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## Ignorance, Intention and Stochastic Outcomes

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# Ignorance, Intention and Stochastic Outcomes\*

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## Abstract

In sequential interactions, both the first mover's intention and the outcome of his choice may influence the second mover's action. While outcomes are typically observable, intentions are more likely to be hidden, leaving potential wiggle room for the second mover when deciding on a reciprocating action. We employ a controlled experiment to investigate how intentions and outcome affect second mover actions and whether second movers use hidden information as an excuse to behave more selfishly. We find that second movers react both to the intention of the first mover and to the achieved outcome when they are fully informed about both, but the effect is stronger for intentions than outcomes. When intentions are not revealed by default, second movers select into information based on their inclination to behave more prosocially. While information avoidance is frequent and selfishness is higher with hidden information, we do not find evidence of a strategic exploitation of moral wiggle room.

*JEL Classification:* D91, C91

*Keywords:* information avoidance, dictator game, public good game, moral wiggle room, intentions, reciprocity

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# 1 Introduction

For a long time, classical economic theory centered around the benchmark of the *homo economicus*, a perfectly rational selfish individual. More recently, a large literature shows that individuals do not just care about their own payoffs but exhibit other-regarding preferences. However, when given the opportunity to justify selfish behavior, they may make use of this moral wiggle room to maintain a positive self-image although they act egoistically (Grossman and Van Der Weele, 2017; Bénabou and Tirole, 2011). While pro-social behavior as well as potential deviations from pro-sociality are thoroughly investigated 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. Inspired by the literature on strategic ignorance, we developed a new design that limits the observability of the first player's action, thereby introducing a potential excuse for selfish behavior of the second player while also adding realism to the setting.

Examples of sequential interactions with potentially hidden information are widespread. Consider, for instance, the following standard employment situation that arises in principal-agent settings in firms: an employee can work hard to make a project succeed or he can be rather lazy. In both cases, other uncontrollable factors also determine the success of the project. Hence, even if the employee puts a lot of effort into the project, it may fail. Similarly, if he does not try hard, it may still be the case that he is lucky and the project succeeds. Observing only whether the project succeeded or not, the boss needs to determine the employee's bonus payment. To do so, she can either try to find out how much effort her employee exerted or she can determine the bonus payment without knowing if her employee worked hard. Remaining ignorant about the exerted effort, she may create some wiggle room to justify a lower bonus payment: in case of a negative outcome, she can attribute it to the potential lack of the employee's effort, while in case of a success, she could claim that luck, not effort was the main driving factor behind the outcome.

We conducted a laboratory experiment that was designed to investigate an abstract version of the above-described situation. 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 (he) 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 or fails is influenced by the invested amount. Hence, the action of the first mover yields a stochastic outcome that alone does not reveal the chosen action. We alter the information that is available to the second player (she) in a between-subject design: she either observes both the first player's investment decision

— his intention — and the payoff of the project — the outcome — (FULLINFO) or only the outcome (HIDDENINFO). 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. We further investigate whether 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 hidden by default than if she is fully informed. In addition, we analyze whether the first player reacts to the difference in information available to the second player, which would be rational given our expectation that second players would behave more selfishly if information is hidden.

Our results confirm previous findings on the importance of intentions for behavior and partially on an outcome bias. When the second player observes both intention and outcome, 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 (Result 1). 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 (Result 2). This is consistent with player 2 showing an outcome bias as in [Brownback and Kuhn \(2019\)](#) for a high investment but not after a low investment. We conclude that the first player’s intention has a larger effect on the second player’s decision than the outcome of his investment decision – a result that is in line with the one in [Charness and Levine \(2007\)](#).

In contrast to a large literature, we find no evidence in support of Hypothesis 3 that the second player will exploit the moral wiggle room provided by the intention being hidden. In contrast, donations under full information are comparable to those from the treatment where information is hidden by default (Result 3). Still, we observe that the decision to become informed correlates with donation behavior in the expected way. Those subjects who self-select into being informed as players 2 in treatment HIDDEN-INFO donate more to player 1 than subjects who are player 2 in the FULLINFO treatment when confronted with a successful investment. We do not find statistically significant differences for informed players facing a failed investment and not for decidedly uninformed players in comparison to those who are informed by default (Result 4).

Finally, even though subjects in the role of player 1 choose the more expensive investment option less frequently when the outcome of their decision is initially hidden and needs to be actively revealed by the second player than when it is immediately observable, we cannot confirm that this difference is statistically significant (Result 5).

Thus, first movers do not appear to anticipate that second movers might react with information avoidance and lower donations to the possibility of avoiding information about their investment decision. While we did not expect this result, it is consistent with the fact that we do not find significant evidence for player 2 exploiting the moral wiggle room provided by the treatment HIDDENINFO.

An additional analysis of the beliefs that participants hold about the share of first movers choosing the costly investment reveals a false consensus effect (Ross et al., 1977). 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. Furthermore, we observe that second movers are on average too optimistic. When we analyze beliefs in more detail, we observe that for second movers in HIDDENINFO who remained uninformed donations correlate positively with the expected share of investing first movers.

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 player 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 that our experiment includes, thus 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) study 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. (2020) 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. \(2020\)](#) 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 closer to 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.<sup>1</sup> 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, with existing experimental work highlighting 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](#); [Feiler, 2014](#); [Grossman, 2014](#)), strategic ignorance and the exploitation of moral wiggle room are also observed in trust games ([Regner, 2018](#)), donations to charity ([Exley, 2016](#)), and contributions to carbon offsets ([Lind et al., 2019](#); [Momsen and Ohndorf, 2020](#)). Interestingly, they are not only observed in situations characterized by *ex-ante* uncertainty about the recipient's payoff but also when *ex-post* information about the recipient's true needs is obscured ([Kandul, 2016](#)). The discrepancy in average behaviors is 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

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<sup>1</sup>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](#)).

of appropriate behavior – but choose more selfish actions otherwise, thus avoiding the ask (Lazear et al., 2012; Andreoni 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. In the latter case, she might exploit her ignorance by choosing a more egoistic action than under full information. Furthermore, we investigate how the second mover’s potential ignorance influences the first mover’s decision in the sequential interaction.

