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Ignorance, Intention and Stochastic Outcomes*

Jana Friedrichsen† Katharina Momsen‡ Stefano Piasenti§

November 15, 2020

Abstract

Intentions play a fundamental role in many situations characterized by non-simultaneous interaction from principal-agent settings in firms to the international task of protecting the environment and the climate. We experimentally investigate how decision makers (DMs) respond to perceived intentions of a matched partner and a stochastic, imperfectly informative outcome when choosing a reciprocating action. We vary if the DM observes their partner's action or only the outcome before taking their own decision. Observing no evidence of an outcome bias, we find that the DM reciprocates good intentions under full information. However, reciprocity of DMs is lower in the treatment where information on the partner's action is hidden. Our analysis suggests that this is driven by the partners' behavior. DMs select into being informed or uninformed based on their inclination to behave more or less prosocially. While information avoidance is frequent, we do not find evidence for moral wiggling. In line with the absence of moral wiggling, an analysis of subjects' beliefs speaks against strategic cynicism.

JEL Classification: D91, C91
Keywords: information avoidance, dictator game, public good game, moral wiggle room, intentions, reciprocity

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1 Introduction

Classical economic theory centered around the benchmark of the *homo economicus*, a perfectly rational selfish individual, for a long time, but now a large literature has shown that individuals do not only care about their own payoffs but exhibit other-regarding preferences. Yet, when given the opportunity to justify selfish behavior, they may make use of this wiggle room to maintain a positive self-image while acting egoistically (Grossman and Van Der Weele, 2017; Bénabou and Tirole, 2011). While pro-social behavior as well as potential deviations from pro-sociality have been investigated thoroughly in dictator games (Dana et al., 2007), the focus of this paper lies on sequential interactions between two players. When both outcomes and intentions of the first player can be observed by the second player, Charness and Levine (2007) find that intentions matter more than outcome for reciprocating actions. Limiting the observability of the first player's action, we introduce a potential excuse for selfish behavior of the second player while adding realism to the setting.

Examples for sequential interactions with potentially hidden information are widespread. Consider, for instance, the following standard employment setting: an employee can work hard to make the company thrive or he can be rather lazy. Apart from his work input, other uncontrollable influence factors determine the success of the company. Observing only (the lack of) the company's success, the boss needs to determine the employee's bonus payment. In order to do so, she can try to find out how much effort her employee exerted. Yet, she can also determine the bonus payment without knowing if her employee has been working hard. Furthermore, this type of sequential interaction can be found in the international task of protecting the environment. Consider the situation of several countries agreeing that one of them needs to cut its emissions. This country, however, can only influence its emissions to a certain degree, i.e. even if the implemented policies should lead to a reduction in emissions, unforeseeable factors may still render the policies useless. On the other hand, emissions may also decrease if no policies have been implemented. Directly measuring the emissions, but unsure about the measures taken to potentially cut emissions, the other countries decide if and to what extent to reward the country, e.g. by giving it more leeway in other domains.

In this paper, we investigate the above-described situations in a laboratory experiment. Subjects interact in pairs of two and sequentially make a decision that affects their own as well as their matched partner's payoff. The first player can invest a large or a small share of his endowment into a joint project of which the payoff is split equally between both players. The probability with which the project succeeds is influenced by the invested amount. Hence, the action of the first mover yields a stochastic outcome which alone does not reveal the chosen action. In a between-subjects design we alter

the information that is available to the second player: she either observes both the first player's investment decision — his intention — and the payoff of the project — the outcome — or only the payoff. In the latter case she has the option to reveal the first player's choice before she decides how to split a fixed endowment between herself and the first player. We also elicit beliefs about first mover's behavior to investigate whether subjects exhibit systematically biased beliefs.

We study if and to what extent the second player's behavior depends on the outcome of the first player's choice as well as his intention. More precisely, we seek to find out if the second player rewards the outcome of the investment decision, i.e. whether the amount allocated to the first player is higher when the investment was successful. We further investigate if the second player rewards the first player's good intention and donates more when the first player has chosen the expensive investment. In addition, we explore if the second player strategically remains ignorant about the first player's investment decision and keeps a larger share of her endowment when the investment decision is initially concealed. We expect more altruistic subjects to self-select into becoming informed such that donations of willfully informed subjects should exceed donations of exogenously informed subjects in the role of the second player. Finally, we expect the first player to anticipate the second player's tendency to exploit moral wiggle room. Hence, he will be less likely to take the expensive investment knowing that the second player does not directly observe his investment and will exploit her ignorance by sharing only a small share of her endowment.

When the second player observes both intention and outcome, we find that she strongly rewards the first player's good intention by sharing a larger amount when the first mover has chosen the expensive investment option. This reciprocity is present for both good and bad outcomes of the investment decision. While the second player shares a larger part of her endowment after a good than after a bad outcome, the difference is relatively small and only significant for situations where the first player invested the large sum. Hence, the first player's intention has a larger effect on the second player's decision than the outcome of his investment decision – a result which is in line with the findings in Charness and Levine (2007).

When comparing the treatment where the second player observes both intention and outcome to the treatment where only the outcome is immediately observable, we find more generous behavior of the second player when both intention and outcome are observable. This might suggest that the second movers exploit moral wiggle room: some participants in the role of player 2 would have donated more if they had been informed about the high investment of player 1 but, instead, they decided to remain uninformed and donate little. This effect is even stronger when the first player's investment decision resulted in the bad outcome. Furthermore, we observe that the donations of willingly informed players are more generous than the donations

of exogenously informed players while willingly uninformed players donate less. This suggests that more generous players seek information.

Finally, we find that the first player indeed anticipates the second player to react to the possibility to avoid information about his investment decision. In fact, he chooses the more expensive investment option less frequently when the outcome of his decision is initially hidden and needs to be actively revealed by the second player.

Regarding the beliefs about the share of first movers choosing the costly investment, we find evidence of a false consensus effect: first movers who have chosen the costly investment expect the share of investing first movers to be higher than first movers who have chosen the cheaper investment option. If the first player's investment was not successful, we observe that second movers with more optimistic beliefs about the share of investing first movers are less likely to reveal the first mover's action. Fearing that their optimistic beliefs are true and they should reciprocate the first player's good intention, they might prefer to remain ignorant about the first mover's actual investment decision.

The paper proceeds as follows: The next section presents an overview on the related literature. We describe our experimental design and the procedures of data collection in Section 3. Our behavioral predictions are formulated in Section 4. We discuss our results in Section 5 and conclude in Section 6. The appendix contains screenshots of the main decision screens, experimental instructions and supplementary material.

2 Related Literature

Our experimental design is inspired by Charness and Levine (2007) who also consider a game between two players where the second paper can reciprocate the first player's action. The outcome of the first player's action depends both on his choice and on luck. In contrast to our paper, the second player can immediately observe the first player's action. Thus, there is no scope for motivated information avoidance – a feature which our experiment includes adding to its applicability to real world situations. Charness and Levine (2007) find that the first player's intention has a large effect on the second player's decision, while the decision outcome only has a minor effect.

In light of the overwhelming evidence on fairness preferences, Falk et al. (2008) studied whether individuals respond to fairness in intentions or in outcomes. By varying whether a first mover controls the action chosen on her behalf or not, they exogenously vary if the affected second mover can infer the intention of the first mover from the action. Strikingly, second movers reciprocate almost one to one if they can infer intentions, but they do much less so otherwise.

Furthermore, there is a growing body of literature investigating motivated reasoning in the context of intentions. In a setting similar to Charness and Levine (2007),

Erkal et al. (2019) investigate if the second player holds biased beliefs regarding the first player's action. Observing only the final payoff and ignorant about the decision maker's action the second player tends to attribute good outcomes to luck and bad outcomes to intentional actions. Hence, decision makers receive too little credit for their choices. Erkal et al. (2019) argue that their experimental setting brings the literature on outcome bias closer to reality because in many situations, the decision maker's choice remains concealed. However, we believe that our experimental setting takes even one step further towards depicting realistic decision situations, as the second player has the option to reveal the first mover's choice.

Ging-Jehli et al. (2020) consider two-player interactions where both players receive an endowment and have the option to take from the other player. Players decide sequentially with the first player's decision to take from the second player reducing the amount the second player can take from the first player. If the first player believed that the second player would take a large amount away from her, he could justify taking a large sum from the second player. However, eliciting the beliefs of the first player, Ging-Jehli et al. (2020) find no evidence for strategic cynicism.

In a broader framework, our paper relates to the large literature on the role of other-regarding preferences and social context.[1] Even without judging bystanders, individuals appear to take into account how they might be perceived in the form of a reflection on their self-image or behave in a way that is considered pro-social because they consider the selfish action morally wrong (Bodner and Prelec, 2003; Gneezy et al., 2012; Sugden, 1984).

Still, selfish interests are an important driver of behavior, and previous experimental work highlights the possible conflict that results from egoistic and social considerations. In situations that allow individuals to choose a selfish action while maintaining a good self-image or appearing "good" to potential observers, average behavior is less pro-social than in situations where such moral wiggle room does not exist. Originally identified and studied in the context of dictator games (Dana et al., 2007; Larson and Capra, 2009; Grossman, 2014), strategic ignorance and the exploitation of moral wiggle room are also observed in trust games (Regner, 2018) and donations to charity (Exley, 2016). The discrepancy in average behaviors has been attributed to the existence of certain types of individuals who behave prosocially under perceived pressure to do so – be it social pressure or perceived norms of appropriate behavior – but choose more selfish actions otherwise and therefore avoid the ask (Lazear et al., 2012; Andreoni

[1]For instance, experimental studies find that subjects are willing to sacrifice own payoffs to increase social welfare as they value efficiency, that they reciprocate positively as well as negatively, and that they care about payoff inequality and payoffs to the least well-off (Charness and Rabin, 2002; Engelmann and Strobel, 2004; Fehr and Schmidt, 2006; Güth and Kocher, 2014). Further studies show that participants cooperate in prisoner's dilemmas and contribute to public goods inside and outside the laboratory beyond the selfishly rational benchmark (Andreoni and Miller, 1993; Ledyard, 1994; Henrich et al., 2001; Shang and Croson, 2009; Chaudhuri, 2011).

et al., 2017). While individuals want to conform to what they consider appropriate, a crucial aspect appears to be that what is perceived as appropriate behavior indeed changes with the context. Building on this literature, the aim of our paper is to investigate decisions in sequential two-player interactions when a potential excuse for not reciprocating pro-social behavior may be available.

3 Experimental Design and Procedures

The experiment is designed to investigate how decision makers who move second in a sequential interaction take both the first mover's intention and the outcome of his choice into account when choosing a reciprocating action. In a between-subjects design, we vary whether the second mover observes the first mover's decision or only the stochastic outcome of it.

Subjects interacted taking the roles of first (player 1) and second movers (player 2). They were randomly assigned to their roles at the beginning of a session and kept their roles throughout the experiment. Subjects interacted with a participant in the opposite role four times. For each interaction, pairs were formed anew following a perfect stranger matching protocol. Participants' identities remained anonymous throughout the entire experiment. There was no feedback between the four rounds. Within each round, each pair engaged in a sequential game. After the four rounds of interaction, risk preferences as well as beliefs about player 1's behavior were elicited. The experiment was concluded with a questionnaire.

