks in one experimental session lasting one hour.

## How Moral to Be

## What Partners to Choose

Behavior that is costly to perform signals trust, a moral trait and fundamental building block of relationships.

Costly signaling theory holds that behaviors can be costly to perform but entail trust in return - regardless of whether these behaviors are intended or unintended [ref].

## When We Cooperate

The effects of partner choice have mainly been investigated in cooperation settings using economic games like the Prisoner’s dilemma game, which allow for analyzing the evolution of cooperation and the establishment of normative behavior.

Indeed, the effects of partner choice have mainly been investigated in cooperation settings and have been shown to … to structure social preferences, make reputation concerns more salient, …

# Methods

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study (Simmons, Nelson, & Simonsohn, 2012).

## Participants and Ethi

Participants were recruited from the subjects pool of the Faculty of Social and Behavioral Sciences at Leiden University. Each of the 212 participants consented digitally to take part in one experimental session lasting approximately one hour and were debriefed digitally. Zero participants withdrew their participation. 12 participants were excluded due to server overload resulting in incomplete data. Therefore, the data of 200 participants were used for our analyses. Participants (mean age = 23.06 +/− 4.25, 155 female) were paid €9,08 on average and incentives for participants were money (59.69%), followed by credits (25.51%), and science (14.80%). The experimental tasks were programmed using oTree (Chen, Schonger, & Wickens, 2016). Screenshots of the instructions are appended to the Supplemental Material and all data and materials are available on OSF (<https://osf.io/v4rma/>).

## Experimental Design and Setup

We conducted an interactive group experiment involving a series of game-theoretic tasks. Figure [x] summarizes both the timeline and the experimental tasks. We used one between-subjects factor (role: selector vs decider) and one within-subjects factor (setting: trust vs dishonesty). In all experimental sessions, four participants were randomly grouped depending on their availability Over a total of 30 rounds, participants went through a sequence of three stages in each round: a rule-following tasks (stage one), a partner selection task (stage two), and two settings - a trust game and a dyadic die-rolling task - for 15 rounds each (stage three). All participants were exposed to both settings and went through different stages based on their role and the decisions others made. After the experimental blocks, all participants did the die-rolling task by themselves and filled in the social value orientation (SVO) scale, their demographics, and answered control questions.

The currency in the experiment was points, where 100 points = €1.00. Participants accumulated their points individually based on their choices and over the three stages. Earnings could range from €6.50 to €14.50. Alternatively, participants could get paid out 2 SONA credits plus the bonus. If they collected less than 650 points, they were paid the show-up fee of €6.50. However, if they collected more than 650 points, all exceeding points were considered their bonus. To calculate the participants’ final payment, two rounds of the total 30 were randomly selected by the computer. The total summed amount of points they collected in these two rounds plus the points from the last die-roll task were converted to Euros and paid out to the participants.

## Experimental Procedure

Participants typically arrived separately at the laboratory and were seated in individual cubicles with computers. At the end of the experiment, they were asked to remain seated inside the cubicles and wait for an experimenter to open the door. We informed the participants that the present study was a group experiment in which they would interact with other participants in a group of four in total. They were also told how many of the group members already arrived and how many were still missing. We stressed this to make sure they trusted their own decisions to have an impact on other real human individuals. Participants were told that the entire experiment was computerized. The consent and debriefing forms were therefore shown on the computers. This study fell under the no-deception policy of Leiden University. So, there were neither hidden information nor deception in the study, and everything was done as stated in the instructions. After completing the comprehension checks, participants went on to the first task.

### Stage one: The rule-following task

The key variable of interest was rule-following behavior. Participants were presented with 15 balls they could allocate one-by-one to either a blue or a yellow bucket (by clicking with the cursor on the buckets’ respective buttons on the computer screen). Participants were instructed that ‘the rule is to put the balls in the blue bucket’. They had no reason for following the rule and did not face any consequences if they did not. The rule-following variable was operationalized as a score of the summed number of balls put in the blue bucket per round and could range from 0 to 15. Instructions read that each ball put in the blue bucket would earn them 5 points and that each ball put in the yellow bucket would earn them 15 points. So, choosing to put all balls in the blue bucket earned participants only a third (75 points) of what they could have earned if they put all balls in the yellow bucket (225 points). A counter below the buckets’ buttons showed the amount of money they accumulated (Kimbrough & Vostroknutov, 2016). Participants received feedback about the scores of the other group members. To avoid reputation concerns, in all stages, feedback displays were sorted by the highest rule-following score (i.e. the summed number of balls put in the blue bucket) in descending order. At the end of each round, rule-following scores were reset to 0 to avoid reputation effects (Milinski, Semmann, & Krambeck, 2002).

* reasoning for incentive scheme: why those numbers?

### Stage two: Partner selection

The partner selection variable was the number of partners selected per round. Participants were randomly assigned to one of two roles: selector or decider. One of the four group members was in the selector role, the other three were in the decider role. Selectors skipped the rule-following task. However, in the second stage, selectors had to select at least one of the deciders - but could also choose two or even all three deciders - for the third stage. We excluded the possibility to select zero deciders to avoid punishment effects (Fehr & Gächter, 2002). All group members were informed that the selector had to spend 150 points for each selected decider. When selecting participants, selectors received feedback about all deciders’ rule-following scores. In the meantime, deciders had to wait. If they got selected, they had to decide about both their own and the selectors’ earnings in the third stage. Therefore, partners (i.e. selected deciders) inevitably earned more than those who were not and it was desirable to get selected. Importantly, partners interacted with the selector only, not with the other partners. Feedback about the selectors’ decisions was provided to all deciders and the feedback showed both the rule-following scores and who got chosen. We expected participants to learn from the feedback about who got chosen and who did not and adjust their choices in the next round. Participants who got chosen continued to stage three and participants who did not wait until the next round.

The partner selection variable was the number of partners selected per round. Participants were randomly assigned to one of two roles: selector or decider. Only one of the four group members was in the selector role, the other three were in the decider role. Selectors skipped the rule-following task. Instead, their role consisted of selecting at least one of the deciders - they could also choose two or all three deciders - for the third stage. Before allocating the balls to either bucket, all group members were informed that there would be a selector, who had to spend 150 points for each selected decider. When selecting participants, selectors received feedback about all deciders’ rule-following scores. In the meantime, deciders had to wait. If they got selected, they had to decide about both their own and the selectors’ earnings in the third stage. Therefore, partners (i.e. selected deciders) inevitably earned more than those who were not, and thus, it was desirable to get selected. Importantly, partners interacted with the selector only, not with the other partners. Feedback about the selectors’ decisions was provided to all deciders and the feedback showed both the rule-following scores and who got chosen. We expected participants to learn from the feedback about who got chosen and who did not and adjust their choices in the next round. Participants who got chosen as interaction partners continued to stage three and participants who did not, waited until the next round.