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.<sup>2</sup>

**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.<sup>3</sup> 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

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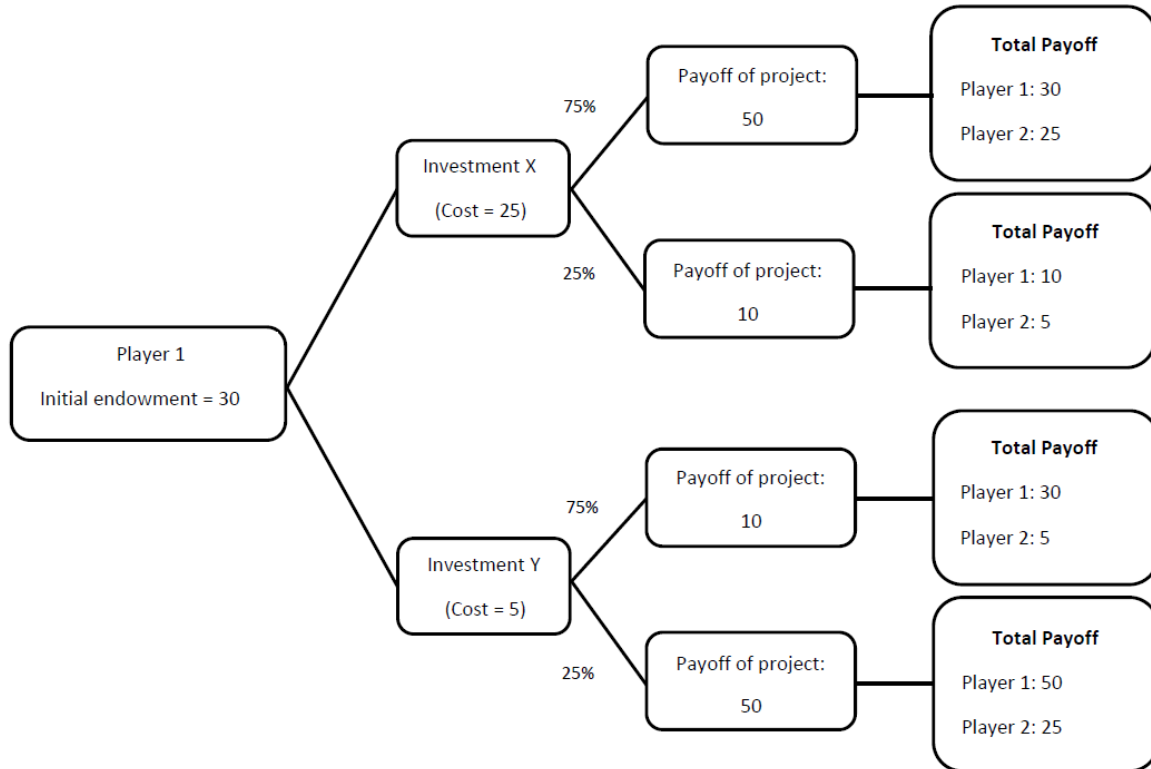
<sup>2</sup>In addition to demographical variables, we also elicited data on the subjects’ political preferences and their views regarding trust and trustworthiness. For time reasons, we could only conclude about half of our sessions with the complete questionnaire. Hence, in our analysis, we do not consider those variables where information is lacking for half of the subjects.

<sup>3</sup>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”.



either case, the return of the project was split equally between both players. The first mover decision is depicted in Figure 1.

Figure 1: Player 1 decision



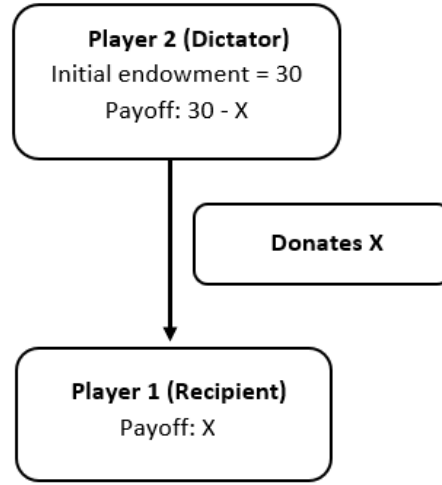
**Second mover decision:** After player 1 made his decision, player 2 received a separate endowment of 30 points and played a dictator game with player 1. In this game, player 1 took the role of the recipient, while player 2 had to decide how to allocate her endowment between herself and player 1. Here, any integer amount between 0 and 25 points was possible, i.e. the second player always kept 5 points to herself. Figure 2 summarizes the decision made by player 2.

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.



Figure 2: Player 2 decision



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.

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 that 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.<sup>4</sup>

**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 infor-

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<sup>4</sup>A screenshot of the decision situation is provided in Figure 7 in the Appendix.

mation 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 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.<sup>5</sup> 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.<sup>6</sup>

**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

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<sup>5</sup>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.

<sup>6</sup>Screenshots of Player 1’s and Player 2’s decision situations both in `FULLINFO` and `HIDDENINFO` are reported in Figure 8, Figure 9 and Figure 10, respectively, in the Appendix.

treatment.<sup>7</sup> The total data set comprises decisions from 374 subjects such that the realized number of participants falls below our preregistered target sample size.<sup>8</sup> The closure of the laboratories as part of the measures against COVID-19 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 experiment. A translation of the original German instructions is included in Appendix C. 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

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

Following Brownback and Kuhn (2019), we further 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 2.** *Conditional on the investment decision, donations of player 2 in treatment FULLINFO are higher if the investment succeeds than when it fails (Outcome Bias).*

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

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<sup>7</sup>A power analysis can be found in Section B in the Appendix.

<sup>8</sup>Link to preregistration: <https://www.socialscisceregistry.org/trials/5368>

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 the 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. Therefore, we 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 (Exploitation of Moral Wiggle Room).*

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. Thus, we 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. Therefore, we 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 HIDDEN-INFO 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.*

Table 1: Data structure for the decisions of player 2. Number of subjects in the role of player 2 who took at least one of the described decisions. Average number of decisions taken by a subject 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)
either type of investment	135 (2.61)	107 (1.83)

## 5 Results

Before analyzing our data, let us briefly describe our data structure: our sample consists of 374 subjects.<sup>9</sup> 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. This yields 187 observations for player 1 and 187 observations for player 2, with 50 for each type of player in treatment FULLINFO and 137 in treatment HIDDENINFO. As described in Section 3, each player took four decisions so that we have in total 1496 decisions. Since decisions taken by same individual cannot be treated as independent, we average decisions to the subject level for most parts of our analysis. When averaging, we condition on the relevant properties of the decision situation. Specifically, due to the decisions made by player 1 and the randomness in the investment process, the same player 2 will face different decision situations and we will only pool like decisions.

Table 1 provides information on the number of subjects in the role of player 2 who took decisions for low and high outcomes, as well as low and high investments of player 1, respectively. To better understand the numbers in the table, let us focus on the subjects in the HIDDENINFO treatment facing a failed investment. Out of the 187 subjects in the role of player 2 in treatment HIDDENINFO, 135 took at least one decision where the investment of player 1 had failed. Of these subjects, each took on average 2.61 decisions of this type. Thus, 133 subjects were at least once in a situation where the low cost investment had failed and 29 faced a situation where the high cost investment had failed at least once. Note that player 2 may or may not have known about the investment decision of player 1 depending on her decision to learn or to avoid this information.