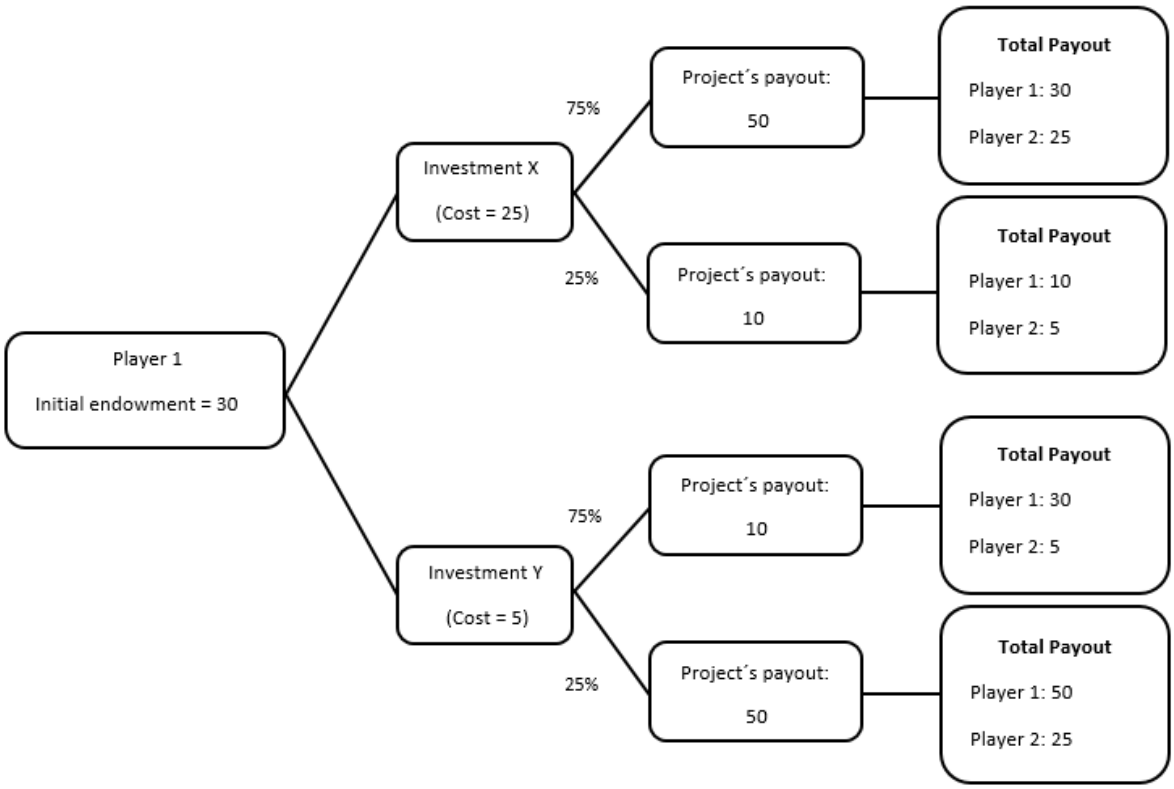
First mover decision: Player 1 made a decision akin to a two-player public good game where only player 1 could contribute. Specifically, player 1 received an endowment of 30 points from which he could choose to invest a high amount of 25 points or a low amount of only 5 points.[2] If the investment succeeded, the return of the project was high (= 50 points); if the investment failed, the return was low (= 10 points). With a probability of 75%, the chances for success were higher if player 1 chose the high investment compared to a 25% success probability if the low investment was chosen. In either case, the return of the project was split equally between both players. The first mover decision is depicted in Figure 1.

Second mover decision: After player 1 made his decision, player 2 received a separate endowment of 30 points and played a dictator game with player 1. In this game, player 1 took the role of the recipient, while player 2 had to decide how to allocate her endowment between herself and player 1. Here, any integer amount between 0 and

[2]The decisions were labelled neutrally, i.e. the high investment decision was called "Investment X" while the low investment was referred to as "Investment Y".

25 points was possible, i.e. the second player always kept 5 points to herself. Figure 2 summarizes the decision made by player 2.

Figure 1: Player 1 decision

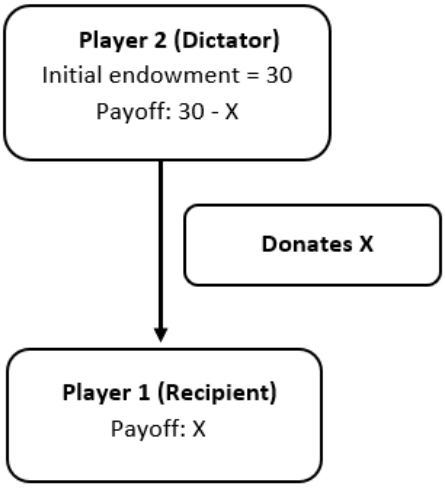


In each round, the payoff of player 1 equaled her endowment of 30 points *minus* the investment cost (high or low) *plus* half the realized return of the project *plus* the donation she received from player 2 in the dictator game. The round payoff of player 2 equaled half the return of the project *plus* her endowment from the dictator game endowment *minus* the donation to player 1.

Beliefs and risk preferences After the last round, we elicited subjects' beliefs about the investment decisions of player 1 as well as their risk preferences. Both tasks were incentivized, but only one was randomly determined to be payoff-relevant at the end of the experiment.

For a measure of beliefs of player 1's choices, subjects had to guess the proportion of first movers who chose the high cost investment in the first round. As this question refers to behavior in round 1 only, we mitigate the concern that beliefs are determined by experience made during the four rounds. Accuracy of the stated belief was incentivized through a linear scoring rule: a correct guess of the real proportion yielded a payoff of 15 points, any deviation reduced the payoff by 0.1 times the absolute deviation between the subject's guess and the true value.

Figure 2: Player 2 decision



In order to elicit risk preference we used a choice-list design. Subjects were confronted with a list of nine binary choices, out of which one was drawn to be payoff-relevant at the end of the experiment if the risk preferences were selected to be relevant for payment. In each choice, the subject had to decide between playing a lottery which delivered a payoff of either 10 or 0 points with a probability of 50% or selecting a secure payment. The secure payment varied from 1 points in the first binary choice to 9 points in the last binary choice. We use the first choice in which subjects chose the safe payment instead of playing the lottery as a measure for subjects' risk tolerance. If a subject chose the secure payment in the first decision, they were very risk averse, while they were risk seeking if they chose the lottery in the first eight decisions and switched to the safe payment only in the last row. [3]

Treatment variation: We implement two treatments FULLINFO and HIDDENINFO in a between-subjects design varying the availability of information about the first mover's investment choice to the second mover. Note that the availability of information is common knowledge, i.e. the first mover knows whether or not the second mover immediately observes his investment decision.

In the treatment with full information FULLINFO, the second player observes both the outcome as well as the first mover's investment decision. However, in order to obtain a within-subject measure of the effect of the investment decision on giving, we make use of the strategy method: observing the realized outcome, the second mover specified a donation for each possible investment decision of the first player — high or low. Hence, the second player made two allocation decisions stating how much she

[3] A screenshot of the decision situation is provided in Figure 10 in the Appendix.

would give to player 1. Which allocation decision was implemented depended on the first player's investment decision.

In the treatment with hidden information HIDDENINFO, the outcome of the first mover's investment choice was again directly observable to player 2. In contrast to the FULLINFO treatment, the second player did not make their allocation decision contingent on the first player's investment choice. While the second player did not observe the first player's investment decision upfront, she could click a button to reveal it at a payoff-irrelevant cost.[4] We implemented this small, payoff-irrelevant cost to capture the fact that information on the first mover's action is often available, yet it takes a negligible amount of effort to gather, which may be taken as an excuse to remain ignorant. Yet, player 2 could also refrain from revealing the first mover's choice and decide solely based on the outcome of the hidden investment decision.[5]

Payoffs: A subject's payoff from the experiment consisted of the payoff from one randomly selected round out of the four rounds of interaction in pairs plus the payment from either the belief elicitation task or the task measuring risk preferences. This payoff in points was converted into euros with an exchange rate of 1 point = 0.2 euros. In addition to the experimental payoff, each participant received a show-up fee of 5 euro.

Procedures: We collected data in 12 experimental sessions conducted in the experimental economics laboratory at TU Berlin and in seven sessions conducted in the PLEx laboratory at the University of Potsdam in February 2020. We ran five sessions of FULLINFO and 14 sessions of HIDDENINFO with 18 to 22 participants each. Note that the use of the strategy method in FULLINFO allowed us to run fewer sessions in this treatment. The total data set comprises decisions from 374 subjects such that the realized number of participants falls below our preregistered target sample size.[6] The Corona-related closure of the laboratories has prevented additional data collection.

The experiment was programmed in zTree (Fischbacher, 2007) and participants were recruited using ORSEE (Greiner, 2015). Assignment to treatments was random in the sense that participants who signed up for a session did not know which treatment would be run nor did they know what the experiment would be about. At the beginning of each session, subjects received detailed written instructions about the

[4]Clicking the button was associated with a cost of 0.1 Taler. With an exchange rate of 10 Taler to 2 Euros, the cost of revealing information was equal to 2 Cents. Subjects were informed in the instructions that their final earnings in Euros would be rounded up to the next 10 Cents. Since only one round was payoff-relevant, they could infer that the costs of clicking could not reduce their final payoff. However, even if they did not engage in these computations, they could see immediately that a cost of 0.1 Taler was very low.

[5]Screenshots of Player 1's and Player 2's decision situations both in FULLINFO and HIDDENINFO are reported in Figure 11, Figure 12 and Figure 13, respectively, in the Appendix.

[6]Link to preregistration: `https://www.socialscienceregistry.org/trials/5368`

experiment. A translation of the original German instructions is included in the Appendix The experiment only started once all participants had correctly answered a set of control questions. Sessions lasted approximately 60 minutes (including payment) and average payment was 15.20 €.

4 Behavioral Predictions

Following Brownback and Kuhn (2019), we analyze if the second player exhibits an outcome bias, i.e. if, given identical actions of the first player, she shares a larger part of her endowment with the first player if the investment was successful. Note that the success of the investment decision does not influence the sum the second player can split as she receives an independent endowment for her distribution decision. Given previous evidence, we formulate the following hypothesis:

Hypothesis 1. *Conditional on the investment decision, donations of player 2 in treatment* FULLINFO *are higher if the investment succeeds than when it fails (Outcome Bias).*

In light of an important strand of the literature focusing on the role of intentions in a two-person trust game (see for example McCabe et al. 2003, Toussaert 2017), we further investigate if the second player values good intentions. In particular, we hypothesize that, for identical outcomes, player 2 allocates a larger share of her endowment to the first player when he has chosen the costly investment option as opposed to an interaction with a first player who has chosen the cheap investment option.

Hypothesis 2. *Conditional on the realized outcome, donations in treatment* FULLINFO *are higher on average in decisions where player 1 has chosen a high investment than in those with a low investment (Rewarding Intentions).*

According to cognitive dissonance theory, agents suffer from situations with conflicting motives (Festinger, 1957). If the first player has chosen the expensive investment option, decision makers may experience a conflict between maximizing their own monetary payoff by keeping a large share of their endowment and reciprocating the prosocial behavior of the first player. When the first player's investment is hidden, however, they have a possibility to circumvent the potential cognitive dissonance: they can choose to remain ignorant about the first player's decision and thus maintain a positive self-image while acting egoistically. We therefore hypothesize that the average share of the endowment which the second player keeps for herself is larger under hidden than under full information. For the analysis we consider both behavior for low and high outcomes separately allowing us to detect potential asymmetries in willful ignorance.

Hypothesis 3. *Conditional on the realized outcome, donations in treatment* HIDDENINFO *are lower on average than those in treatment* FULLINFO *(Wiggling).*

Grossman and Van Der Weele (2017) and Kajackaite (2015) show both theoretically and empirically that less prosocial types sort into ignorance while highly prosocial types sort into being informed. In line with this literature, we investigate whether it is the more altruistic second players who reveal the first player's intention. We therefore compare the average donations of exogenously informed players in the full information treatment with willingly informed players in the treatment with hidden information. We also investigate whether it is the more selfish second players who avoid information on the first player's investment decision. We therefore compare the average donations of players in the full information treatment to the donations made by willingly uninformed players in the hidden information treatment. For this analysis we condition on the first player making the expensive investment decision while considering low and high outcomes separately (i.e. conditioning on both high investment and high outcome as well as high investment and low outcome).