### Stage three: Two settings

There were two settings in the third stage: a dictator game and a dyadic die-rolling game. Each setting was repeated for 15 rounds and which one was shown first depended on the condition of the particular sessions. Therefore, the order of the settings was experimentally counterbalanced.

In one setting, participants played a modified dictator game in which selectors could not reject the offer made by the individual partners (i.e. selected deciders). Therefore, punishment could not act as a confound. In the game, the variable of interest was fairness and it was conceptualized as the number of points that partners gave to the selectors. Partners were endowed with 500 points and had to allocate x to the selector and kept 500 - x for themselves, where x could assume a value between 0 and 250 in steps of 50 points. Options were shown in a drop-down menu. Choosing the maximum of x = 250 resulted in a fair mutual outcome and choosing the minimum of x = 0 resulted in a selfish outcome. In this stage, selectors’ earned totals were the sums of their partners’ allocated points, so that sum(1 to i) (500 - xi). Selectors received feedback about all partners’ allocations along with their rule-following scores from the first stage. Then, the next round started.

In the other setting, partners played a modified version of the commonly used dyadic die-rolling game (Fischbacher & Föllmi-Heusi, 2013; Weisel & Shalvi, 2015; for a meta-analysis, see Abeler et al., 2019). Instead of two participants having to match their responses, only the partners had to report a die-roll. The reported number determined partners’ earnings and those of the selectors. The variable of interest was dishonesty and the incentives for the die-rolling game were set in such a way that participants had to be dishonest and coordinate their reported die-roll outcomes with their partners if they wanted to receive a relatively reasonable amount of points for themselves. Weisel and Shalvi (2015) already observed people to coordinately report die-roll outcomes and report a ‘double’ 82% of the time, a result that exceeds chance (2.78% for two separate die rolls with the same outcome) and outcomes reported when alone. Both the partners and selectors earned the same amount of points for the reported die roll so that both earned x points. Earnings ranged from 0 points (for reporting a 1) to 250 points (for reporting a 6) in steps of 50 points. For example, if a partner reported a 4, the partner and selector both earned 150 points. However, if a partner reported a 5, both earned 200 points. At the end of every round, selectors received feedback about all partners’ contributions along with their rule-following score from the first stage. Earnings of a selector were the sum of points that each of their partners decided on or reported, so that sum(1 to i) (500 - xi). Also, all participants received feedback about their earnings at the end of each round. Then, the next round started. When participants reached the end of round 30, they finished the experimental block and continued to final individual-level measures.

### Final measures

We measured a few potential individual-level confounds. First, dishonesty could have had an influence on both the deciders’ as well as the selectors’ decisions. Similar to the previous dyadic die-roll task, this time, participants did a die-roll. However, this time, they did the die-roll for themselves only. Hence, the die-roll only increased participants’ earnings, not the earnings of any other group members. Second, participants’ concern for others could have affected their decisions. We used a 6-item social value orientation (SVO) scale (Murphy, Ackermann, & Handgraaf, 2011) slider variant with continuous choices. Last, we asked control questions about participants’ motives to participate, previous experiences with similar experiments, knowledge of this experiment before its start, and whether they believed they interacted with real human individuals. At the end of the experiment, participants were debriefed and informed about their final earnings digitally. They waited for an experimenter, got paid, and were thanked for their participation.

# Results

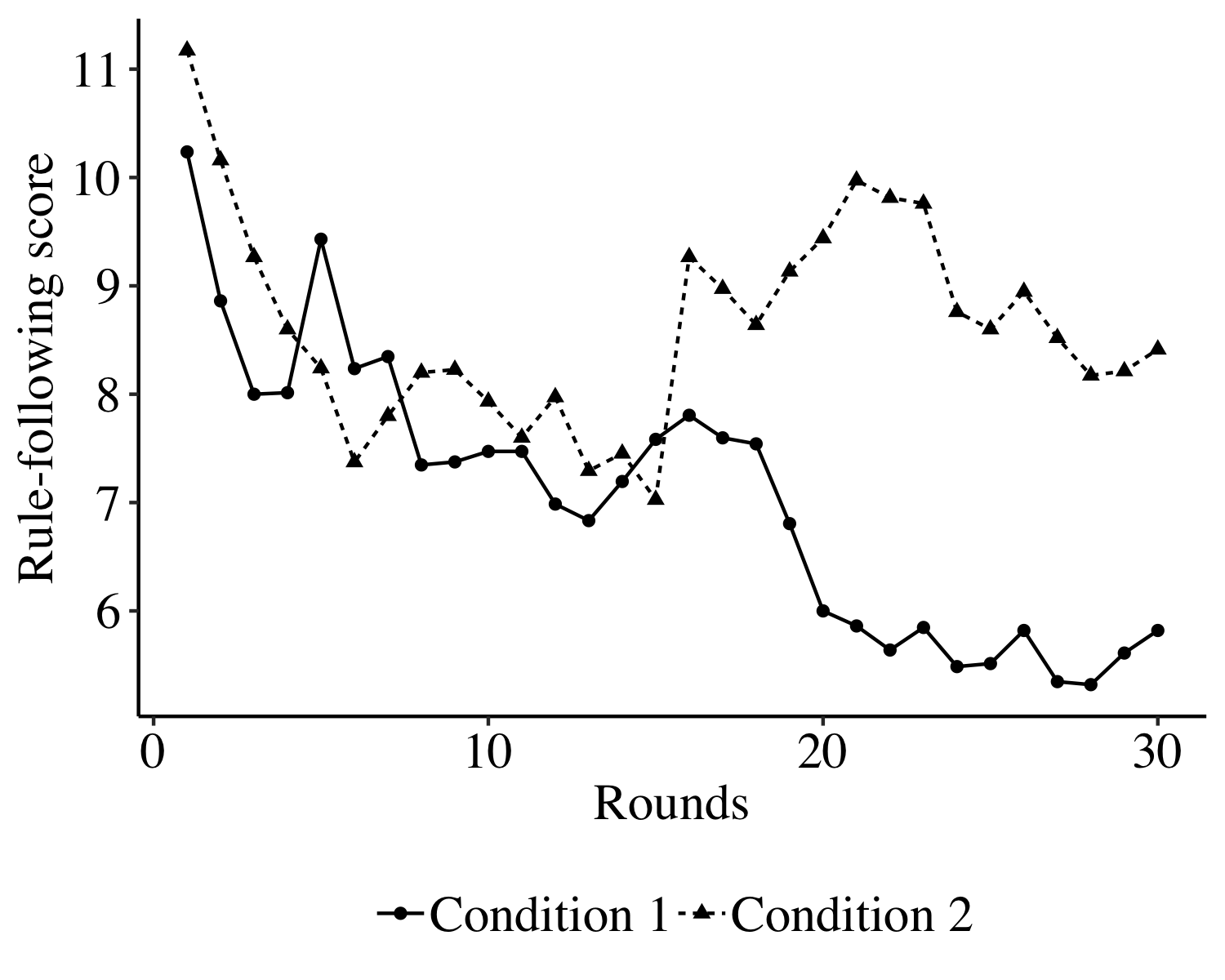
There was no missing data and boxplots revealed neither present outliers nor observations with high leverage. We used R (Version 3.5.1; R Core Team, 2018) and the R-packages *ggplot2* (Version 3.1.1; Wickham, 2016), *lme4* (Version 1.1.21; Bates, Mächler, Bolker, & Walker, 2015), and *papaja* (Version 0.1.0.9842; Aust & Barth, 2018) for all our analyses. The data is nested in groups and therefore we use multilevel models with restricted maximum likelihood (REML) taking intraclass correlations into account (Gelman & Hill, 2006). All statistical models are specified in the Supplemental Material. When proceeding to the analyses, first, we will compare the diverging effects of the two settings (H1; i.e., the dictator game and the die-rolling task) and their order (H2) on rule-following scores, respectively. Then, we will examine whether and how diverging partner choice pressures arise in the two settings (H3).