<sup>9</sup>Descriptive statistics for our sample are given in Table 11 in the Appendix.

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

## 5.1 Donation decision of player 2

For the analysis of the donation and investment decisions, we start with the donation decisions and proceed backwards to the investment decisions. Hence, our analysis follows the structure set by our behavioral predictions. For the donation decisions, subjects in the role of player 2 decide in a standard dictator game how much of their 30-point endowment to give to player 1. By design, they always keep 5 points of their endowment. Hence, for this analysis we focus on the 25 points that they can split between themselves and player 1. As the repeated decisions of a subject cannot be considered independent, we compute individual-level averages for each of the relevant outcome measures 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. Unless explicitly stated otherwise, our analysis uses these individual-level averages as the unit of observation.

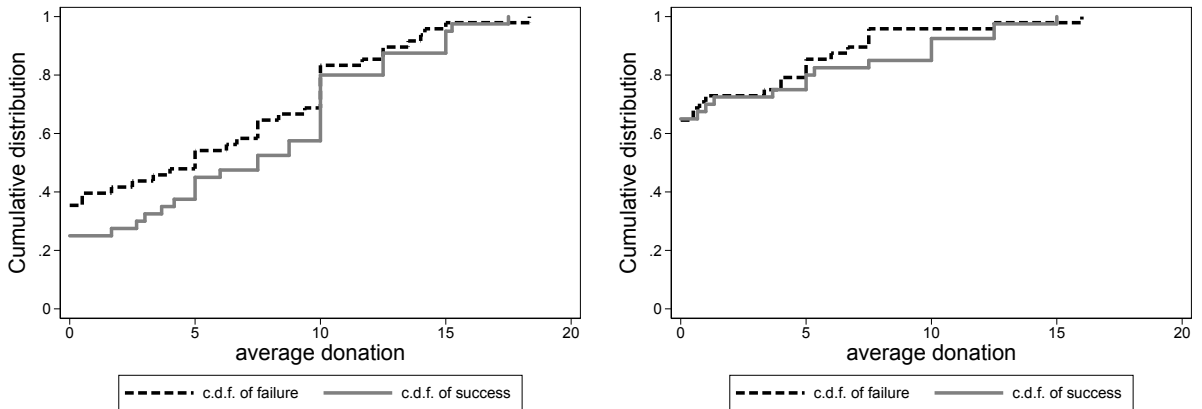
First, we analyze behavior in the treatment FULLINFO alone to investigate Hypothesis 1, which states that subjects in the role of player 2 will be more generous when player 1 has chosen the high investment than when she has chosen a low investment. Table 2 shows the respective average donation of subjects in the role of player 2 over all four rounds.<sup>10</sup> 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. 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

<sup>10</sup>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.

points conditional on the low cost one. The difference in donations is highly significant (two-sided Wilcoxon signed-rank test,  $z = 4.43$ ,  $p < 0.001$ ) and amounts to player 2 reimbursing player 1 for 17.7% of the cost difference. 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 (two-sided Wilcoxon signed-rank test,  $z = 4.45$ ,  $p < 0.001$ ) and the difference corresponds to 21.8% of the cost difference (see Table 2). Thus, our data support Hypothesis 1 that informed players reward intentions in that they respond to high cost investments with an increase in their donation.

**Result 1.** *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.*

Next, we turn to Hypothesis 2, which states that, conditional on the investment decision, donations of player 2 in treatment FULLINFO are higher when the investment succeeds than when it fails. Out of the 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 respective average donations. The raw data shows that donations are on average higher after a successful investment than after a failed investment, but the difference is relatively small with an average increase of about 0.5 Taler in case of a low investment and about 1.4 Taler in case of a high investment. Figure 3 illustrates that the differences are consistent throughout the range of possible donations: the cumulative distribution function of donations exhibits a rightward shift for donations conditioning on a successful investment but the effect appears to be much smaller for the low investment.



(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.



Table 3: Player 2 donations conditional on player 1 investment decision

	High investment		Low investment	
	(1)	(2)	(3)	(4)
Success	1.2461*	1.0271*	0.4648	0.3136
	(0.4992)	(0.4904)	(0.6089)	(0.5831)
Period		-0.2803		-0.1936
		(0.1673)		(0.1412)
Constant	5.2366***	6.0271***	1.7919***	2.3381***
	(0.2047)	(0.4622)	(0.2497)	(0.3950)
$R^2$	0.0026	0.0058	0.0069	0.0082
N	200	200	200	200
No. of subjects	50	50	50	50

*Notes:* Dependent variable is player 2 donation conditional on the investment decision of player 1 being *high* in columns 1 and 2, and *low* in columns 3 and 4. Output from fixed effects regressions. *Success* is a dummy for the investment having been successful. In columns 2 and 4, we control for a potential time trend by including the variable *Period*, which runs from 1 to 4. Robust standard errors are in parentheses.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

To formally test Hypothesis 2, 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 the signed-rank test. We find that average donations of player 2 are significantly more generous after a successful investment than after a failure in case of high cost investments (two-sided Wilcoxon signed-rank test,  $z = -2.497$ ,  $p = 0.013$ ). However, conditional on player 1 having chosen the low cost investment, we cannot reject equality of donations for the two possible outcomes (two-sided Wilcoxon signed-rank test,  $z = -1.317$ ,  $p = 0.188$ ). To address concerns that the non-parametric test may lead to a biased result, we also use a regression-based approach to investigate the outcome bias.<sup>11</sup> To account for the repeated nature of decision making, we estimate a fixed-effect regression.<sup>12</sup> The regression results in Table 3 are in line with those from the non-parametric test: donations are higher on average when a high investment was successful than when it failed. Conditional on a low investment, however, donations do not differ significantly with the outcome of the investment. Including a time trend reduces the coefficient on the *Success* dummy suggesting that time does affect behavior but the coefficient of *Period* does not reach statistical significance. We conclude that our

<sup>11</sup>There are two possible concerns: First, the signed rank test excludes observations from 12 subjects who made decisions only one of the two possible investment outcome. Second, subjects take four subsequent decisions and the averages may hide a time trend that might be problematic if a) first movers becomes less likely to choose a high investment over time such that second movers are more likely to see a low outcome in later rounds and b) second movers become less generous in later rounds.

<sup>12</sup>A Hausman test does not reject the hypothesis that differences between coefficients from fixed and random effects estimations are unsystematic.

subjects exhibit an outcome bias only in the case of a high investment but not in the case of a low investment, partially supporting Hypothesis 2.