Hypothesis 4. *Average donations by informed (uninformed) player 2 in treatment* HIDDENINFO *are higher (lower) than those by exogenously informed players 2 in treatment* FULLINFO.

Although our focus lies on the behavior of player 2, we also seek to investigate if the first player's investment decision depends on whether the second player directly observes his intention or needs to actively reveal his investment decision. If the first player expects the second player to be less generous in the dictator game under initially hidden information about his investment, he might refrain from incurring the higher investment costs to improve the second player's payoff from the first part of the game. Believing that the second player will use her initial ignorance as excuse to act selfishly, he will reciprocate expected egoism by choosing the cheap investment option. Hence, we expect to observe fewer choices of the high investment option under hidden information.

Hypothesis 5. *Player 1 chooses the high investment less frequently in* HIDDENINFO *than in* FULLINFO.

5 Results

Our sample consists of 374 subjects who made in total 1496 decisions. Summary statistics for our sample are given in Table 11 in the Appendix. 100 subjects took part in treatment FULLINFO and 274 in HIDDENINFO. Half of the subjects in either treatment made decisions in the role of player 1 and the other half in the role of player 2. For most of our analyses, we average decisions to the subject level because decisions of the

Table 1: Data structure for the decisions of player 2. The table contains information on the number of subjects in the role of player 2 who took at least one such a decision. Mean of the number of decisions taken by subjects is given in parentheses.

	investment failed	investment succeeded
FULLINFO		
strategy method for investments	48 (2.46)	40 (2.05)
HIDDENINFO		
low cost investment	133 (2.4)	79 (1.34)
high cost investment	29 (1.03)	70 (1.29)
total within treatment	135 (2.61)	107 (1.83)

same individual cannot be treated as independent observations. This implies that for most analyses, we have 187 observations for player 1 and 187 observations for player 2, with 50 in treatment FULLINFO and 137 HIDDENINFO. Due to the decisions made by player 1 and the randomness in the investment process, these do not split equally onto the four possible constellations of intention and outcome. Table 1 provides information on the number of subjects in the role of player 2 who took decisions for low and high outcomes and low and high investments of player 1, respectively.

5.1 Donation decision of player 2

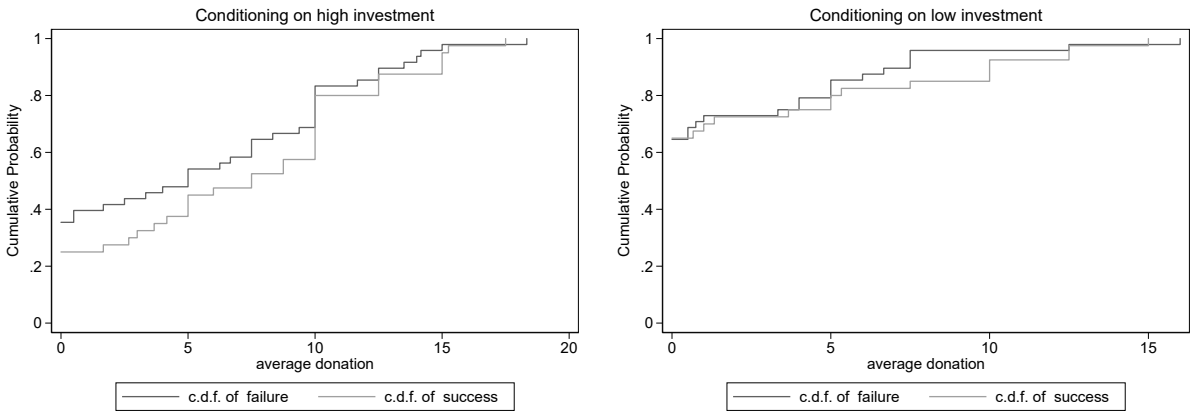
We study the behavior of player 2 who decides in a standard dictator game how much of her 30-point-endowment to give to player 1. Our analysis follows the structure set by our behavioral predictions. As the repeated decisions of a subject cannot be considered independent, we compute for each of the relevant outcome measures individual-level averages on the basis of all decisions that the individual took under the respective conditions. Specifically, if we want to investigate for instance donations conditional on a high and successful investment, we take, for each subject in the role of player 2, the average over all her donation decisions that were characterized by a high and successful investment of player 1. If not indicated otherwise, our analysis uses these individual-level averages as the unit of observation.

First, we analyze behavior in the treatment FULLINFO alone to investigate Hypothesis 1. Previous research showed that decision makers may suffer from an outcome bias: their actions rather respond to the observed outcome than incorporate information about actions and stochastic processes involved (Brownback and Kuhn, 2019). If this was true in our sample, then average donations in the treatment with full information should be higher if the investment succeeded than if it failed.

Out of 50 subjects in the role of player 2, 48 made at least one decision for a failed investment and 40 made at least one decision for a successful investment. Table 2

shows the average donation of subjects in the role of player 2 over all four rounds.[7] The raw data suggests that average donations respond both to the outcome and to the intention of player 1, but the difference with respect to intention is much larger than that with respect to the outcome.

As can be seen in Table 2, a success of the investment on average leads to an increase in the donation of about 0.5 Taler as compared to a failed investment in case of a low investment and to an increase of about 1.4 Taler in case of a high investment. In neither case, however, do we find the difference in donations to be statistically significant ($p > 0.22$ in a two-sided Wilcoxon rank-sum test).[8] A graphical investigation shows that the differences are consistent throughout the range of possible donations as the cumulative distribution function of donations exhibits a rightward shift for donations conditioning on a successful investment. Note that the changes are relatively small (see Figure 3). Hence, we conclude that our subjects do not show a significant outcome bias, in contrast to what we expected according to Hypothesis 1.



(a) Donations in FULLINFO conditional of a high investment.

(b) Donations in FULLINFO conditional of a low investment.

Figure 3: Cumulative distribution functions of player 2 donations in treatment FULLINFO split up by the size of player 1's investment and the realized outcome.

Result 1. *Player 2 does not show a strong outcome bias. Conditional on the investment decision, donations of player 2 in treatment* FULLINFO *tend to be higher for a successful than for an unsuccessful investment. The difference is not statistically significant.*

[7] As specified above, averages are computed at the individual level, conditioning on the type of investment chosen by the respective player 1 and on the outcome of the investment.

[8] We obtain essentially the same results if we restrict attention to those 38 subjects who made at least one decision for a successful investment and also at least one decision for a failed investment and use Wilcoxon signed-rank tests instead. In this subsample, average donations of player 2 are significantly more generous after a successful investment than after a failure in case of high cost investments (Wilcoxon signed-rank test, z=-2.497, p=0.013). Conditional on player 1 having chosen the low cost investment, however, we cannot reject equality of donations for the two possible outcomes (Wilcoxon signed rank test, z = -1.317, p = 0.188).

Table 2: Average donation of player 2 in treatment FULLINFO. Standard deviations in parentheses.

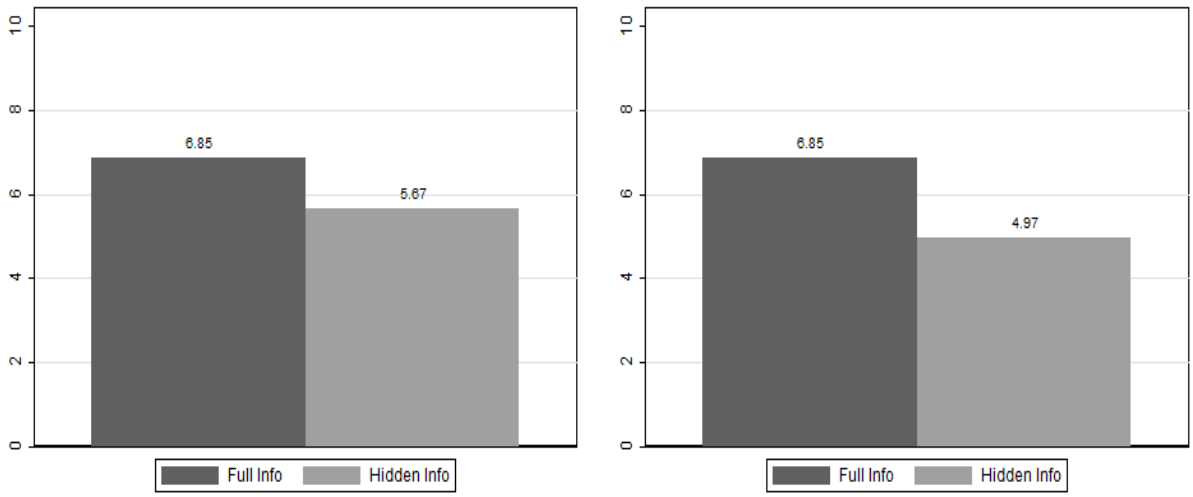
	investment failed	investment succeeded
low cost investment	1.93 (3.58)	2.49 (4.36)
high cost investment	5.46 (5.41)	6.85 (5.39)
N	48	40

As specified in Hypothesis 2, we expect subjects in the role of player 2 to be more generous when player 1 has chosen the high investment than if she has chosen a low investment. Indeed, when we investigate the influence of the first player's investment decision on donations, we observe that, on average, player 2 gives significantly more to player 1 conditional on the latter having chosen the high cost investment than conditional on the low cost one. The difference is substantial regardless of the success of the investment decision. Our sample contains decisions from 48 subjects where the investment of player 1 has failed and from 40 subjects where the investment of player 1 has succeeded. The average donation after a failed investment is 5.46 points conditional on a high cost investment and only 1.93 points conditional on the low cost one. The difference in donations is highly significant (Wilcoxon signed-rank test, $z = 4.43$, $p < 0.001$). Similarly, the average donation following a successful investment amounts to 6.85 points conditional on a high cost investment, but only 2.49 points conditional on a low cost one. Donation behavior is again highly significantly different (Wilcoxon signed-rank test, $z = 4.45$, $p < 0.001$). This difference is also apparent from a comparison of the right and left panel in Figure 3. Thus, our data support Hypothesis 2 that informed players reward high cost investments with an increase in their donation.

Result 2. *Player 2 rewards intentions. Conditional on the realized outcome, donations in treatment* FULLINFO *are significantly higher on average in decisions where player 1 had chosen a high investment than in those with a low investment. This holds both for successful and for unsuccessful investments.*

We now turn to our next question, whether individuals respond to the moral wiggle room created by the first player's decision being hidden. Specifically, we expect that subjects in treatment HIDDENINFO avoid learning about player 1's investment decision so as to justify on average lower donations that do not reward player 1's intentions. Note that the data from the full information treatment shows that in the presence of information, player 2 indeed strongly responds to player 1's intention so that there is room for moral wiggle room exploitation. To investigate the corresponding hypothesis 3, we compare donations conditional on the outcome and the investment between the treatments FULLINFO and HIDDENINFO. Note that we include both informed and uninformed players in the treatment with hidden information because the decision to

become informed is itself endogenous and will be analyzed separately. Here, we are interested in the aggregate effect, including also the possibility that subjects inform themselves before making their donation decision.



(a) N = 40 in FULLINFO and N = 70 in HIDDENINFO.

(b) N = 40 in FULLINFO and N = 100 in HIDDENINFO.

Figure 4: Mean donation conditional on high outcome in case of a high investment of player 1. In (a) the unit of observation is the subject-level average over all decisions where investment and outcome were high. In (b) the unit of observation is the subject-level average over all decisions where investment and outcome were high in FULLINFO and all decisions where the investment was not known to be low in HIDDENINFO.