## H1: Establishing Norms of Rule-Following Behavior

Incentive structures of social settings determine behavior in groups. In a corrupt setting, for example, people may abandon rules. However, in a prosocial setting, people may do the opposite and adhere to rules instead. In the long run, such behaviors can turn into norms and in our experiment, we investigated such norms. But will these norms establish over time? And will these norms differ between the settings?

In line with our expectations, rule-following norms were established in both settings as shown in Figure 1. However, to our surprise, rule-following scores generally decreased over time (*b* = -0.03, 95% confidence interval, or CI[-0.06, -0.00]) and did not change as a function of the setting alone (*b* = -0.20, 95% CI[-1.11, 0.70]). Instead, the effect of setting depends on the rounds passed by showing that rule-following scores decreased in the corrupt setting over time (*b* = -0.07, 95% CI[-0.12, -0.01]). However, setting and rounds do not interact per se; rather, the interaction depends on the order of settings (first half vs second half). Specifically, both setting and rounds do not interact in the first half (*b* = -0.04, 95% CI[-0.12, -0.04]), only in the second (*b* = -0.08, 95% CI[-0.15, -0.02]). The main effect of rounds on rule-following scores, however, remains consistent regardless the order with the effect being stronger in the first half (*b* = -0.17, 95% CI[-0.22, -0.11]) than the second (*b* = -0.07, 95% CI[-0.12, -0.03]). The order in which settings are presented therefore seems important for examining spill-over effect and resulting anchoring effects.

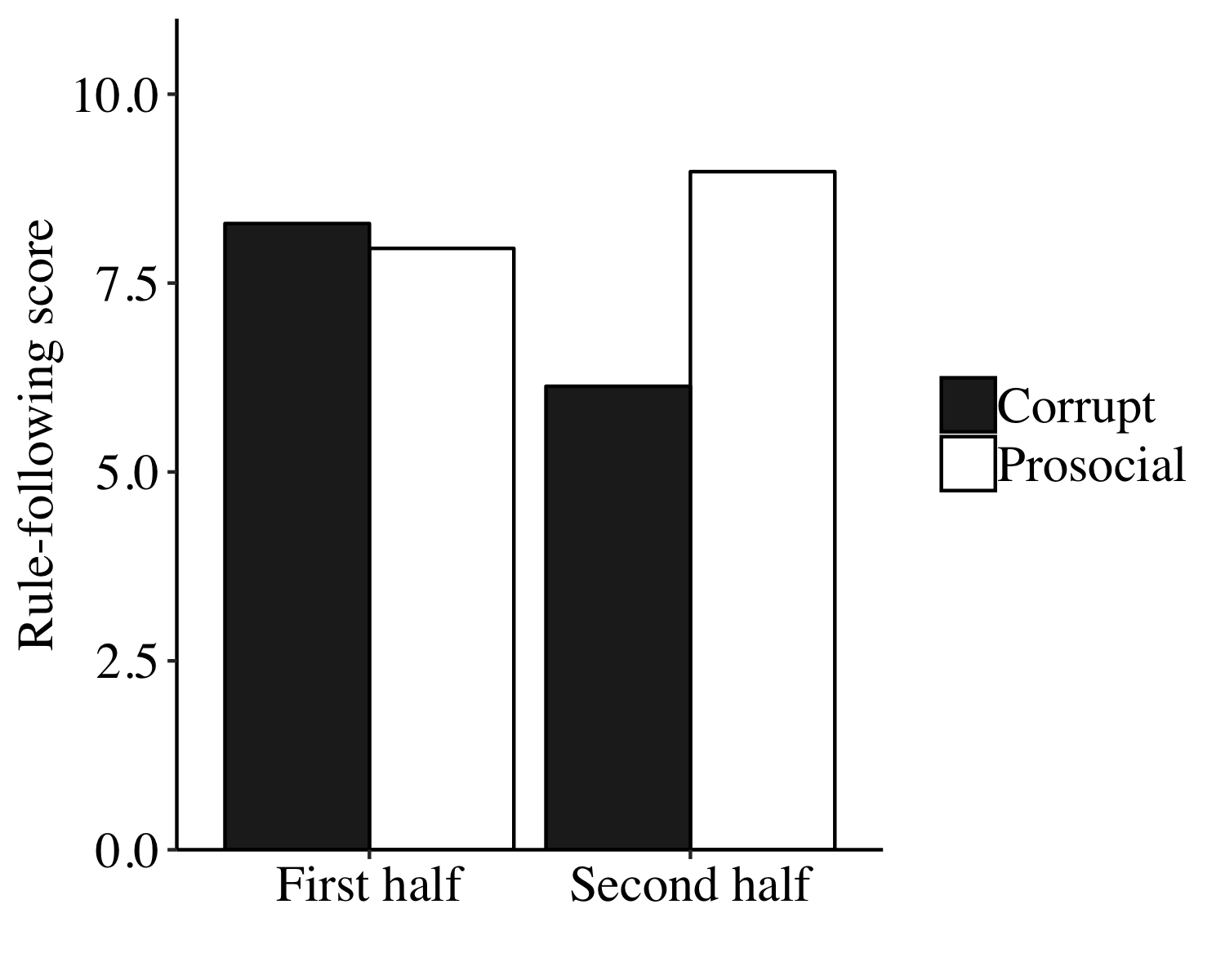
[Why?]

 *Figure 1.* Line graph of rule-following behavior trends over time. There are two settings (dictator vs die-rolling game) and after 15 rounds, the settings were switched. In condition 1, the die-rolling game was presented first, followed by the dictator game. In condition 2, the order was reversed. The graph shows that rule-following generally decreases but that rule-following behavior polarized after transitioning to the second setting.

## H2: Transitioning to Differing Settings

The order of social settings that people find themselves in can introduce spillover effects and shape human behavior. For example, time trends of rule-following behavior may spill over to another social setting and anchor behavior. If rule-following scores constantly decreases due to a corrupt social setting, for example, this norm may be carried over to a prosocial setting in which the opposite behavior may be rewarded (i.e., following rules) and, hence, the opposite norm formed. The norm should then anchor and modify the behavior in the second setting and, over time, render the norm subject to change towards the norm of the current setting. However, do norms of rule-following behavior anchor each other? Or do they exacerbate each other’s properties?