**Result 2.** *Conditional on a high investment by player 1, donations of player 2 in treatment FULLINFO are significantly higher for a successful than for an unsuccessful investment. Conditional on a low investment, player 2 donations do not differ significantly with the investment outcome.*

We now turn to the next question, whether individuals exploit the moral wiggle room created by the first player's decision being hidden. 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 a potential benefit from avoiding knowledge about intentions. We investigate the corresponding Hypothesis 3 by comparing donations between the treatments FULLINFO and HIDDENINFO. We are interested in the aggregate effect, including also the possibility that subjects inform themselves before making their donation decision and, therefore, include both informed and uninformed players in the analysis.

Note that donations in FULLINFO are elicited for both high and low investments using the strategy method for a given outcome but not so in HIDDENINFO. Thus, the data structure differs by treatment and we must take care to make data comparable. In treatment HIDDENINFO, uninformed participants who face a given outcome should expect a high and a low cost investment 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. Specifically, given that a high investment has a success probability of 75% and a low investment one of only 25%, the expected probability of a high investment having been undertaken given that the outcome was high and a prior about the probability of player 1 choosing the high investment of  $p$  is given by  $P(\text{high inv.} \mid \text{success}) = \frac{p \cdot 0.75}{p \cdot 0.75 + (1-p) \cdot 0.25}$ . To make the data from both treatments comparable to each other, we 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 4). The imputed average donation from treatment FULLINFO and the average donation observed in treatment HIDDENINFO, by design, incorporate the same distributions of high and low cost investments conditional on either investment outcome and allow us to compare donations condition on outcomes alone across treatments.

Table 4: Conditional empirical frequency of high investment in HIDDENINFO.

	Cond. frequ. of high investment	Percent of decisions
High outcome	0.46	64%
Low outcome	0.09	36%

Table 5: Average donations in HIDDENINFO and FULLINFO.

	Hidden Info	Full Info (imputed)
High outcome	4.79 (6.09)	4.49 (4.22)
N	107	40
Low outcome	2.76 (4.45)	2.23 (3.52)
N	135	48

*Notes:* We use the empirical distribution of high and low investments conditional on each outcome in HIDDENINFO from Table 4 to impute hypothetical means in FULLINFO. Observations are subject level averages. Standard deviations in parentheses.

Table 5 shows that average donations tend to be higher in HIDDENINFO than FULLINFO for both low and high outcomes but the raw differences are not statistically different from zero for either of the two possible outcomes (two-sided Wilcoxon rank-sum tests:  $z = -0.941$ ,  $p = 0.35$  conditional on the low outcome and  $z = -0.733$ ,  $p = 0.46$  conditional on the high outcome). Thus, we find no evidence in favor of Hypothesis 3.

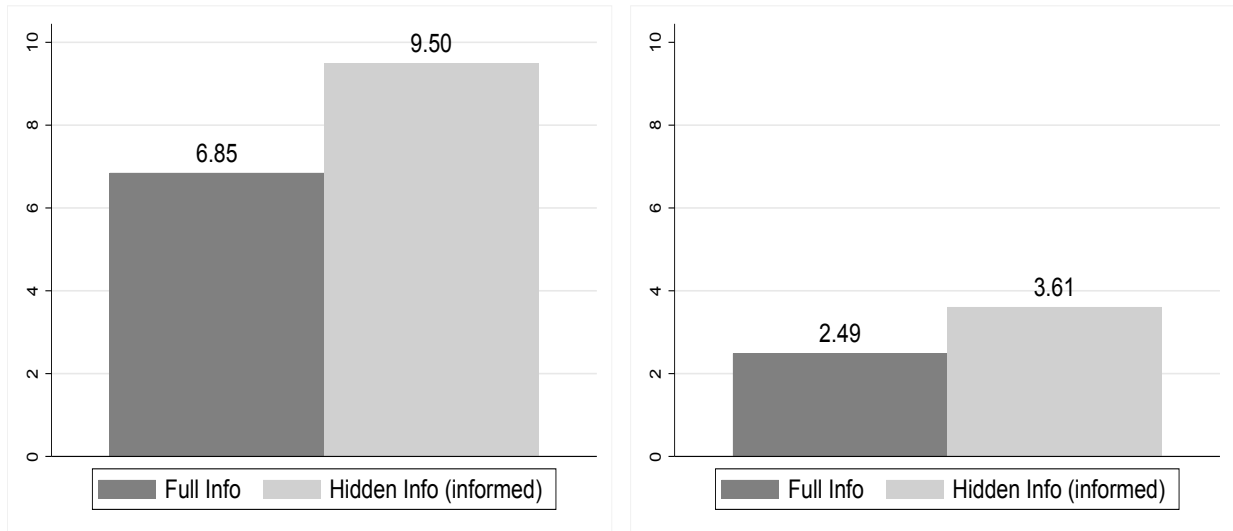
**Result 3.** *We find no evidence that donations in treatment HIDDENINFO are lower on average than donations in FULLINFO.*

Next, we analyze the relation between the decision to become informed and donation behavior. We note that the vast majority of decisions were made while uninformed. 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. The standard deviations are large in both cases and 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).<sup>13</sup>

We first compare average donations of exogenously informed players 2 in FULLINFO with willingly informed players in HIDDENINFO. We perform the analysis for all pos-

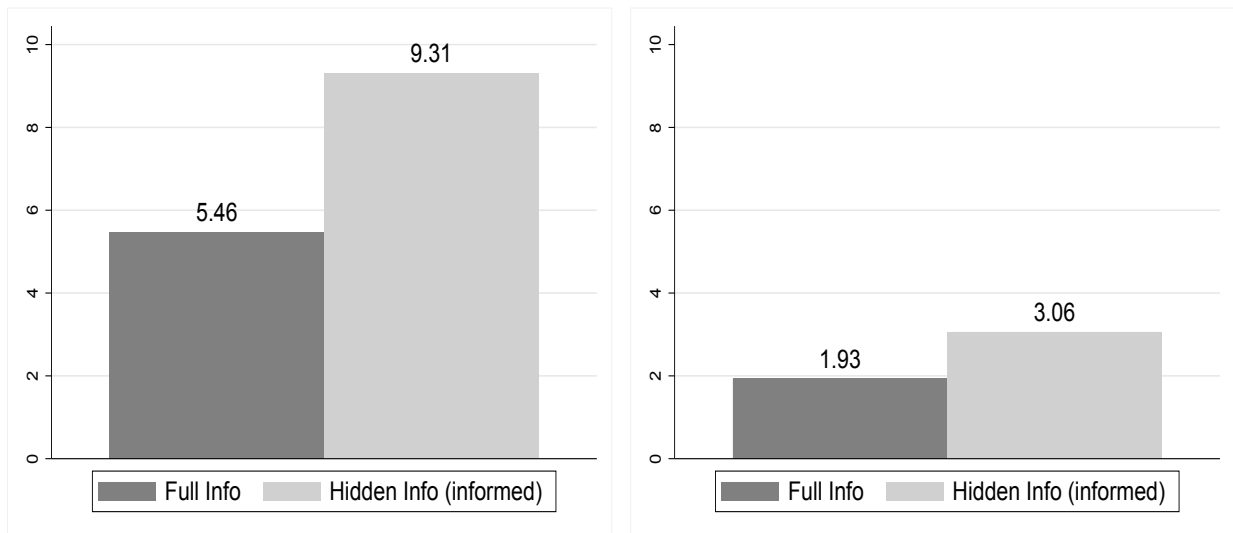
<sup>13</sup>The difference remains insignificant with  $p = 0.6$  if we restrict attention to those 105 subjects who faced at least one decision with a high outcome and at least one with a low outcome and conduct a two-sided Wilcoxon signed-rank test.