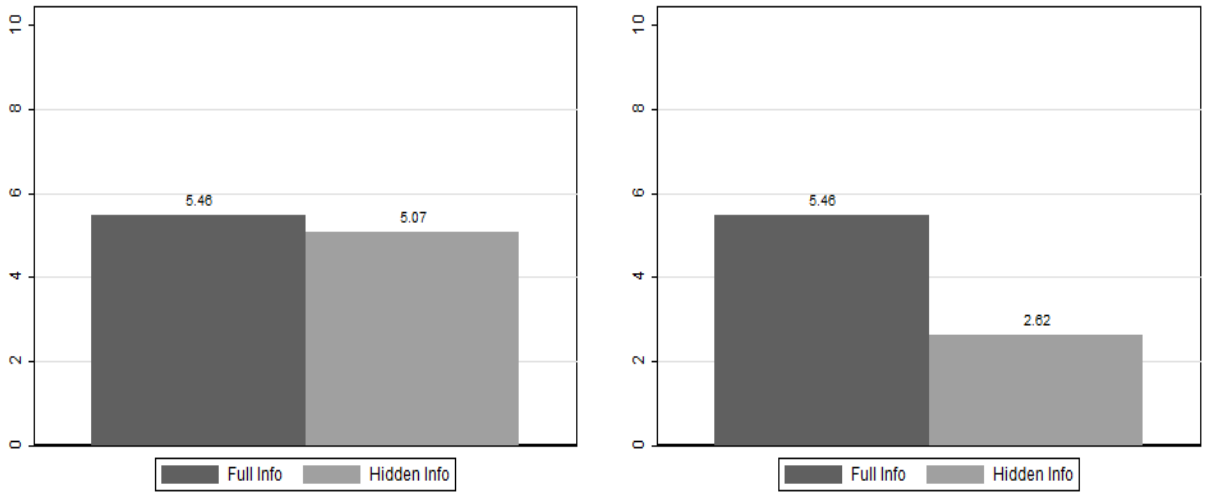
We have 40 subjects facing at least one situation with a *high* outcome in the full information treatment.[9] In the treatment with hidden information, we have 70 subjects who at least once faced a decision where the outcome realized was high and player 1 had chosen the high cost investment (see Table 1). These 110 subjects form the sample on which Figure 4a is based. It shows that, conditional on a high outcome and on player 1 having invested a high amount, donations are lower on average in the treatment where player 2 is by default uninformed about the investment behavior of player 1. The difference amounts to about 1 point, but it is not statistically significant, thus lending no support to Hypothesis 3.

One may argue, though, that subjects who remained uninformed about player 1's behavior should – in expectation – not differentiate between whether the actual investment was high or low.[10] Thus, we compute an alternative measure the HIDDENINFO

[9]Recall that, under full information, each second mover decides about her donation for both the low and the high cost investment option having been chosen by player 1. Thus, we have an observation for the constellation high outcome-high investment for each of these 40 subjects.

[10]The average donation of an uninformed player 2 conditional on a high outcome does not differ with the investment choice of player 1. In the subsample of 27 subjects who faced a high outcome both after a low and after a high investment (unknowingly though), the average donation is 4.55 with a low investment and 4.56 with a high investment ($p > 0.99$ in a two-sided Wilcoxon signed-rank test).

treatment, where we also include observations where player 2 faced a decision with a high outcome but – unknown to player 2 – player 1 had invested little. This allows us to analyze decisions of 100 subjects and, thus, substantially increases our sample for this test. For this larger sample, the average donation in the HIDDENINFO treatment drops further as compared to the first measure (see Figure 4b). In this comparison, donation behavior differs significantly between the two treatments (Wilcoxon rank-sum test, z = -2.060, p = 0.04). This result is consistent with the idea that some participants in the role of player 2 would have donated more if they had been informed about the high cost investment of player 1 but they instead decided to remain uninformed and donated little. This observation supports Hypothesis 3.



(a) N = 48 in FULLINFO and N = 29 in HIDDENINFO.

(b) N = 48 in FULLINFO and N = 135 in HIDDENINFO.

Figure 5: Mean donation conditional on low outcome in case of a high investment of player 1. In (a) the unit of observation is the subject-level average over all decisions where investment was high and outcome low. In (b) the unit of observation is the subject-level average over all decisions made where investment was high and outcome low in FULLINFO and all decision where the investment was not known to be high in HIDDENINFO.

Along the same line of thought, we find that participants in the role of player 2 facing a *low* outcome in the hidden information treatment appear to give similar amounts as do those subjects in the full information treatment if we condition on player 1 having made a high cost investment (see Figure 5a). Note, however, that only 29 subjects in the full information setting faced a low outcome combined with a high cost investment decision – this is by construction as a high investment makes the low outcome less likely. But this also means that this subsample may not be representative of how players in this situation decide. As argued above, subjects who only know the outcome of the investment but remain uninformed about player 1's investment decision should – in ex-

pectation – not differ in their donation behavior depending on player 1's investment.[11] Thus, we compute an additional measure for the treatment HIDDENINFO that allows us to also analyze behavior of all those players 2 who remained uninformed after a low outcome, even if in fact player 1 chose the low cost investment. If we include all these decisions in the analysis, we can compute average donations conditional on the low outcome for 135 subjects in the treatment HIDDENINFO. Strikingly, their average donation is only half of the average donation of subjects in the treatment HIDDENINFO who face a high cost investment and a low outcome (see Figure 5b). The difference in donation behavior is statistically significant ($z = -3.465$, $p < 0.001$, Wilcoxon rank-sum test) suggesting that, when faced with a low outcome, individuals, part of them avoiding information about the investment decision made by player 1, give less on average than they would if informed about player 1 behavior. This observation is in line with Hypothesis 3.

Result 3.A. *Conditioning on outcome and investment, donations of players 2 tend to be lower on average in treatment* HIDDENINFO *than in* FULLINFO. *The difference is not statistically significant.*

Result 3.B. *Conditioning on the outcome and the investment for all informed players 2 but only on the outcome for uninformed player 2s, donations are significantly lower on average in treatment* HIDDENINFO *than in* FULLINFO.

Hence, the above analysis suggests that there is a certain extent of moral wiggling in our data. It ignores, however, the fact that uninformed participants should expect a high cost investment only with a certain probability while our strategy method design of the full information environment implies that participants in FULLINFO will not factor in the probabilities of the respective situation being payoff-relevant. Thus, the data is not perfectly comparable across treatments and one might even argue that the preceding analysis is biased toward finding moral wiggling by design.

To investigate behavior in more detail and make the data from both treatments more comparable to each other, we next compute average donations in the treatment FULLINFO using the mean empirical frequency of high and low cost investments conditional on the outcome being low or high, respectively, from the treatment HIDDENINFO (see Table 3). This gives us a counterfactual decision from the treatment FULLINFO conditioning only on the outcome and comparable to the treatment HIDDENINFO insofar as the distributions of investments are made identical. We then compare this imputed counterfactual average donation from treatment FULLINFO with the

[11] Again, this also holds in our data. Among those 17 participants who made uninformed donation decisions after a low outcome in both a high and a low investment situation, donation behavior does not differ by player 1 investment ($p = 0.39$, a two-sided Wilcoxon signed-rank test). Using all 263 uninformed decisions after a low outcome, potentially multiple per subject, the difference remains insignificant ($p = 0.32$, two-sided t-test.)

Table 3: Conditional empirical frequencies of high and low cost investments conditional on a high and low outcome being observed in treatment HIDDENINFO. The second column indicates the percentage of decisions characterized by a high or low outcome.

	conditional frequency of high cost investment	percent of decisions
high outcome	0.46	64%
low outcome	0.09	36%

Table 4: Comparison between mean donation in HIDDENINFO and FULLINFO.

	Hidden Information	Full Information (imputed)	Overall
High outcome	4.79 (6.09)	4.49 (4.22)	4.71 (5.63)
N	107	40	147
Low outcome	2.76 (4.45)	2.23 (3.52)	2.62 (4.23)
N	135	48	183

Notes: We use the empirical distribution of high and low investments conditional on each outcome in HIDDENINFO to impute hypothetical means in FULLINFO that condition only on the outcome. Observations are averaged to the subject level, the number of observations differs from the number of subjects because some subjects faced only situations with high, respectively, low outcomes so that a decision for the opposite outcome is unavailable. Standard deviations in parentheses.

average donation observed in treatment HIDDENINFO that, by design, incorporates the same distribution of high and low cost investments conditional on either investment outcome (see Table 4). It turns out that the resulting distributions of donations are not statistically different from each other by treatment for either of the two possible outcomes (two-sided Wilcoxon rank-sum tests: $p = 0.35$ conditional on the low outcome and $p = 0.46$ conditional on the high outcome). Thus, using this approach, we find no evidence in favor of Hypothesis 3.

Result 3.C. *When we use the empirical frequency of investment decision conditional on a realized outcome to impute counterfactual donations for the* FULLINFO *treatment that condition only on the outcome, we find no evidence for differences in donations as compared to the treatment* HIDDENINFO.

Overall, we find at best weak evidence in favor of individuals exploiting the possibility to strategically avoid information about intentions to justify less generous donations. Thus, we conclude that our data do not support Hypothesis 3. Our various investigations in this issue suggest that part of the differences in behavior that we observe at the treatment level might be driven by differences in the empirical frequency of high and low cost investments. Further, differences in beliefs about those invest-

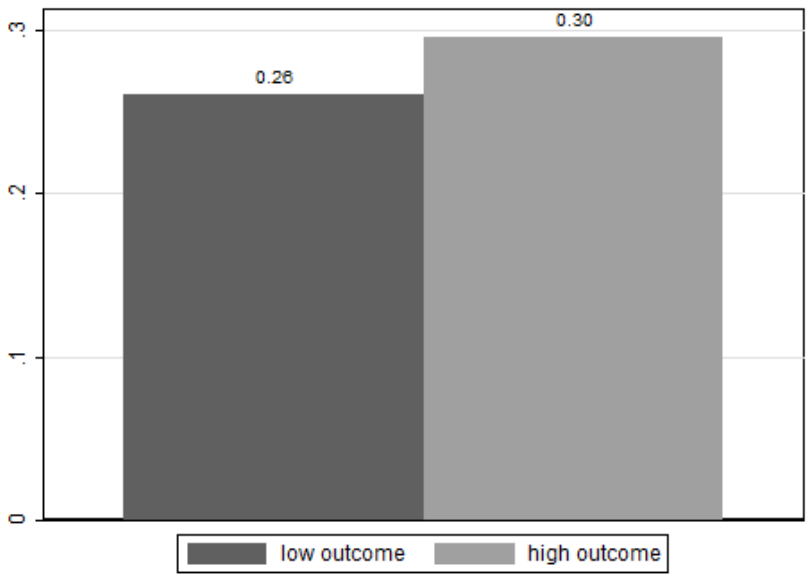


Figure 6: Average share of decisions in which player 2 chose to become informed.