Figure 1 reveals that there were no such expected anchoring effects across conditions and that the spill-over effects of rule-following behavior are more complex than anticipated. However, Figure 1 also shows that rule-following behavior appears to be strongly modified by the order of settings. More specifically, overall scores were lower in the second half than the first [stats] but, importantly, scores were higher in the second half for the second condition - the prosocial setting (i.e. the dictator game). This interaction shows that even though there are no anchoring effects per se, merely transitioning from one setting to the next, can evoke differential rule-following behavior between settings. However, rule-following behavior can also be driven by underlying mechanisms of biological markets. Specifically, people may attempt to appear more trustworthy than their competitors for the sake of personal gain.

 *Figure 2.* Bar graph of rule-following scores by setting and order. Rule-following scores did not differ between conditions (condition 1 = die-rolling game first, condition 2 = dictator game first) but were lower in the second half than the first half. Most importantly, rule-following scores were higher in the second half for condition 2. Hence, while the corrupt setting promoted abandoning rules, the prosocial setting facilitated following them.

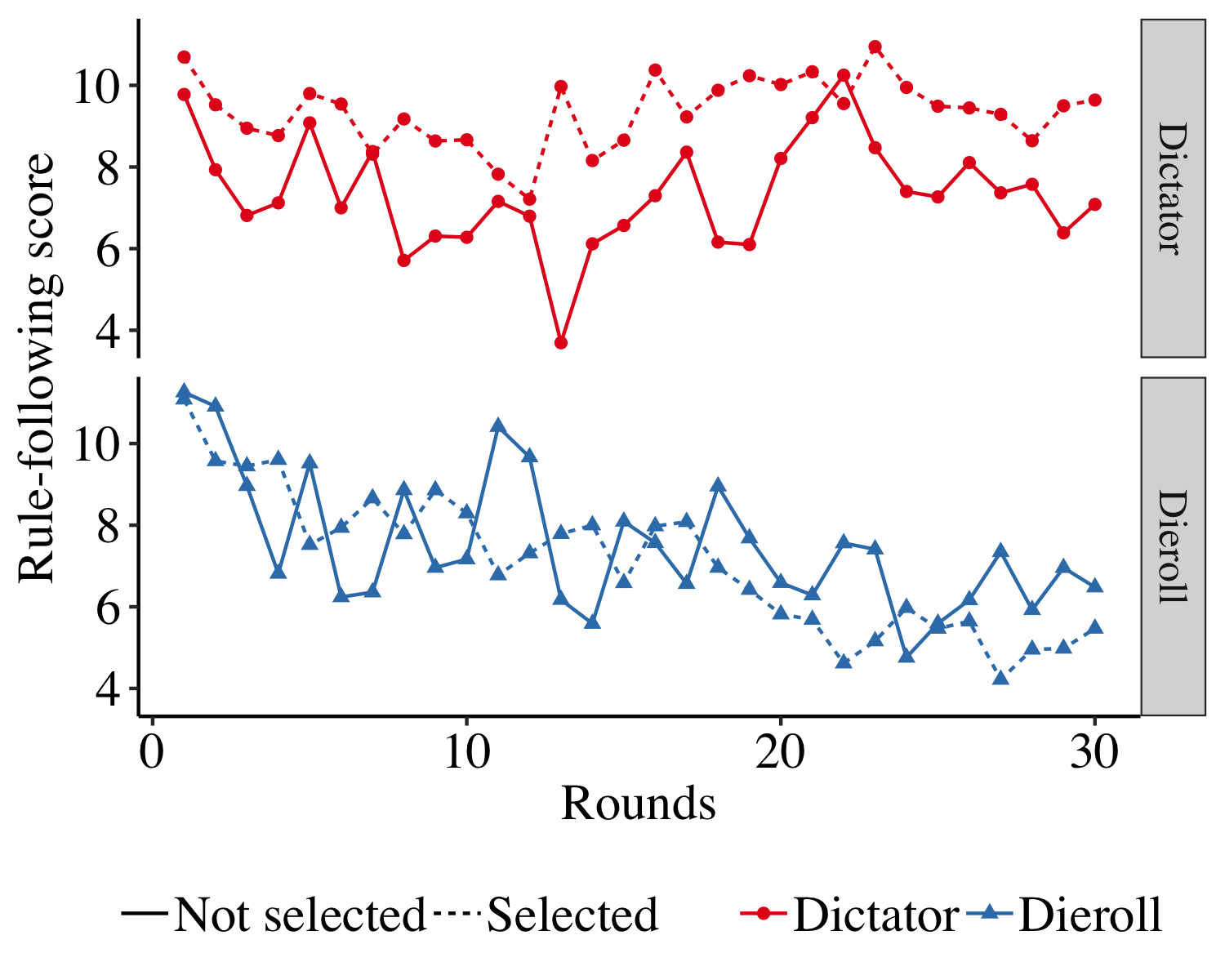
## H3: Choosing the Trustworthy

Biological markets typically make group members subject to selection pressures where being selected is generally more desirable than not being selected due to the potential gains that come with being selected. In addition, the social setting a biological market comes with determines the incentive structure that group members find themselves in and these structures can modify members’ behavioral tendencies. For instance, whereas following rules may be desirable in one setting, doing so may be condemned in another. But how exactly will partner choice influence rule-following behavior? Will people abandon rules for the sake of being selected when they are in a corrupt setting? And will people modify their rule-following behavior over time in order to get selected?

Figure 3 below shows the partner choice trends that emerged in the two settings over time. People who were selected (61.11%) generally followed rules more often than those who were not (38.89%; *b* = 1.30, 95% CI[0.72, 1.89]) but the setting people found themselves in by itself did not modulate whether they would follow or abandon rules [stats]. Instead and in line with our expectations, partner choice and setting interacted. More specifically, in the corrupt setting, people who were selected (66.12%) as compared to those who were not selected (33.88%) abandoned rules more often (*b* = -1.43, 95% CI[-1.95, -0.90]). In addition, people became less rule-following as experimental rounds progressed (*b* = -0.07, 95% CI[-0.09, -0.05]) but whether participants were selected or not did not make a difference over time (*b* = 0.00, 95% CI[-0.03, 0.03]) indicating that partner choice preferences remained relatively stable over time. Table 1 shows that the main and interaction effects were stable regardless the order of the settings (i.e., half one and half two).