sible constellations of investment and outcome to obtain as complete as possible a picture of behavior. Figures 4a and 4b show that willfully informed players 2 in treatment HIDDENINFO give, on average, more after a high outcome than those who are informed by default in FULLINFO, independent of the investment decision of player 1. The differences are not statistically significant (two-sided Wilcoxon rank-sum test in case of a high investment:  $z = 1.652$ ,  $p = 0.099$ ; in case of a low investment:  $z = 0.687$ ,  $p = 0.492$ ).



(a) High investment succeeds.  $N = 40$  in FULLINFO and  $N = 25$  in HIDDENINFO.

(b) Low investment succeeds.  $N = 40$  in FULLINFO and  $N = 23$  in HIDDENINFO.



(c) High investment fails.  $N = 48$  in FULLINFO and  $N = 8$  in HIDDENINFO.

(d) Low investment fails.  $N = 48$  in FULLINFO and  $N = 46$  in HIDDENINFO.

Figure 4: Mean donation after successful and unsuccessful investments in treatment FULLINFO and for informed players 2 in treatment HIDDENINFO. (a) After high investment that succeeded, (b) after low investment that succeeded, (c) after high investment that failed, (d) after low investment that failed.

Table 6: Player 2 donations conditional on player 1 investment decision

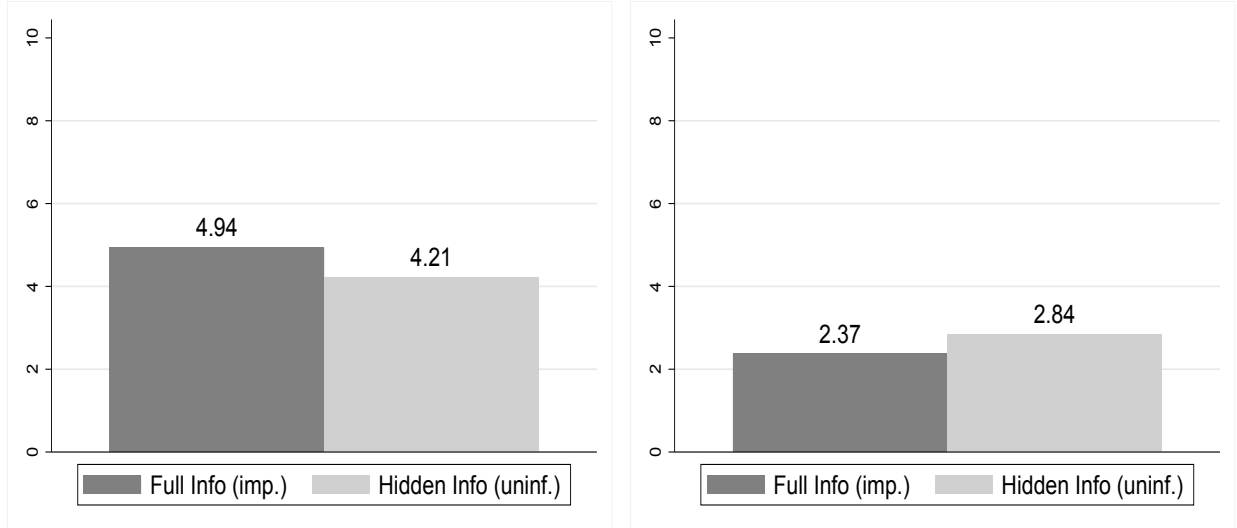
	High investment		Low investment	
	(1)	(2)	(3)	(4)
Full	-3.3608** (1.1858)	-3.0204* (1.2316)	-1.0586 (0.7858)	-1.1255 (0.7932)
Success		1.1234 (1.1000)		0.5523 (0.8032)
Constant	9.4540*** (1.0113)	8.6030*** (1.3103)	3.2432*** (0.5883)	3.0591*** (0.6473)
$R^2$	0.0632	0.0714	0.0116	0.0146
N	121	121	157	157

Notes: Dependent variable is player 2 donation conditional on the investment of player 1 being *successful* in columns 1 and 2, and having *failed* in columns 3 and 4. The unit of observation is the subject-level average over all respective decisions for all players 2 in FULLINFO and for all informed players 2 in HIDDENINFO. *Full* is a dummy taking the value 1 for observations in treatment FULLINFO and 0 for those in HIDDENINFO. *Success* is a dummy for the investment having been successful. Standard errors in parentheses.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

A similar picture obtains after a failed investment. Figures 4c and 4d show that willfully informed players 2 in treatment HIDDENINFO give on average more after a failed investment than those who are informed by default in FULLINFO. Again, the differences are not statistically significant (two-sided Wilcoxon rank-sum test in case of a high investment:  $z = 1.281$ ,  $p = 0.200$ ; in case of a low investment:  $z = 0.666$ ,  $p = 0.505$ ). However, we have relatively few observations in each of these cases. We repeat the analysis by pooling data conditional on a high respectively low investment over both possible outcomes. Results from a regression analysis that also allows us to control for the realized outcome are shown in Table 6. We find that, conditional on a high investment, willingly informed players choose higher donations than those who are informed by default, on average. The p-value for the estimated coefficient on FULL equals 0.0052 in column (1) and 0.0157 in column (2). Thus, the result remains significant if we use the Holm-Bonferroni method and test with a threshold of  $0.05/3=0.0167$  to account for the fact that this is the third test that we use three different approaches to test the hypothesis that donations are higher with full information for the case of a high investment. We find no significant difference after a low investment.