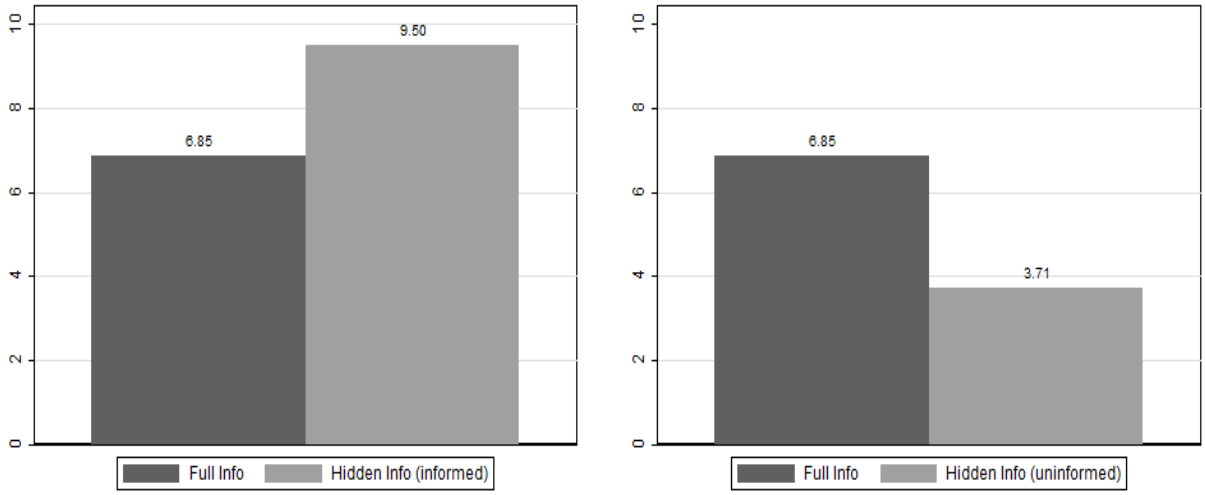
ment frequencies as well as in self-selection into information might play a role. We will turn to the role of the latter aspects in the following.

Next, we analyze the relation between the decision to become informed and donation behavior. If a low outcome was observed, player 2 chose to become informed about player 1's intention in only 26% of the decisions on average, i.e. in about one out of the four decisions that subjects made during the experiment. If the outcome was high, player 2 revealed the information in about 30% of the decisions and thereby in slightly more than one out of the four decisions (see Figure 6). As the standard deviations are large in both cases, we find no evidence that the information choices differ significantly from each other across the realized outcome ($N = 242$, $z = -0.403$, $p > 0.68$ in a two-sided Wilcoxon rank-sum test).[12] Note, however, that the direction of the difference speaks against a desire to avoid the information that player 1 chose a high investment, which is much more likely to be the case conditional on observing a high outcome.

We now compare average donations of exogenously informed players 2 in FULLINFO with willingly informed or uninformed players in the HIDDENINFO one. We perform the analysis conditioning on both high cost investment and high outcome (Figure 7) as well as on high cost investment and low outcome (Figure 8) to obtain as complete as possible a picture of behavior. Figure 7a shows that willfully informed players 2 in treatment HIDDENINFO reward high cost investment and high outcome with higher donations on average than those who are informed by default in the treatment

[12]The difference remains insignificant with $p = 0.6$ if we restrict attention to those 105 subjects who faced at least one decision with a high outcome and at least one with a low outcome and conduct a two-sided Wilcoxon signed-rank test.

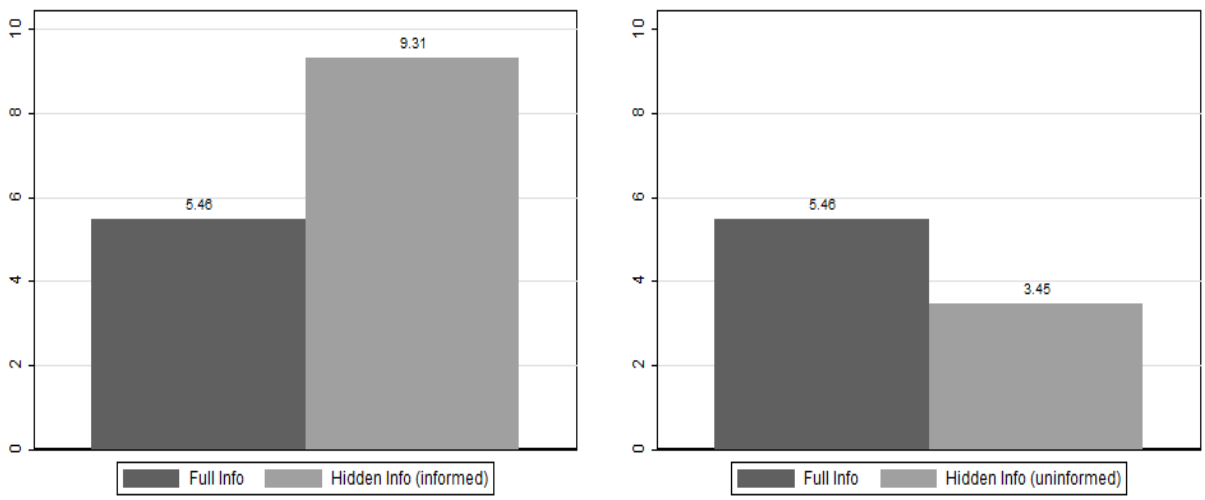
FULLINFO. In fact, the average donation for the former category is 9.49 points compared to 6.84 points for the latter (Wilcoxon rank-sum test, z = 1.652, p < 0.10).
We observe the reverse pattern for willingly uniformed players. Figure 7b shows that willfully uninformed players 2 in treatment HIDDENINFO reward high cost investment and high outcome with lower donations on average than those who are informed by default in the treatment FULLINFO. The average donation for the former category is 3.71 points compared to 6.84 points for the latter (Wilcoxon rank-sum test, z = -2.883, p < 0.01).



(a) N = 25 in HIDDENINFO and N = 40 in FULLINFO.

(b) N = 48 in HIDDENINFO and N = 40 in FULLINFO.

Figure 7: Mean donation conditional on high investment of player 1 and on high outcome having realized. In (a) the unit of observation is the subject-level average over all decisions where investment and outcome were high between treatment FULLINFO and informed players 2 in treatment HIDDENINFO. In (b) the unit of observation is the subject-level average overall decisions where investment and outcome were high between treatment FULLINFO and uninformed players 2 in treatment HIDDENINFO



(a) N = 8 in HIDDENINFO and N = 48 in FULLINFO.

(b) N = 21 in HIDDENINFO and N = 48 in FULLINFO.

Figure 8: Mean donation conditional on high investment of player 1 and on low outcome having realized. In (a) the unit of observation is the subject-level average over all decisions where investment was high and outcome was low between treatment FULLINFO and informed players 2 in treatment HIDDENINFO. In (b) the unit of observation is the subject-level average overall decisions where investment was high and outcome was low between treatment FULLINFO and uninformed players 2 in treatment HIDDENINFO

The data reveal a similar pattern for donation decisions following a low outcome. Willfully informed players 2 in treatment HIDDENINFO reward a high cost investment in case of a low outcome with higher donations on average than those who are informed by default in the treatment FULLINFO (Figure 8a). The average donation for the former category is 9.31 points compared to 5.46 points for the latter (Wilcoxon rank-sum test, z = 1.281, p = 0.200). The difference fails to reach significance though. This is likely driven by a lack of power in this test: In treatment HIDDENINFO, we have only 8 players who faced a low outcome and learned that player 1 had chosen the high cost investment. Not surprisingly, the difference goes in the opposite direction for those who avoid information. Willfully uninformed players 2 in treatment HIDDENINFO reward a high cost investment in case of a low outcome with on average lower donations than those who were informed by design in the treatment FULLINFO (Figure 8b). The average donation for the former category is 3.44 points compared to 5.46 points for the latter (Wilcoxon rank-sum test, z = -1.446, p = 0.148). Also in this case the difference fails to reach significance. In the HIDDENINFO treatment, we have 21 players who faced a low outcome and a high cost investment decision so that this lack of significance may be a result of the test not being well-powered.

In all our four analyses, the differences in donation behavior have the expected sign but they are not always statistically significant. Our results suggest that – regardless of

the outcome – informed (uninformed) players 2 in HIDDENINFO tend to reward good intentions of player 1 more (less) strongly than those participants who are informed by default in FULLINFO. This finding is consistent with the information choice representing a self-selection on social preferences, in line with Hypothesis 4.

Result 4. *Average donations by informed (uninformed) player 2 in treatment* HIDDENINFO *are higher (lower) than those by exogenously informed players 2 in treatment* FULLINFO *conditional on a high outcome. The differences go in the same direction conditional on a low outcome but are not statistically significant.*

5.2 Investment choices of player 1

We now turn to the behavior of player 1. We ask whether player 1's investment decision depends on its observability to the second player. In particular, we investigate whether player 1 makes different investment decisions in treatment HIDDENINFO where the investment decision is initially hidden, but can be revealed compared to treatment FULLINFO, where player 2 is perfectly informed. Table 5 shows the proportion of participants in the role of player 1 who chose the low and the high cost investment in each treatment.

Table 5: Fraction of high cost investments in investment decisions of player 1

Investment/Treatment	Hidden	Full	Total
high	21.9%	30.0%	24.1%
N	548	200	748

We hypothesize that the first player expects the second player's generosity to depend on the availability of information: under HIDDENINFO, player 1 anticipates that player 2 might avoid information about his investment choice and choose a low donation. For this reason, we expect player 1 to reciprocate this anticipated act of selfishness and choose the low cost investment more frequently under HIDDENINFO (see Hypothesis 5).

In a total of 748 investment decisions, player 1 chose to invest a high amount in 24.1% of the situations. Moreover, we indeed see a difference in the expected direction. The proportion of high cost investments amounts to 30% in treatment FULLINFO, while it is only 21.9% in HIDDENINFO. These two proportions differ significantly suggesting that player 1 indeed adjusts his investment decisions to player 2's information structure (Pearson χ^2 test, p = 0.022). However, while participants receive no feedback in between the four decisions and are never matched with the same partner twice, one

might worry that decisions made by the same subject are still correlated.[13] We therefore compute the average of all investment decisions for each of the 187 subjects in the role of player 1. A Wilcoxon rank-sum test shows that these individual averages in investments differ weakly significantly between treatments (z = -1.786 p = 0.074). As the influence of experience from previous rounds on the investment decisions may vary between the treatments, we also consider the investment decisions only from the first round. In round 1, the proportion of high cost investments is 40% in FULLINFO as opposed to 27% in HIDDENINFO. While the treatment effect appears to be of comparable size as when considering all four decisions, the difference fails to reach significance at conventional levels (Pearson χ^2 test, p = 0.109). In summary, our results tend to support Hypothesis 5 but are not conclusive.

Result 5. *Player 1 tends to choose the high investment more often if player 2 will be informed about the investment decision. The difference is not statistically significant.*

To further investigate the investment decisions of player 1 we perform a regression analysis that allows us to control for potentially confounding factors. For the sake of an easy interpretation of the coefficients, we estimate a linear probability model where the dependent variable takes the value one if player 1 chose the high investment and zero otherwise. Cluster-robust standard errors are reported below the coefficients. The results are depicted in Table 6.[14]

[13] A cluster-robust χ^2-test (Donner, 1989) yields a p-value of 0.112 suggesting only a weak difference between the treatments.

[14] The results are essentially unchanged if we run the regression with subject-level average investments instead. Results are reported in Table 12 in the Appendix. We also obtain very similar results if we estimate a probit or a logit model instead of the linear probability model. Given its simplicity, we chose to present results from the latter only. Results from the former are reported in the Appendix in Table 13 and 14.