[insert table 1]

However, the effects of partner choice differed in strength by the order of the settings with the main effect for partner choice being stronger for the second half (64.13% selected; *b* = 2.65, 95% CI[0.66, 4.64]) than the first (58.10% selected; *b* = 1.22, 95% CI[0.29, 2.16]), indicating that selectors discriminated members more after transitioning to the second half. In line with our expectations, the interaction term between partner choice and type of setting can explain the larger CI of the stronger effect. Specifically, in the corrupt setting, selected participants became more rule violating in the first half of the experiment (*b* = -2.45, 95% CI[-3.27, -1.62]) than in the second half (*b* = -0.83, 95% CI[-1.60, -0.06]). Therefore, it appears that in first encounters following rules is the default behavior and does not pose harm to being selected in general but that violating norms in a prosocial context does. However, when progressing to another setting, these norms are modified so that previous norms blend into currently establishing norms.

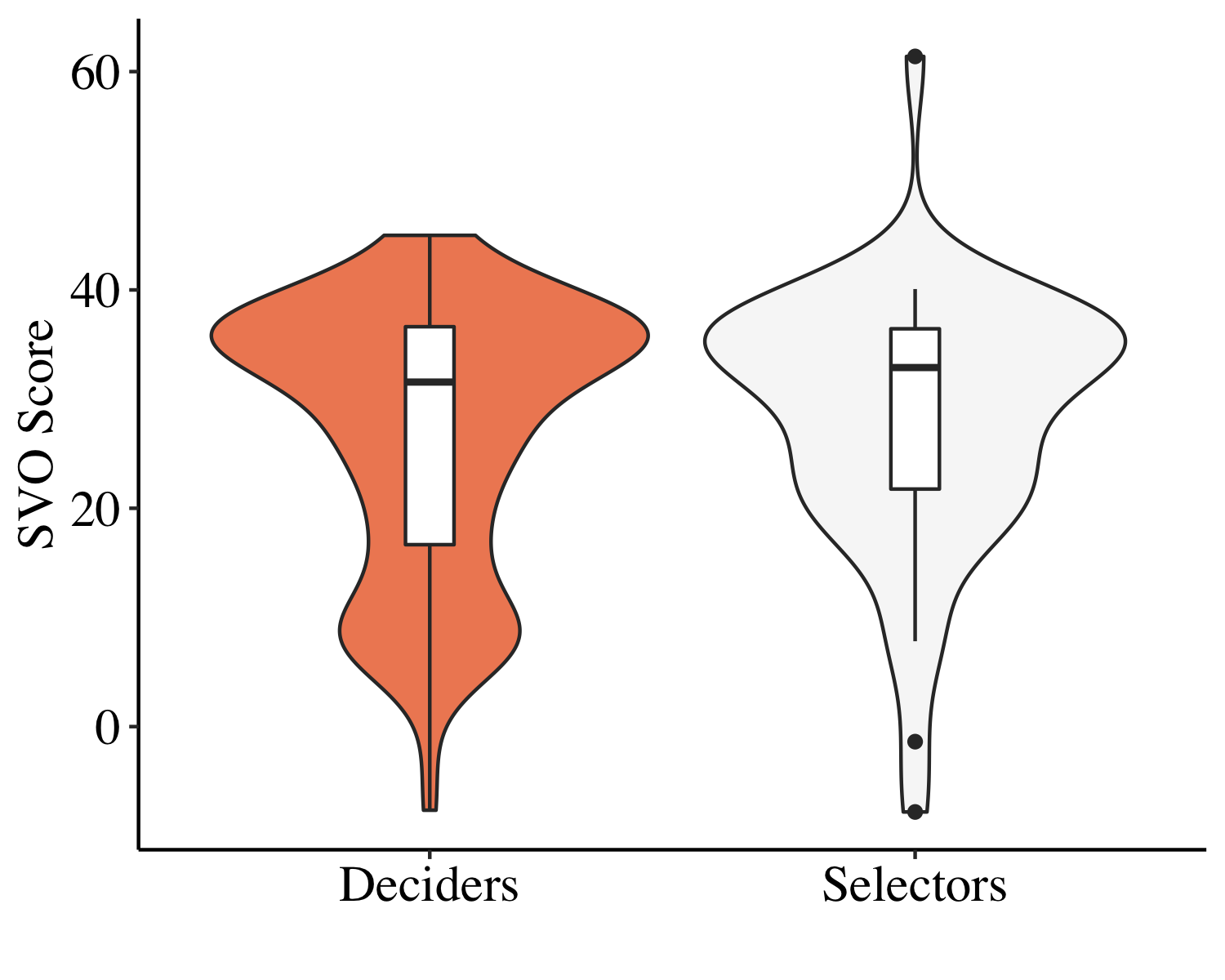
 *Figure 3.* Line graphs showing rule-following behavior over time by partner choice and setting. Overall, selectors discriminated rule-following group members from rule-violating members and this distinction was more present across settings with rule-violating members being more selected in the corrupt setting. However, the time passed by did not interact with partner choice indicating that selection preferences remained stable over time. right rule-following behavior of not selected members peaks followed by a plummet.

## Who Are the Corrupt and Who Are the Prosocial?

The nature of biological markets declares the existence of social hierarchies in which some people can choose interaction partners while others cannot. However, selectors may differ on personality variables which, consequently, influence their decisions. For instance, do selectors perceive themselves to be more prosocial or more corrupt than those who compete with others to get selected? And if there are differential perceptions, do these perceptions change as the consequence of the settings people find themselves in?

In our experiment, selectors and deciders may have differed in how corrupt they were and in order to assess this, all participants had to report an individual die roll at the end of the experiment, a common measure of corruption [ref]. Selectors and deciders by themselves should theoretically not differ from each other on average because participants were randomly allocated to roles and groups. Rather, differences should emerge as a result of being assigned a particular role. Random intercepts Poisson regression (McElduff, Cortina-Borja, Chan, & Wade, 2010) revealed that selectors and deciders were equally corrupt (*b* = -0.01, 95% CI[-0.16, 0.15]) indicating that the experimentally assigned roles did not change participants’ behavior.

Furthermore, selectors and decieers may have differed in how prosocial they perceived themselves to be and these perceptions may have influenced their behavior as t To assess this in our experiment, all participants completed the social value orientation (SVO) scale right after the individual die roll mentioned above. Random intercepts regression revealed that selectors perceived themselves to be more prosocial than did deciders (see Figure 4; *b* = 1.35, 95% CI[0.70, 2.00]) and reciprocal altruism may explain this finding [ref trivers]. As biological markets introduce resource asymmetries with selectors being able to confer benefits on the selected. In this context, selectors act as discriminators to counterbalance defectors who would otherwise prevail. Therefore, selectors have to be more prosocial and discriminate justly while deciders cooperate when necessary and defect if possible.

 *Figure 4.* Violin and boxplots showing the social value orientation (SVO) scores obtained from all participants and categorized by role. Random intercepts regression revealed that selectors perceived themselves to be more prosocial than did deciders.

[add die roll frequency distribution]

* figures
  + number of sixes reported: selector vs decider

# Discussion

* feedback from participants
  + terms ‘selector’ and ‘decider’ confusing
* methods
  + die rolling game in the end confounding the svo

# References

## Warning in readLines(file): incomplete final line found on 'r-  
## references.bib'

Abele, A. E., & Wojciszke, B. (2014). Communal and agentic content in social cognition: A dual perspective model. In *Advances in experimental social psychology* (Vol. 50, pp. 195–255). Elsevier.