We observe a different pattern for willingly uniformed players. To compare donations of uninformed players to those from FULLINFO, we must use a different approach for comparison because we cannot reasonably condition on the investment decision of player 1 because this remains unknown to player 2 if she remains uninformed. Each uninformed player 2 might be facing a player 1 who has chosen the high investment or



(a) Successful investment.  $N = 40$  in FULLINFO and  $N = 68$  in HIDDENINFO. (b) Failed investment.  $N = 48$  in FULLINFO and  $N = 92$  in HIDDENINFO.

Figure 5: Mean donation after successful and unsuccessful investments in treatment FULLINFO (imputed with investment distribution from HIDDENINFO) and for uninformed players 2 in treatment HIDDENINFO. (a) After successful investment, (b) after failed investment.

the low investment with probabilities that differ with the observed outcome. In contrast, a player 2 in treatment FULLINFO can condition her donation on the investment decision of player 1 and she knows that her decision will only become relevant if player 1 has actually chosen the respective investment. Thus, as in the analysis of Hypothesis 3, we compute a weighted average of player donations in FULLINFO that uses the frequencies of investments in HIDDENINFO to analyze how decisions vary with treatment if the only difference was the information.

Figure 5a shows that when observing a high outcome, i.e. a successful investment, willfully uninformed players 2 in treatment HIDDENINFO choose slightly lower donations than those who are fully informed and, in addition, condition on the chosen investment by player 1 in FULLINFO. The average donation for the willfully ignorant players is 4.21 points compared to 4.94 points for the latter. We cannot reject the null hypothesis that donations are equal (two-sided Wilcoxon rank-sum test,  $z = -1.591$ ,  $p = 0.112$ ). Not surprisingly, the difference goes in the opposite direction after an unsuccessful investment. Willfully uninformed players 2 in treatment HIDDENINFO give an average of 2.84 points after a low outcome, while we compute that informed players would give an average of 2.37 points after a low outcome for the same underlying distribution of investments (see Figure 5b). Again, we cannot reject the null hypothesis that donations are equal (Wilcoxon rank-sum test,  $z = -0.968$ ,  $p = 0.333$ ).

To summarize, we find that, in all of the analyses, the differences in donation behavior have the expected sign but they largely fall short of statistical significance. We

Table 7: Fraction of high cost investments in investment decisions of player 1

	Hidden	Full	Total
High investment	21.9%	30.0%	24.1%
N	548	200	748
No. of subjects	137	50	187

find that, only conditional on a high outcome, players who self-select into information behave more generously than those who are informed by default. Conditional on a low outcome, we do not find evidence for systematic differences in the donations of willingly informed players. Nor do we find evidence that those who self-select into remaining uninformed choose more selfish donations than those who decide under full information in the strategy method.

This finding does not support the idea that the avoidance of information represents a negative self-selection. Instead, we only find partial evidence for those players who choose to become informed being positively selected on prosociality as they give more after a high outcome. Thus, the results are in line with Hypothesis 4 for self-selectedly informed players only.

**Result 4.** *Average donations by informed players 2 in treatment HIDDENINFO are higher than those by exogenously informed players 2 in treatment FULLINFO conditional on a high outcome. We do not find significant differences for informed players conditional on a low outcome or for uninformed players.*

## 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 whether it is automatically disclosed to player 2 as in FULLINFO or is initially hidden but may be revealed by player 2 as in HIDDENINFO. We expected player 1 to choose the low cost investment more frequently under HIDDENINFO in response to an anticipated increase in selfishness of player 2 when information is hidden (see Hypothesis 5).

Table 7 shows the proportion of total decisions by player 1 in which the high cost investment was chosen, split up by treatment. In a total of 748 investment decisions, player 1 chose to invest a high amount in 24.1% of the situations. The raw data suggests a treatment 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, with these two proportions differing significantly (Pearson  $\chi^2$ -test,  $p = 0.022$ ). However, this test does not take into account a potential dependence of decisions within subject; a more appropriate cluster-robust  $\chi^2$ -test (Donner, 1989) yields a p-value of



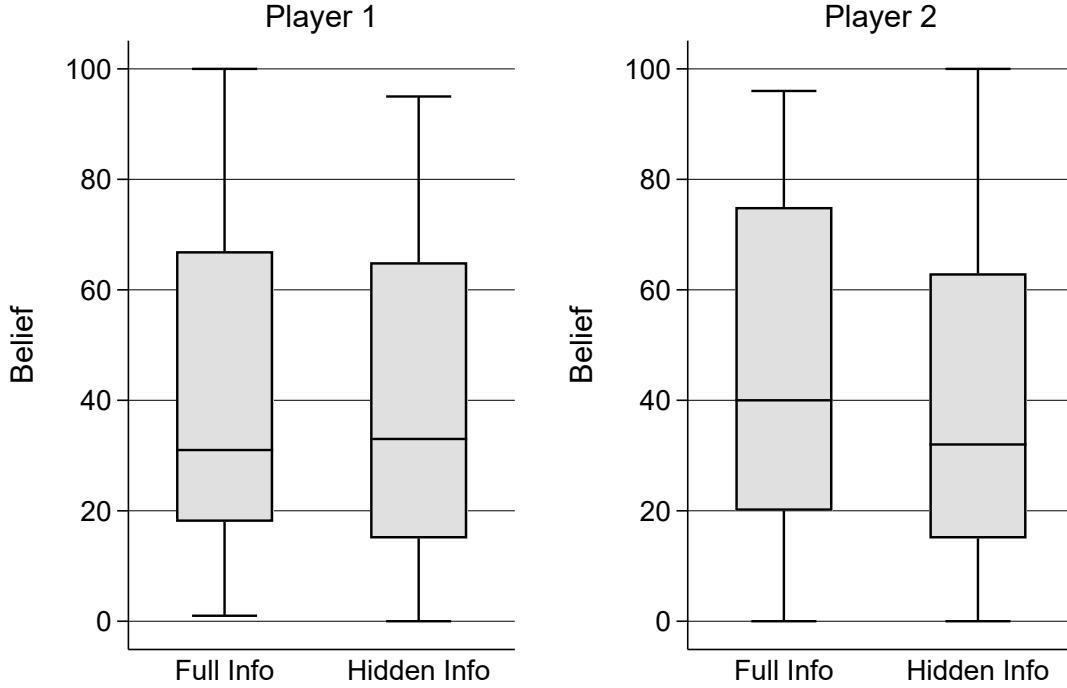


Figure 6: Beliefs, separating between role and treatment

0.112, meaning that we cannot reject the null hypothesis that investment behavior is equal across treatments. This null results is confirmed if we compute the average of all investment decisions for each of the 187 subjects in the role of player 1 and run a two-sided Wilcoxon rank-sum test ( $z = -1.786$   $p = 0.074$ ) and when we consider the investment decisions only from the first round (Pearson  $\chi^2$ -test,  $p = 0.109$ ).<sup>14</sup> Thus, even though the raw data suggest the expected effect, we do not find support for Hypothesis 5.