Table 6: Probability of choosing player 1 choosing the high cost investment (LPM)

	(1) Investment	(2) Investment	(3) Investment	(4) Investment
Full Info	0.0810	0.0937*	0.0819**	0.0756*
	(0.0527)	(0.0501)	(0.0394)	(0.0433)
Age		0.0129**	0.00857**	0.00686
		(0.00593)	(0.00401)	(0.00421)
Male		0.0173	0.00616	0.0113
		(0.0436)	(0.0344)	(0.0362)
Econ		-0.0656	-0.0432	-0.0531
		(0.0488)	(0.0383)	(0.0391)
Period		-0.0460***	-0.0460***	-0.0343***
		(0.0109)	(0.0109)	(0.0112)
Belief			0.00667***	0.00652***
			(0.000680)	(0.000784)
Risk				0.00179
				(0.0152)
Constant	0.219***	0.0358	-0.123	-0.118
	(0.0257)	(0.146)	(0.104)	(0.143)
R^2	0.01	0.04	0.233	0.224
N	748	748	748	664
No. of subjects	187	187	187	166

Notes: Dependent variable is a dummy for player 1 choosing the high investment. Output from a linear probability model. Cluster-robust standard errors in parentheses (on subject-level).* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The model in column (1) regresses investment decisions only on a treatment dummy. In column (2), we control for age, gender, whether the subjects studies economics, and the round of decision making. In column (3), we additionally include the elicited belief about player 1's behavior and in column (4) we further control for the elicited risk measure.

The regression analyses confirm that subjects in the role of player 1 are about 7 to 9 percentage points more likely to choose the high cost investment in treatment FULLINFO than in treatment HIDDENINFO (see Table 6). The only regression in which the coefficient does not reach statistical significance is presented in column (1), where we regress investment decisions on a dummy for the full information treatment alone. However, the coefficient of the treatment dummy becomes significant once we control for a set of demographic controls and the round of the decision in column (2). The effect remains robust when we additionally include the elicited beliefs and risk preferences in columns (3) and (4).

While there is no significant correlation between risk preferences and investments, we find a significant positive correlation between the participant's belief about others in the role of player 1 choosing the high investment and their own choice of the high investment. This observation is consistent with a false consensus effect, which posits

that individuals expect others to behave in a way that resembles their own behavior. This effect is relatively large: on average, subjects whose guess of the proportion of others choosing the high investment in the first round is by 1 percentage point higher are about 0.6 percentage points more likely to invest a high amount themselves. Further, the significant coefficient on *Period* indicates that subjects are more likely to choose the high investment in earlier rounds and cease to invest the larger amount in later rounds.

5.3 Beliefs

After subjects had completed four rounds of investment and donation decisions, we elicited their beliefs about the share of first movers taking the more expensive investment decision in the first round. In the following, we analyze their beliefs with respect to treatment effects, biased beliefs and the interactions between beliefs and behavior.

First, we seek to detect potential treatment effects, i.e. we ask if beliefs are affected by whether the second player could immediately observe the first player's investment decision (see Figure 9). Both for subjects in the role of player 1 and in the role of player 2, the treatment did not affect their beliefs. In both treatments, subjects in the role of player 1 expect about 40% of the first movers to take the more costly investment decision. For the second movers, the belief in the treatment HIDDENINFO also equals 40%, while it is slightly higher in theFULLINFO one with 46%. This difference, however, is not significant at conventional levels (z = -1.320, p = 0.188, Wilcoxon rank-sum test).

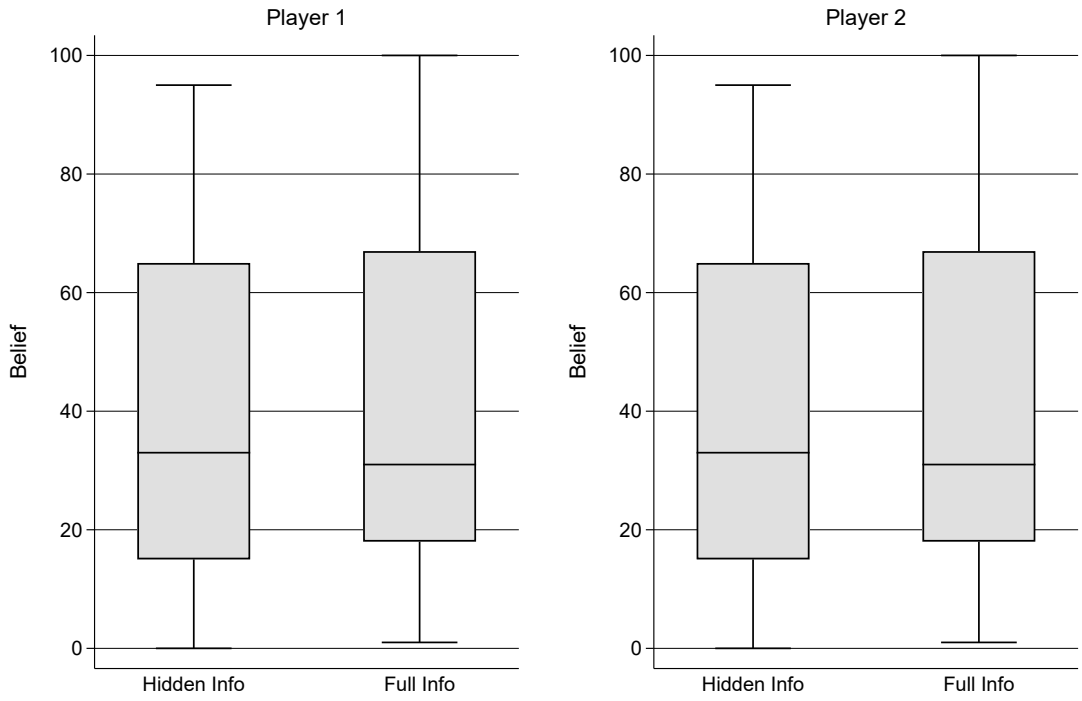


Figure 9: Beliefs, separating between role and treatment

No matter if in the treatment FULLINFO or HIDDENINFO, first movers who invested in the first period have a more positive view towards the share of investing first movers than those first movers who themselves did not choose the high cost investment. With investing first movers expecting 60.2% of the other subjects in the same role to invest, non-investing first movers expect only 30.4% of first movers to incur the higher investment cost. This difference is highly significant (z = -6.842, p < 0.001, Wilcoxon rank-sum test) and manifests itself in both treatment variations (61% vs. 26.7 in FULLINFO and 59.8% vs. 31.5% in the HIDDENINFO). Our regression results (see Table 7) support the above findings: the coefficient of the dummy variable depicting whether player 1 has chosen the costly investment in the first round is highly significant and positive, whereas the treatment dummy remains insignificant in predicting the beliefs of player 1. Hence, there is some evidence of a false consensus effect: subjects expect others to behave like they do, which might also be used as a strategy to justify their own decisions.

Table 7: Beliefs of first movers regarding investment decisions

	(1) No controls	(2) Controls
Investment	30.120***	30.576***
	(3.641)	(3.815)
Full	-2.560	-2.849
	(3.870)	(4.025)
Age		0.103
		(0.412)
Male		4.353
		(3.692)
Econ		1.420
		(4.592)
Constant	30.952***	25.802***
	(2.545)	(9.776)
R^2	0.244	0.251
N	187	187

Notes: Dependent variable is the belief regarding the share of first movers choosing the costly investment. Output from an OLS regression model. Cluster-robust standard errors in parentheses (on subject-level).* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The second player's decision to reveal information does not relate to their beliefs about the investment behavior as both uninformed and informed players share the same beliefs of about 40% investing first movers. This holds both within HIDDENINFO and across treatments. Hence, observed investment decisions do not induce subjects to alter their beliefs.

Furthermore, we ask how the second players' donations in the first round are affected by their beliefs about player 1's investment decisions (Table 8). Note that this part of the analysis only considers players who have decided to remain uninformed about the investment decision of the first player. We observe that subjects in the role of player 2 holding higher beliefs about the investment decision of player 1 donate significantly more. Splitting the observations into situations where the investment was successful and situations where the investment failed, we observe that this finding is driven by the beliefs held when the investment is unsuccessful. If the second player only receives 5 Taler from the project, she donates more to the first player when she holds a more positive belief. When the investment was successful, the donation decision is not affected by beliefs.

Table 8: Donations of second movers

	(1) all	(2) successful	(3) unsuccessful
Belief	0.041**	0.044	0.037**
	(0.017)	(0.048)	(0.017)
Age	0.291**	0.362	0.201
	(0.137)	(0.219)	(0.138)
Male	-0.782	-1.944	-0.989
	(1.097)	(2.248)	(1.096)
Econ	0.992	0.541	1.325
	(1.103)	(2.182)	(1.345)
Constant	-4.440	-3.651	-3.107
	(3.386)	(5.419)	(3.655)
R^2	0.126	0.154	0.152
N	96	32	64

Notes: Dependent variable is the donation of the second mover. Output from an OLS regression model. Cluster-robust standard errors in parentheses (on subject-level).* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To develop a feeling of the precision of the stated beliefs we compare the beliefs to the actual investment decisions of subjects in the role of player 1 in round 1 (see Table 9). Here, we analyze both aggregate behavior as well as beliefs held by informed and uninformed second movers separately. On the aggregate, we observe that players in the role of the second player tend to overestimate the share of players 1 who take the more expensive investment decision in treatment HIDDENINFO. Differentiating between informed and uninformed second movers, we observe that, independent of the outcome of the investment, informed players hold relatively precise estimates. Uninformed players, however, tend to overestimate the share of first movers incurring high investment costs when the investment fails. While only 12.5% of the first movers have invested, the second players believe that almost 40% have invested.

Table 9: Beliefs and investments

All investments	**All**	**Informed**	**Uninformed**
Investments	0.277	0.390	0.229
Beliefs	0.399	0.409	0.395
Successful investments			
Investments	0.500	0.600	0.438
Beliefs	0.461	0.561	0.399
Unsuccessful investments			
Investments	0.141	0.190	0.125
Beliefs	0.362	0.265	0.393

Finally, we ask how beliefs relate to the decision to reveal the first mover's investment decision in the first period (see Table 10). Considering both successful and unsuccessful investments within the same regression, we do not observe any correlation between beliefs and revelation decisions. Running a separate regression for each investment outcome, we find that, if the investment succeeds, second movers holding higher beliefs are more likely to reveal the hidden information. This effect, however, is only significant at the 10% level. Considering only unsuccessful investments, the belief-variable has a negative, significant coefficient, i.e. second movers with more optimistic beliefs are more likely to remain uninformed about the first mover's investment decision. Hence, there appears to be no evidence of strategic cynicism.

From the above, one might conclude that players remain ignorant to maintain their excessively positive beliefs which drive their donations. However, this is unlikely to be the case given that the donations of uninformed second movers are lower on average than those of informed players. Instead, they might decide to remain ignorant fearing that their positive beliefs might in fact be true and would force them to donate more. Hence, they seek to avoid certainty about the first mover's decision in order to be able to donate less.

Table 10: Beliefs and revelations

	(1) all	(2) successful	(3) unsuccessful
Belief	0.001	0.005**	-0.003**
	(0.001)	(0.002)	(0.001)
Age	-0.004	0.003	-0.016
	(0.009)	(0.014)	(0.011)
Male	0.171**	0.242*	0.082
	(0.082)	(0.133)	(0.104)
Econ	-0.031	-0.103	0.030
	(0.100)	(0.167)	(0.121)
Constant	0.287	-0.062	0.669**
	(0.247)	(0.403)	(0.291)
R^2	0.040	0.140	0.067
N	137	52	85

Notes: Dependent variable is a dummy variable for the decision to reveal the investment decision. Output from a linear probability model. Cluster-robust standard errors in parentheses (on subject-level).* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6 Conclusion

In sequential interactions, reciprocity may play an important role, i.e. the second mover may react to a pro-social act of the first mover with more generosity than to a selfish action. It may, however, be the case that the first mover has only limited control over the consequences of his action for the second player, since other, uncontrollable factors also play a role. When deciding how to react towards the first mover, the second mover thus has several options: she can put a higher weight on the outcome of the first mover's action, being more generous towards the first mover if the first mover's action resulted in a higher payoff for her irrespective of the reason behind the higher payoff – the first player's intention or luck. Yet she might also focus on the first player's intention and, independent of the outcome of the first mover's action, respond with more generosity when the first mover's intention was pro-social instead of selfish. So far, the literature has found evidence of the latter (Charness and Levine, 2007). However, the literature relies on the fact that the second mover observes both outcome and intention – an assumption which may be unrealistic in many situations. With this paper, we investigate the behavior of the second mover in sequential interactions when the first mover's intention is not immediately observable, but the second mover can gather information on the first mover's action. Furthermore, we ask if the behavior of the first mover changes with the visibility of his action.