Abeler, J., Becker, A., & Falk, A. (2014). Representative evidence on lying costs. *Journal of Public Economics*, *113*, 96–104.

Abeler, J., Nosenzo, D., & Raymond, C. (2019). Preferences for truth-telling. *Econometrica*, *87*(4), 1115–1153.

Ades, A., & Tella, R. D. (1996). The causes and consequences of corruption: A review of recent empirical contributions. *IDs Bulletin*, *27*(2), 6–11.

André, J.-B., & Baumard, N. (2011). The evolution of fairness in a biological market. *Evolution: International Journal of Organic Evolution*, *65*(5), 1447–1456.

Auguie, B. (2017). *GridExtra: Miscellaneous functions for "grid" graphics*. Retrieved from <https://CRAN.R-project.org/package=gridExtra>

Aust, F., & Barth, M. (2018). *papaja: Create APA manuscripts with R Markdown*. Retrieved from <https://github.com/crsh/papaja>

Bahmani-Oskooee, M., & Goswami, G. G. (2005). The impact of corruption on the black market premium. *Southern Economic Journal*, 483–493.

Barclay, P. (2013). Strategies for cooperation in biological markets, especially for humans. *Evolution and Human Behavior*, *34*(3), 164–175.

Barclay, P., & Willer, R. (2006). Partner choice creates competitive altruism in humans. *Proceedings of the Royal Society B: Biological Sciences*, *274*(1610), 749–753.

Bates, D., & Maechler, M. (2018). *Matrix: Sparse and dense matrix classes and methods*. Retrieved from <https://CRAN.R-project.org/package=Matrix>

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>

Baumard, J., Osiurak, F., Lesourd, M., & Le Gall, D. (2014). Tool use disorders after left brain damage. *Frontiers in Psychology*, *5*, 473.

Baumard, N., André, J.-B., & Sperber, D. (2013). A mutualistic approach to morality: The evolution of fairness by partner choice. *Behavioral and Brain Sciences*, *36*(1), 59–78.

Chen, D. L., Schonger, M., & Wickens, C. (2016). OTree—an open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, *9*, 88–97.

Cialdini, R. B. (2001). Harnessing the science of persuasion. *Harvard Business Review*, *79*(9), 72–81.

Cottrell, C. A., Neuberg, S. L., & Li, N. P. (2007). What do people desire in others? A sociofunctional perspective on the importance of different valued characteristics. *Journal of Personality and Social Psychology*, *92*(2), 208.

Cukierman, A., Edwards, S., & Tabellini, G. (1989). *Seigniorage and political instability*. National Bureau of Economic Research.

Dahl, D. B., Scott, D., Roosen, C., Magnusson, A., & Swinton, J. (2018). *Xtable: Export tables to latex or html*. Retrieved from <https://CRAN.R-project.org/package=xtable>

Efferson, C., Roca, C. P., Vogt, S., & Helbing, D. (2016). Sustained cooperation by running away from bad behavior. *Evolution and Human Behavior*, *37*(1), 1–9.

Everett, J. A., Pizarro, D. A., & Crockett, M. (2016). Inference of trustworthiness from intuitive moral judgments. *Journal of Experimental Psychology: General*, *145*(6), 772.

Farwell, J. P. (2014). The media strategy of isis. *Survival*, *56*(6), 49–55.

Fehr, E., & Fischbacher, U. (2003). The nature of human altruism. *Nature*, *425*(6960), 785.

Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. *Nature*, *415*(6868), 137.

Fehr, E., & Rockenbach, B. (2004). Human altruism: Economic, neural, and evolutionary perspectives. *Current Opinion in Neurobiology*, *14*(6), 784–790.

Fischbacher, U., & Föllmi-Heusi, F. (2013). Lies in disguise—an experimental study on cheating. *Journal of the European Economic Association*, *11*(3), 525–547.

Freud, S. (1977). *Introductory lectures on psychoanalysis*. WW Norton & Company.

Garnier, S. (2018a). *Viridis: Default color maps from ’matplotlib’*. Retrieved from <https://CRAN.R-project.org/package=viridis>

Garnier, S. (2018b). *ViridisLite: Default color maps from ’matplotlib’ (lite version)*. Retrieved from <https://CRAN.R-project.org/package=viridisLite>

Gausel, N., & Leach, C. W. (2011). Concern for self-image and social image in the management of moral failure: Rethinking shame. *European Journal of Social Psychology*, *41*(4), 468–478.

Gelman, A., & Hill, J. (2006). *Data analysis using regression and multilevel/hierarchical models*. Cambridge university press.

Gintis, H. (2003). Solving the puzzle of prosociality. *Rationality and Society*, *15*(2), 155–187.

Goodman, L. M. (2015). Why volkswagen cheated. *Newsweek Global*, *165*(23), 14.

Goodwin, G. P. (2015). Moral character in person perception. *Current Directions in Psychological Science*, *24*(1), 38–44.

Gupta, J. dSanjeev, Davoodi, H., & Alonso-Terme, R. (1998). *Does corruption affect income inequality and poverty?* International Monetary Fund.

Gurven, M., Allen-Arave, W., Hill, K., & Hurtado, M. (2000). “It’s a wonderful life”: Signaling generosity among the ache of paraguay. *Evolution and Human Behavior*, *21*(4), 263–282.

Hirschman, E. C. (1987). People as products: Analysis of a complex marketing exchange. *Journal of Marketing*, *51*(1), 98–108.

Hoffman, M. L. (1977). Moral internalization: Current theory and research. In *Advances in experimental social psychology* (Vol. 10, pp. 85–133). Elsevier.

Jordan, J. J., Hoffman, M., Nowak, M. A., & Rand, D. G. (2016). Uncalculating cooperation is used to signal trustworthiness. *Proceedings of the National Academy of Sciences*, *113*(31), 8658–8663.

Jordan, J., Mullen, E., & Murnighan, J. K. (2011). Striving for the moral self: The effects of recalling past moral actions on future moral behavior. *Personality and Social Psychology Bulletin*, *37*(5), 701–713.

Kimbrough, E. O., & Vostroknutov, A. (2016). Norms make preferences social. *Journal of the European Economic Association*, *14*(3), 608–638.

Köbis, N. C., Prooijen, J.-W. van, Righetti, F., & Van Lange, P. A. (2016). Prospection in individual and interpersonal corruption dilemmas. *Review of General Psychology*, *20*(1), 71–85.

Lacetera, N., & Macis, M. (2010). Social image concerns and prosocial behavior: Field evidence from a nonlinear incentive scheme. *Journal of Economic Behavior & Organization*, *76*(2), 225–237.

Landy, J. F., Piazza, J., & Goodwin, G. P. (2016). When it’s bad to be friendly and smart: The desirability of sociability and competence depends on morality. *Personality and Social Psychology Bulletin*, *42*(9), 1272–1290.