**Result 5.** *Player 1 does not choose the high investment significantly more often in treatment FULLINFO than HIDDENINFO.*

### 5.3 Additional results with respect to subjects' 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. We analyze whether beliefs exhibit a treatment effect, whether they are systematically biased and the interactions between beliefs and behavior.

Figure 6 illustrates that the treatment did not affect beliefs of subjects in the role of player 1 and in the role of player 2. In both treatments, subjects in the role of player 1

<sup>14</sup>We separately investigate decisions from round 1 because the influence of experience from previous rounds on the investment decisions may vary between the treatments.

Table 8: Beliefs of first movers regarding investment decisions

	(1)	(2)
	No controls	Controls
Investment	30.120*** (3.641)	30.576*** (3.815)
Full Info	-2.560 (3.870)	-2.849 (4.025)
Constant	30.952*** (2.545)	25.802*** (9.776)
Controls	No	Yes
R <sup>2</sup>	0.244	0.251
N	187	187

*Notes:* OLS. Dependent variable is the belief regarding the share of first movers choosing the costly investment. Controls are age, a dummy for male and a dummy for studying business or economics. Cluster-robust standard errors in parentheses (on subject-level). \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

expect about 40% of the first movers to take the more costly investment decision. For subjects in the role of player 2, the belief in treatment HIDDENINFO also equals 40%, while it is slightly higher in the FULLINFO treatment at 46%. This difference, however, is not significant (two-sided Wilcoxon rank-sum test,  $z = -1.320$ ,  $p = 0.188$ ).

**Player 1 beliefs and investment decisions.** While beliefs are similar across treatment for player 1, there are systematic differences with respect to player 1's own investment decisions. In both treatments, first movers who chose a high investment in the first period expect a higher share of investing first movers than those first movers who themselves did not choose the high cost investment. In total, first movers with a high investment expect 60.2% of other players 1 to choose the high investment, whereas those with a low investment expect only 30.4% to do so. This difference is highly significant ( $z = -6.842$ ,  $p < 0.001$ , two-sided Wilcoxon rank-sum test) and holds separately in both treatments (61% vs. 26.7% in FULLINFO and 59.8% vs. 31.5% in HIDDENINFO). This observations is confirmed in a regression analysis where the dummy for a high investment is highly significant (see Table 8). We interpret this as 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 (Ross et al., 1977).<sup>15</sup>

**Player 2 beliefs and donations.** Next, we ask how the second players' donations in the first round are affected by their beliefs about player 1's investment decisions if

<sup>15</sup>See also Engelmann and Strobel (2000) as an early experimental economics study on the false consensus effect and Blanco et al. (2014) on the relevance of false consensus in explaining behavior in social dilemmas.

Table 9: Donations of second movers

	(1) all	(2) successful	(3) unsuccessful
Belief	0.041* (0.017)	0.044 (0.048)	0.037* (0.017)
Constant	-4.440 (3.386)	-3.651 (5.419)	-3.107 (3.655)
Controls	Yes	Yes	Yes
R <sup>2</sup>	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. Controls are the subjects' age, a dummy for being male and a dummy for studying business or economics. Cluster-robust standard errors in parentheses (on subject-level). \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

they remain uninformed (Table 9).<sup>16</sup> We find that subjects in the role of player 2 donate significantly more when they hold more optimistic beliefs about the investment decision of player 1. 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 was not successful. When the investment failed, the second player's donation increases with her expected share of players 1 choosing the high investment. When the investment succeeded, player 2's donation decision is not systematically related to stated beliefs.

**Precision of beliefs.** We summarize the beliefs and the actual investment decisions of subjects in the role of player 1 in round 1 in Table 10, showing the respective values for the aggregate as well as for the subsamples of informed and uninformed players 2 separately. Subjects in the role of player 2 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.

<sup>16</sup>This part of the analysis only considers those players who decided to remain uninformed about the investment decision of the first player because beliefs of subjects who learned player 1's investment decision are possibly influenced by the specific decision they observed.

Table 10: Beliefs and investments

	All	Informed	Uninformed
<i>All decisions</i>			
Investments	0.277	0.390	0.229
Beliefs	0.399	0.409	0.395
<i>All decisions with a successful investment</i>			
Investments	0.500	0.600	0.438
Beliefs	0.461	0.561	0.399
<i>All decisions with an unsuccessful investment</i>			
Investments	0.141	0.190	0.125
Beliefs	0.362	0.265	0.393

From Table 10, one might conclude that players remain ignorant to maintain their excessively positive beliefs that, in turn, 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, player 2 might decide to remain ignorant fearing that her positive beliefs is in fact true and would force her to donate more than she is prepared to give. Hence, they seek to avoid certainty about the first mover’s decision in order to be able to choose her preferred donation.

## 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. However, the first mover may have only limited control over the consequences of his action since other influencing factors may also play a role. When deciding how to react toward the first mover, the second mover can decide how much weight to give to the chosen actions and the realized outcome. She can emphasize 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 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 respond with more generosity when the first mover’s intention was pro-social instead of selfish. Thus far, evidence in the literature supports the latter ([Charness and Levine, 2007](#)). However, it relies on the fact that the second mover observes both outcome and intention – an assumption that may be unrealistic in many situations.

With this paper, we use a controlled laboratory experiment on a two-player sequential interaction to investigate the behavior of the second mover (player 2) — a dictator game donation — when the first mover’s (player 1’s) intention — an investment choice that benefits both players — is not immediately observable but can be

revealed by player 2. We also ask if the behavior of player 1 changes with the visibility of his action.

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 that is only significant after a high investment. Hence, we find that intentions matter more than outcome in our setting. We further find that only a minority of subjects in the role of player 2 choose to learn about player 1's investment decision if given the choice to remain uninformed. However, those players 2 who self-select into information choose more generous donations than those who are informed by default, suggesting that the information choice correlates with prosocial preferences. However, we do not find significant evidence for willingly uninformed players 2 choosing lower donations than those who are informed by default, suggesting that players do not avoid information to exploit moral wiggle room but rather that those who remain uninformed would not have chosen higher donations if they had been informed. In line with the finding that donations are not more generous, on average, with full information about investments, we do not find evidence for player 1 choosing the high investment more often with full information than when player 2 might remain ignorant of the investment decision. In an explorative analysis of player beliefs, we find evidence for first movers exhibiting a false-consensus effect: those who act pro-socially also expect others to do so and vice versa. Moreover, for second movers who are uninformed about player 1's investment decision, donations to player 1 increase with the expected belief about the share of players 1 having chosen the high investment. Interestingly, this effect appears to be driven by player 2 having too optimistic beliefs and choosing relatively high donations after observing a failed investment.