We design a laboratory experiment to investigate how decision makers take into account the perceived intention of a first-moving partner varying the observability of

the first mover's intention. The first mover (player 1) decides whether to invest a low or a high amount into a project that yields a stochastic return equally shared by both partners. Investing a high amount is more expensive for player 1, but it also yields a high return with higher probability than investing only a low amount. While the second mover (player 2) is fully informed about both the intention and the resulting outcome in the full information treatment, she only observes the outcome, which can have obtained after either of the two investment options, in the hidden information treatment. However, she has the option to reveal the first player's action at no cost. In both treatments, the second mover decides how to split a fixed amount between herself and the first mover.

We are interested in the decision of player 2 about how much of her endowment to give to player 1. We find that player 2 reciprocates good intentions of player 1 if fully informed, i.e. player 2 gives more to player 1 if player 1 has chosen the high investment. The outcome of the investment, in contrast, only has a small effect on the second mover's choices. Hence, we find no evidence of an outcome bias. We further observe that reciprocal behavior after high investments is weakened if player 2 is uninformed about player 1's action by default. This suggests that ignorance about the first mover's intention may be used as an excuse to exhibit more selfish behavior and thus to exploit the resulting moral wiggle room. Note, however, that our results are not fully conclusive regarding the exploitation of moral wiggle room: when considering subject-level averages over all decisions where investment and outcome are high under full information and all decisions where the investment is not known to be low under hidden information, our results suggest that second movers exploit moral wiggle room. Yet, this finding in not robust to reweighting the observations to take the use of the strategy method into account.

We find strong evidence of self-selection into information: willingly informed second movers are more generous than second movers who immediately observe the first mover's action. In addition, second movers who remain uninformed exhibit less generous behavior towards first movers than exogenously informed second movers.

Moreover, we find that the first movers react to the fact that the second mover does not directly observe their action: anticipating that the ignorance may be used to justify selfish behavior on the part of the second movers, first movers choose the expensive investment option less frequently than in situations where the second movers always observe their actions. Hence, anticipated anti-social behavior provokes anti-social behavior in the first place.

Furthermore, we observe that first movers exhibit a false-consensus effect: those who act pro-socially also expect others to do so and vice versa. Interestingly, second movers believing that a larger share of first movers has acted pro-socially are less willing to reveal the first mover's action than second movers with less optimistic beliefs.

Taken together, our results show that, in sequential interactions, the first mover's intention has a large positive impact on the second mover's generosity. However, the observability of intentions plays an important role as intentions which are not immediately observable may have a twofold negative impact on pro-social behavior: first, second movers may remain ignorant about the intention and act more selfishly. Second, first movers anticipate this behavior and react by acting more selfishly themselves. Hence, in all sequential interactions, information on the first mover's behavior should be unavoidable to foster prosociality on both sides of the interaction.

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Appendix

A Instructions (translated from German)

Welcome to our experiment!

The experiment you will now participate in is designed to analyze economic decision making behavior. In this experiment you can earn money and the amount you will receive in the end depends on the decisions you and other participants make. The amount of your payout at the end of the experiment also depends on how well you have understood the following instructions. All statements in the instructions are true and the instructions are identical for all participants. Please read the instructions carefully now.

During the experiment you are not allowed to use electronic devices or communicate with other participants. Please use only the programs and functions intended for the experiment. Please do not talk to the other participants. If you have a question, please raise your hand. We will then come to you and answer your question in silence. Please do not ask your questions out loud under any circumstances. If the question is relevant for all participants, we will repeat it aloud. If you violate these rules, we will have to exclude you from the experiment and payout.

Please read these instructions carefully now. The instructions are identical for all participants.

Today's experiment consists of two parts. These instructions refer to the first part of the experiment. Instructions for the second part will be displayed on your screen once the first part is complete. The two parts are completely independent and your earnings from the experiment are calculated from your earnings in the two parts.

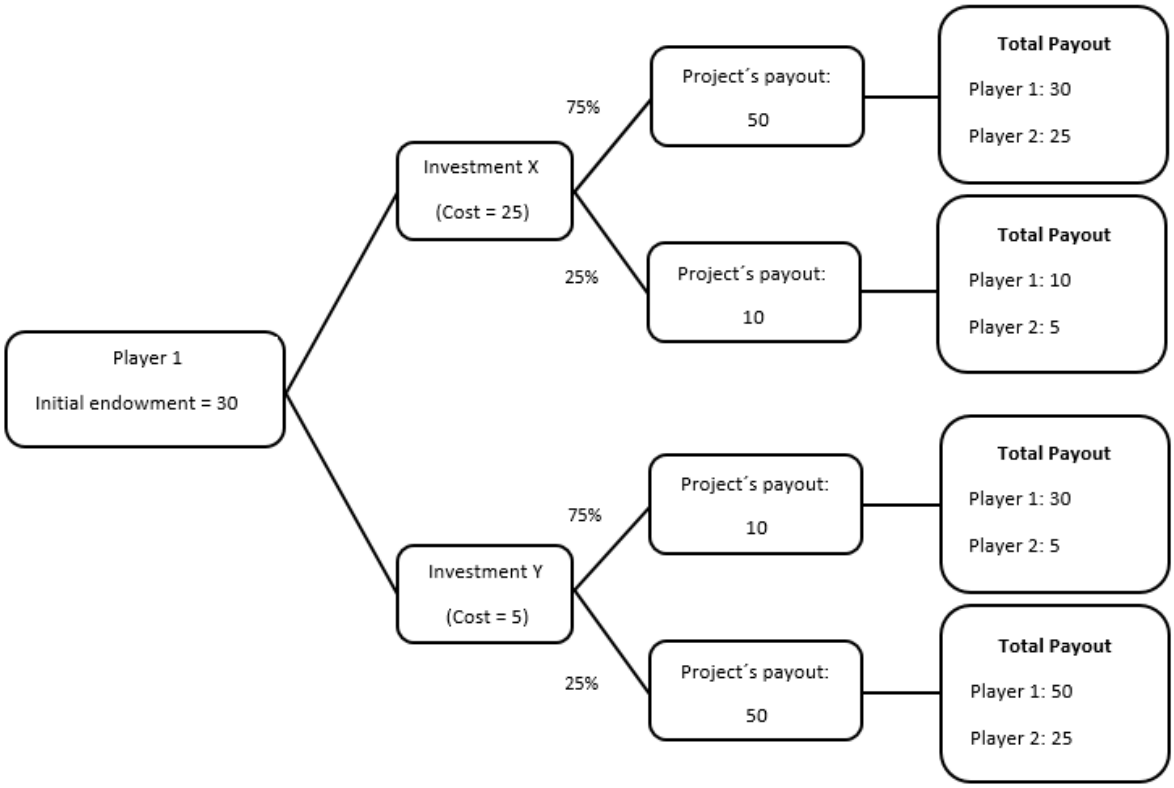
The first part of the experiment consists of 4 independent rounds. Only one of these rounds is relevant for payment. Which one it will be is determined randomly at the end of the experiment.

There are two types of players in the experiment, player 1 and player 2. Which role you play is determined randomly. You keep your role for all rounds of the experiment. You will be divided into groups of two, each consisting of player 1 and player 2. In each round, new groups of two are randomly formed, so you will only interact with the same player once. You will never know the identity of your fellow players. In each round, Player 1 decides first (Decision Phase 1), followed by Player 2 (Decision Phase 2).

Decision stage 1

Player 1 has an initial endowment of 30 Taler. From these 30 Taler he can invest either 5 or 25 Taler in a common project. This project affects the payouts of both players in a group of two, as the amount in the project is divided equally between both players. Player 1 can choose between two investment options. Both investment options can either succeed (50 Taler) or fail (10 Taler). They differ in the probability of success or failure. They also have different costs for player 1.

The investment opportunities for player 1 are as follows:



- **Investment X:** This investment costs player 1 25 Taler. With a probability of 75% it will be successful, i.e. it will lead to the high payout of 50 Taler from the project, with a probability of 25% it will fail (10 Taler).
- **Investment Y:** This investment costs player 1 5 Taler. With a probability of 25% it will be successful, i.e. it will lead to a high payout of 50 Taler from the project, with a probability of 75% it will fail (10 Taler).

Player 1 and Player 2 each receive half of the final amount in the project. If the investment was successful, each player gets 25 Taler, if it was not successful, each player gets 5 Taler from the project. Note that player 1 has kept either 5 Taler (Investment Y) or 25 Taler (Investment X) from his initial investment.

Decision stage 2

After Player 1 has made his investment decision for the joint project, it is Player 2's turn. Player 2 receives an amount of 30 Taler. This amount is independent of the payout from decision phase 1. 25 of these 30 Taler can be split between player 1 and himself. Any split is possible; he can, for example, keep the entire 25 Taler for himself, share them equally with player 1 (i.e. 12.50 Taler for each player) or transfer the initial endowment completely to player 1.

only in FULLINFO*:*
[Player 2 observes the result of the investment decision without knowing whether player 1 has chosen Investment X or Investment Y. Player 2 now makes two decisions: In case player 1 has chosen Investment X, he has to decide how he would divide the 25 Taler between himself and player 1. He also has to decide how he would split his 25 Taler if player 1 chose Investment Y. After he has made both decisions, it is resolved which decision player 1 has actually made. The actual decision determines which of the decisions is implemented by player 2.]

only in HIDDENINFO*:*
[Player 2 only observes the result of the investment decision, but not whether player 1 has chosen Investment X or Investment Y. However, he has the possibility to change the investment by clicking the button "Decision Player 1" to find out if player 1 has chosen Investment X or Investment Y. The click costs 0.1 Taler. Player 2 can also make his distribution decision without informing himself about the decision of player 1.]

Payout

The payout of the two players from a round is calculated as follows:

- Player 1: Initial equipment - investment costs + payout from the project + payout from the distribution decision of player 2
- Player 2: Payout from the project + payout from own distribution decision

After player 2 has made his distribution decision, new groups of two are formed and a new independent round (consisting of an investment decision and a distribution decision) begins. At the end of the experiment, one of the 4 rounds is randomly selected by drawing a card from a deck. Only this round from part 1 is relevant for payment.

For the first part of the experiment, an exchange rate of 0.2 Taler to Euro applies, i.e. 10 Taler equal 2 Euro.

Your income from the experiment is calculated from your income from the first part of the experiment plus your income from the second part of the experiment plus a fixed payment of 5 Euro for participating.

In order to minimize the effort needed for payout at the end of the experiment, we round up your income from each part of the experiment to the next 10 cent amount.

The experiment is concluded with a questionnaire. Afterwards, each player will receive his payout privately and in cash.