Landy, J. F., & Uhlmann, E. L. (2018). Morality is personal. *Atlas of Moral Psychology*, 121.

Mauro, P. (1995). Corruption and growth. *The Quarterly Journal of Economics*, *110*(3), 681–712.

Mazar, N., Amir, O., & Ariely, D. (2008). The dishonesty of honest people: A theory of self-concept maintenance. *Journal of Marketing Research*, *45*(6), 633–644.

McElduff, F., Cortina-Borja, M., Chan, S.-K., & Wade, A. (2010). When t-tests or wilcoxon-mann-whitney tests won’t do. *Advances in Physiology Education*, *34*(3), 128–133.

Melnikoff, D. E., & Bailey, A. H. (2018). Preferences for moral vs. Immoral traits in others are conditional. *Proceedings of the National Academy of Sciences*, *115*(4), E592–E600.

Milinski, M., Semmann, D., & Krambeck, H.-J. (2002). Reputation helps solve the “tragedy of the commons”. *Nature*, *415*(6870), 424.

Montesquieu, C. L. (1951). Oeuvres completes (2 vols.). *Paris: Pl6iade*.

Murphy, R. O., Ackermann, K. A., & Handgraaf, M. (2011). Measuring social value orientation. *Judgment and Decision Making*, *6*(8), 771–781.

Nieto, N. (2012). Political corruption and narcotrafficking in mexico. *Transcience*, *3*(2), 24–26.

Ostrom, E. (2000). Collective action and the evolution of social norms. *Journal of Economic Perspectives*, *14*(3), 137–158.

Peeters, G. (1992). Evaluative meanings of adjectives invitro and in context-some theoretical implications and practical consequences of positive-negative asymmetry and behavioral-adaptive concepts of evaluation. *Psychologica Belgica*, *32*(2), 211–231.

Pepitone, A. (1976). Toward a normative and comparative biocultural social psychology. *Journal of Personality and Social Psychology*, *34*(4), 641.

Rand, D. G., Arbesman, S., & Christakis, N. A. (2011). Dynamic social networks promote cooperation in experiments with humans. *Proceedings of the National Academy of Sciences*, *108*(48), 19193–19198.

R Core Team. (2018). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from <https://www.R-project.org/>

Rose-Ackerman, S., & Palifka, B. J. (2016). *Corruption and government: Causes, consequences, and reform*. Cambridge university press.

Rothstein, B. (2011). *The quality of government: Corruption, social trust, and inequality in international perspective*. University of Chicago Press.

Sethi, R., & Somanathan, E. (1996). The evolution of social norms in common property resource use. *The American Economic Review*, 766–788.

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2012). A 21 word solution. *Available at SSRN 2160588*.

Tomasello, M., & Rakoczy, H. (2003). What makes human cognition unique? From individual to shared to collective intentionality. *Mind & Language*, *18*(2), 121–147.

Utikal, V., & Fischbacher, U. (2013). Disadvantageous lies in individual decisions. *Journal of Economic Behavior & Organization*, *85*, 108–111.

Weisel, O., & Shalvi, S. (2015). The collaborative roots of corruption. *Proceedings of the National Academy of Sciences*, *112*(34), 10651–10656.

Wickham, H. (2011). The split-apply-combine strategy for data analysis. *Journal of Statistical Software*, *40*(1), 1–29. Retrieved from <http://www.jstatsoft.org/v40/i01/>

Wickham, H. (2016). *Ggplot2: Elegant graphics for data analysis*. Springer-Verlag New York. Retrieved from <https://ggplot2.tidyverse.org>

Wickham, H., François, R., Henry, L., & Müller, K. (2019). *Dplyr: A grammar of data manipulation*. Retrieved from <https://CRAN.R-project.org/package=dplyr>

Wojciszke, B., Abele, A. E., & Baryla, W. (2009). Two dimensions of interpersonal attitudes: Liking depends on communion, respect depends on agency. *European Journal of Social Psychology*, *39*(6), 973–990.

Xie, Y. (2015). *Dynamic documents with R and knitr* (2nd ed.). Boca Raton, Florida: Chapman; Hall/CRC. Retrieved from <https://yihui.name/knitr/>

Xie, Y., Cheng, J., & Tan, X. (2019). *DT: A wrapper of the javascript library ’datatables’*. Retrieved from <https://CRAN.R-project.org/package=DT>

# Appendix

Syntax goes here.

# Supplemental Material

## Information Brochure

Dear participant, this brochure provides you with information about the type and methods of the study in which you are about to participate. It is therefore important that you read this document closely.

### Purpose of the Study

People constantly make decisions, sometimes to improve their situation and sometimes to prevent it from worsening. In this study we will let you make a series of decisions, in which you can increase or decrease your starting capital. Whatever you have earned from your decisions during the task will be paid out to you in the end. We expect that the decision task is involving and that we get a good insight into the kind of investments you make.

### What is going to happen?

After you have read this introduction and signed the informed consent form, you will be briefed and trained in the task. It is important for you to know that you can leave the experiment at any point without providing a justification and without consequences. In this experiment, you will make a number of decisions. Each time, performance and earnings will be measured. At the end of this study, you will receive debriefing and eventual earnings. We will not provide your personal information to anybody else, only use these for scientific purposes, and will only report results averaged over all participants and not about individual cases.

### Financial reward

In this experiment, you participate in 1 session of about 60 minutes. You will receive a participation fee of 6,50 Euros (or 2 credits if you prefer) independent of your performance. In addition, depending on your decisions you may earn up to 6,50 Euros for your participation. You may thus earn up to 13 Euros in total. Your earnings will be calculated after the conclusion of the experiment and paid out to you after the second session.

### Voluntary participation

If you now decide not to participate in this experiment, this shall have no consequences for you. If you decide during the experiment to withdraw from the study, this shall have no consequences for you. In addition, up to 24 hours after the study you can still withdraw your consent for use of your personal information. You can thus withdraw your participation at any point. You are free to do so without providing any justification. If you now or within the next 24 hours want to withdraw your consent, your personal information will be removed from our database.

### Confidentiality of study results

All information from this study will remain coded. The principal investigator has no insight into your identity and will transfer any sum to be transferred to you to the research assistants in sealed envelopes. Thus, the experimenters do not know how much money you earned.

### Debriefing

At the end of this session, you will receive a short summary of the purpose of this study. You can always direct questions about the experiment to the experimenters or per email to Dr. Jörg Gross ([j.a.j.gross@fsw.leidenuniv.nl](mailto:j.a.j.gross@fsw.leidenuniv.nl)).

### Informed Consent

This study involves the reading of instructions and making a series of decisions that can affect your payment. All instructions, decisions, and questionnaires will be presented to you on the computer. At the end of the experiment, you will receive a debriefing with background information on the study, along with the additional earnings you obtained during the experiment. The additional earnings depend on your decisions and can range between 2 and 6,50 Euros. How much you have earned will be paid out to you in cash after the session.