Screenshots of the main decision screens

Figure 10: Risk preferences elicitation task

Lottery decision number	Payoff from lottery	Choose whether you want to play the lottery (yes) or **not** (no))	**Payoff** if lottery is **not** played
1	50%: **10**; 50%: **0**	Yes ○ ○ No	**1**
2	50%: **10**; 50%: **0**	Yes ○ ○ No	**2**
3	50%: **10**; 50%: **0**	Yes ○ ○ No	**3**
4	50%: **10**; 50%: **0**	Yes ○ ○ No	**4**
5	50%: **10**; 50%: **0**	Yes ○ ○ No	**5**
6	50%: **10**; 50%: **0**	Yes ○ ○ No	**6**
7	50%: **10**; 50%: **0**	Yes ○ ○ No	**7**
8	50%: **10**; 50%: **0**	Yes ○ ○ No	**8**
9	50%: **10**; 50%: **0**	Yes ○ ○ No	**9**

Continue

Figure 11: Player 1's main decision screen

You have an endowment of **30** Taler. Please decide between Investment X and Investment Y:

		Project	Your payoff	Payoff of Player 2
Investment X (Costs = 25 Taler)	With a probability of **75%**	**50**	**30**	**25**
	With a probability of **25%**	**10**	**10**	**5**

		Project	Your payoff	Payoff of Player 2
Investment Y (Costs= 5 Taler)	With a probability of **25%**	**50**	**50**	**25**
	With a probability of **75%**	**10**	**30**	**5**

Your decision: Investment X Investment Y

Figure 12: Player 2's main decision screen FULLINFO

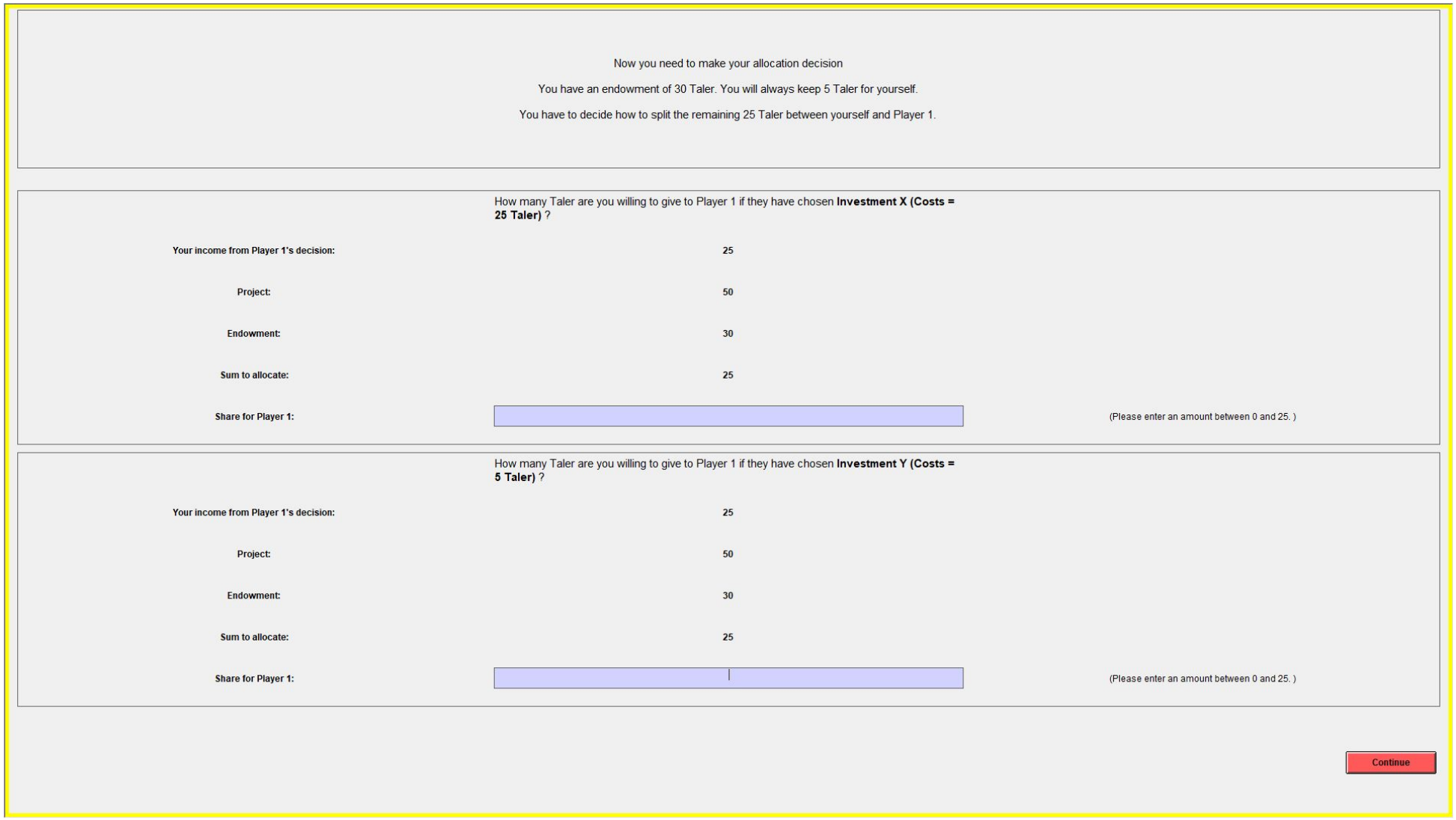


Figure 13: Player 2's main decision screen HIDDENINFO

Instructions for the second part of the experiment (displayed on screen)

In the following, you will make two decisions of which one will be payoff-relevant. Which one it is will be communicated at the end of the experiment.

Task 1

In this task, your decision will only affect your own payoff. The exchange rate from Taler to Euro is 0.2, i.e. 10 Taler correspond to 2 Euros.

Imagine there are 100 players of Type 1. In your opinion, how many players decided in favor of Investment X in the first round of the experiment?

If your estimate is correct, you will receive 15 Taler. If your estimate deviates from the correct number, you will lose 0.1 Taler per incorrectly estimated person.

Please decide now. If something is unclear, please raise your hand and we will come to you.

Task 2

In this task, your decision only affects your own payoff. Your payoff depends on your own decision and (potentially) a randomly drawn number. The exchange rate from points to Euro is 0.5, i.e. 2 points correspond to 1 Euro.

This task consists of a sequence of decisions to play or not to play a lottery. With a probability of 50% the lottery yields a payment of 0 points; with a probability of 50% it yields a payment of 10 points. If you decide against playing the lottery, you will receive a certain payment. This certain payment varies across the different decisions. In the first decision, it is 1 point, in the last decision, it is 9 points. For each decision, you can find the certain payment below.

If this task is chosen to be payoff-relevant, first a line will be determined randomly. Each line has the same probability of being chosen. Your decision for this line will implemented. If you have chosen the certain payment, you will receive it. If you have chosen the lottery, it will be played and you will receive 0 or 10 points, each with the same probability.

If something is unclear, please raise your hand and we will come to you.

B Supplementary analysis

Table 11: Descriptive statistics

Table 11: Descriptive Statistics

variable	#obs.	mean	sd	min	max
Female	374	0.45	0.50	0	1
Male	374	0.53	0.50	0	1
Age	374	23.2	4.67	17	55
Trust	374	1.47	0.62	0	3
Field==Management and Economics	374	0.20	0.40	0	1
Field==Social Sciences	374	0.094	0.29	0	1
Field==Engineering Sciences	374	0.28	0.45	0	1
Field==Education Sciences	374	0.021	0.14	0	1
Field==Law	374	0.064	0.25	0	1
Field==Psychology	374	0.0053	0.073	0	1
Field==Natural Sciences	374	0.13	0.33	0	1
Field==Sports	374	0.056	0.23	0	1
Field==Medicine	374	0.011	0.10	0	1
Field==Other	374	0.14	0.35	0	1

Notes: Subjects self-classified as Male, Female, Diverse, or other so that shares of male and female subjects do not add up to 100%. The variables *Trust* is the average of three trust-related survey questions which are all coded such that the least trusting answer is 0 and the most trusting is 3; specifically, the questions used are the following: Trust1: In general you can trust people. Answers coded from 0=fully disagree to 3=fully agree; Trust2: Nowadays, you can't rely on anybody. Answers coded from 0=fully agree to 3=fully disagree; Trust3: It's better to be cautious before trusting strangers. Answers coded from 0=fully agree to 3=fully disagree.

Table 12: Mean frequency of player 1 choosing the high cost investment

	(1)	(2)	(3)	(4)
Full Info	0.0810	0.102*	0.0889**	0.0824*
	(0.0508)	(0.0518)	(0.0410)	(0.0453)
Age		0.0145***	0.00940**	0.00764*
		(0.00518)	(0.00412)	(0.00438)
Male		0.0131	0.00372	0.00948
		(0.0453)	(0.0358)	(0.0393)
Econ student		-0.0684	-0.0455	-0.0545
		(0.0551)	(0.0437)	(0.0477)
Belief			0.00663***	0.00649***
			(0.000638)	(0.000702)
Risk				0.00217
				(0.0122)
Constant	0.219***	-0.114	-0.255**	-0.222*
	(0.0263)	(0.124)	(0.0992)	(0.120)
R^2	0.01	0.06	0.418	0.391
N	187	184	184	163

Notes: Dependent variable is the individual share of high cost investments in the four investments decisions of player 1. We estimate a OLS model. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 13: Probability of choosing player 1 choosing the high investment (Probit model)

	(1)	(2)	(3)	(4)
Full Info	0.0810	0.0927*	0.0818**	0.0785*
	(0.0526)	(0.0507)	(0.0391)	(0.0435)
Age		0.0115**	0.00656*	0.00477
		(0.00509)	(0.00338)	(0.00344)
Male		0.0180	-0.000416	0.00736
		(0.0438)	(0.0343)	(0.0351)
Econ		-0.0683	-0.0364	-0.0449
		(0.0522)	(0.0402)	(0.0416)
Period		-0.0458***	-0.0461***	-0.0348***
		(0.0107)	(0.0105)	(0.0108)
Belief			0.00584***	0.00556***
			(0.000518)	(0.000576)
Risk				-0.000176
				(0.0128)
N	748	748	748	664
No of subjects	187	187	187	166

Notes: Dependent variable is a dummy for player 1 choosing the high cost investment. We report average marginal effects from a probit model. Cluster-robust standard errors are in parentheses (on subject-level). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 14: Probability of choosing player 1 choosing the high investment (Logit model)

	(1)	(2)	(3)	(4)
Full Info	0.0810	0.0941*	0.0768*	0.0725
	(0.0526)	(0.0505)	(0.0405)	(0.0459)
Age		0.0118**	0.00660*	0.00478
		(0.00497)	(0.00337)	(0.00346)
Male		0.0178	0.00101	0.0101
		(0.0438)	(0.0356)	(0.0368)
Econ		-0.0681	-0.0372	-0.0479
		(0.0531)	(0.0419)	(0.0442)
Period		-0.0459***	-0.0459***	-0.0343***
		(0.0108)	(0.0108)	(0.0111)
Belief			0.00570***	0.00540***
			(0.000535)	(0.000592)
Risk				0.000589
				(0.0137)
N	748	748	748	664
No of subjects	187	187	187	166

Notes: Dependent variable is a dummy for player 1 choosing the high cost investment. We report average marginal effects from a logit model. Cluster-robust standard errors are in parentheses (on subject-level). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Ignorance, Intention and Stochastic Outcomes

Abstract
Intentions play a fundamental role in many situations characterized by nonsimultaneous interaction from principal-agent settings in firms to the international task of protecting the environment and the climate. We experimentally investigate how decision makers (DMs) respond to perceived intentions of a matched partner and a stochastic, imperfectly informative outcome when choosing a reciprocating action. We vary if the DM observes their partner's action or only the outcome before taking their own decision. Observing no evidence of an outcome bias, we find that the DM reciprocates good intentions under full information. However, reciprocity of DMs is lower in the treatment where information on the partner's action is hidden. Our analysis suggests that this is driven by the partners' behavior. DMs select into being informed or uninformed based on their inclination to behave more or less prosocially. While information avoidance is frequent, we do not find evidence for moral wiggling. In line with the absence of moral wiggling, an analysis of subjects' beliefs speaks against strategic cynicism.

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