The study involves one session and you will be compensated 6,50 Euros or 2 credits. In addition, you can earn more during the study itself. All measures taken in this study are for scientific purposes only and will be stored in a coded way. Participation is voluntary and at your own discretion. This means that you can withdraw from the study at any time and without having to explain or justify why. You will still receive the show-up fee of 6,50 Euros or 2 credits. All information collected during this study is confidential and the data will be stored in such a way that responses cannot be traced back to your identity. The study is coordinated by Dr. Jörg Gross ([j.a.j.gross@fsw.leidenuniv.nl](mailto:j.a.j.gross@fsw.leidenuniv.nl)). Questions or complaints can be addressed to him.

I herewith confirm that I have read and understood the information brochure and that I consent with participating in this study.

# Instructions

Welcome to the experiment! Below you will find detailed information about the study and a short test to check whether you understood the general setup. It is therefore important that you read the instructions closely. Click the blue headings to collapse the subsections. There is no deception and no hidden information in this study. Please do not hesitate to call the experimenter if anything remains unclear to you. Note: Tick the check boxes in the subsections below to show that you have read and understood the instructions. Otherwise, you will not be able to proceed.

In this study, you will be assigned to one of two roles and you will remain in this role throughout the experiment. You will either be playing in the role of the “selector” or in the role of a “decider”. In total, there is one selector and there are three deciders. You will find out about your role at the start of the experiment.

## Part 1

This study consists of two parts. Below, we will explain the first part in detail. After you have completed the first part of the experiment, we will give you instructions about the second part. At the end of the experiment, one round of part 1 will be selected randomly by the computer. Since you do not know which round will count for real, you should treat each round independently and as if every round is the one that counts. The points you earn in a round will be converted to money at a conversion rate of 100 points = 1 Euro. Hence, your decisions have real consequences for your earnings and, potentially, the earnings of other participants. You will start with 0 points and if your point total is below 650 points at the end of the experiment, you will still get paid 6.50 Euros. Therefore, you can earn a bonus if your point total is above 650 points.

### Stage 1.

The first part of the study consists of 15 rounds. Each round has three stages. Each decider will decide how to allocate 15 balls between two buckets on the computer screen. The deciders’ task is to put each ball, one-by-one, into one of the two buckets: the blue bucket or the yellow bucket. For each ball the decider puts in the blue bucket he or she will receive 5 points and for each ball the decider puts in the yellow bucket he or she will receive 15 points. The rule is to put the balls in the blue bucket. The deciders’ payments in this stage will be based on the sum of the points of the blue bucket and the yellow bucket. The selector will not take part in stage 1.

### Stage 2.

The selector will start by receiving 450 points. The selector will then learn about the decisions of all three deciders. Specifically, the selector will be told how many balls each decider placed in the blue bucket. The selector can then choose which decider to interact with for stage 3. The selector has to select at least one decider to interact with but can also choose to interact with two deciders in stage 3 - or even with all three. For every decider that the selector chooses, the selector has to pay a cost of 150 points. If a decider is not selected for stage 3, he or she will skip this stage, wait for the others to finish, and not earn be able to earn more. Importantly, the selector will not be able to identify the deciders across rounds, but only learn about their behavior in stage 1 (the bucket task). Specifically, the selector will be told how many balls each decider placed in the blue bucket.

### Stage 3.

If a decider is selected as interaction partner, he or she will receive 500 points. The decider is then asked how many points he or she wants to keep and how many points he or she wants to give to the selector. Hence, the decision of the decider determines the earnings of the decider as well as the earnings of the selector in this stage. After the decider has made his or her decision, the selector will learn about the outcome.

### Feedback in part 1.

After stage 3, the round is over, and you will receive a summary of this round. In the role of the decider, you receive a summary of: (a) your payoff from stage 1, (b) whether you were selected as interaction partner for stage 3 (c) how many points you decided to keep for yourself and give to the selector (d) your total sum of points you earned in this round In the role of the selector, you receive a summary of: (a) the deciders you chose as interaction partners for stage 3 (b) how many points the deciders you interacted with decided to keep for themselves and give to you (c) your total sum of points you earned in this round. Then, you move to the next round starting with stage 1.

## Part 2

In this part, everything will stay the same as in part 1, except for stage 3 and the feedback. You will also stay in your role (decider or selector) from part 1. Again, this part consists of 15 rounds. For your convenience, we repeat the instructions for stage 1 and 2 below. Again, click the blue headings to collapse the subsections. Note: Tick the check boxes in the subsections below to show that you have read and understood the instructions. Otherwise, you will not be able to proceed.

In this stage the selected deciders will use the die and the cup. The deciders have to roll the die using the cup, peek under the cup, and report the die-roll outcome. The payoff for the decider and the selector will be determined by the result that the decider reports. Specifically: If a decider reports a 1, both the decider and the selector will earn 0 points. If a decider reports a 2, both the decider and the selector will earn 50 points. If a decider reports a 3, both the decider and the selector will earn 100 points. If a decider reports a 4, both the decider and the selector will earn 150 points. If a decider reports a 5, both the decider and the selector will earn 200 points. If a decider reports a 6, both the decider and the selector will earn 250 points.

### Feedback in part 2.

After stage 3, the round is over, and you will receive a summary of this round. In the role of the decider, you receive a summary of: (a) your payoff from stage 1 (b) whether you were selected as interaction partner for stage 3, and (c) your die-roll report and how many points you and the selector earned, accordingly In the role of the selector, you receive a summary of: (a) the deciders you chose as interaction partners for stage 3 and (b) the die-roll report and resulting earnings for each decider you interacted with. Then, you move on to the next round starting with stage 1.

# Debriefing

In this study, you were part of a four-person group and made a series of decisions that could affect your final payoff. In one part of the experiment you were confronted with a rule of how to make decisions. We were interested in how many people and to what extent they follow this rule. In another part, one person of your group had to decide who to interact with based on the decisions that you and others made before. We are interested in when people choose to interact with others based on others’ previous decisions in the rule-task. In the last part, there were two contexts: you were assigned to either report the rolls of a die or divide money among yourself and a partner. If you had to report the rolls of a die, by not reporting truthfully, you were able to earn more money. We are interested to what extent over-reporting in this task is related to following the rule in the first task and being chosen as a partner. If you had to divide money among yourself and a partner, by giving more to yourself, you were able to earn more money. We are interested to what extent people make fair allocations and how this is related to getting chosen as a partner and signaling to follow rules in the rule-task. The study will help us better understand when and why individuals choose to interact with other people and follow or break rules.

The study did not involve any deception – everything that was told to you did in fact happen and/or will be implemented upon completion of the study. For further information, please contact the coordinator the study, Dr Jörg Gross ([j.a.j.gross@fsw.leidenuniv.nl](mailto:j.a.j.gross@fsw.leidenuniv.nl)). Thank you for your participation!