Our results show that the first mover's intention has a large positive impact on the second mover's generosity, while the outcome only matters conditional on a high investment. Despite donations responding strongly to the investment decision if known, hiding the investment decision by default does not appear to have a detrimental effect on donations, but we find evidence for subjects selecting into or out of information in relation to their inclination to be more or less generous toward player 1. This suggests that prosocial individuals may benefit from the informed interaction.

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# Appendix

## A 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
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%.

## B Power analysis

For a comparison of the investment choices made by player 1, we assume that the baseline investment rate is 50% and compute power for varying effect sizes and a sample size of 35 subjects in the full information treatment and 70 in the hidden information treatment. With this sample size and an  $\alpha$  of 0.05, we can detect an effect of a change in the investment frequency by 0.27 with a power of 0.8.

For a comparison of the second mover's donations across treatments, we compute the power for the planned sample sizes. With the planned sample size, we would pick up a difference in the average donations between full information and hidden information at a power of 0.8 and  $\alpha = 0.05$  only if it is at least in the order of 60% of a standard deviation.

If we go down the game tree, we end up in branches that will have fewer observations. Let us look at a scenario where we average over decisions conditional on a certain outcome (assuming half of the first players decide to choose the high and the low investment, respectively). Then, we would only be able to detect effect sizes of more than 85% of a standard deviation at a power of 0.8 and at  $\alpha = 0.05$ .

For a within-subject comparison of the donations of the second player conditional on outcome or intention, we use `power onemean 0.30 0.20, sd(0.1 0.25 0.3) n(10 30 50 70) alpha(0.05)` in Stata to compute the power for different effect sizes, standard deviations and sample sizes. In Bardsley (2008), comparing giving frames in experiments 2 and 3 produces average donations of about 0.3 (SD about 0.26) and 0.13 (SD about 0.15) with around 30 participants each. Rephrasing this, with 70 observations, we would be able to detect a difference 1/3 of a standard deviation with a power of 0.79 and an  $\alpha = 0.05$ . With 35 observations, we would be able to detect an effect of half a standard deviation at a power of 0.82 with an  $\alpha = 0.05$ .

## C 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.

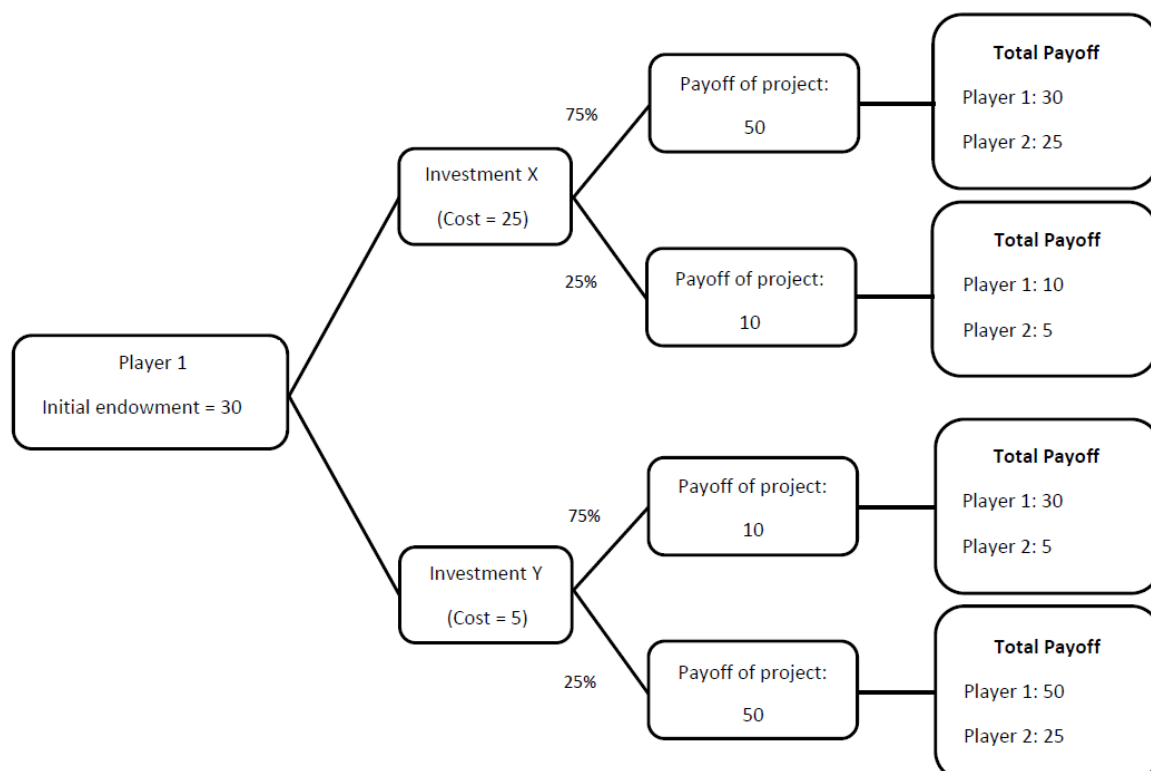
The first part of the experiment consists of 4 independent rounds. Only one of these rounds is relevant for payment. Which one it will be is determined randomly at the end of the experiment.

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 7: 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 <input type="radio"/> <input type="radio"/> No	1
2	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	2
3	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	3
4	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	4
5	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	5
6	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	6
7	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	7
8	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	8
9	50%: 10; 50%: 0	Yes <input type="radio"/> <input type="radio"/> No	9

Continue



Figure 8: 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
<b>Investment X (Costs = 25 Taler)</b>	With a probability of <b>75%</b>	<b>50</b>	<b>30</b>	<b>25</b>
	With a probability of <b>25%</b>	<b>10</b>	<b>10</b>	<b>5</b>

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

Your decision: Investment X Investment Y

Figure 9: Player 2's main decision screen FULLINFO

Now you need to make your allocation decision

You have an endowment of 30 Taler. You will always keep 5 Taler for yourself.

You have to decide how to split the remaining 25 Taler between yourself and Player 1.

How many Taler are you willing to give to Player 1 if they have chosen **Investment X (Costs = 25 Taler)** ?

Your income from Player 1's decision:	25
Project:	50
Endowment:	30
Sum to allocate:	25
Share for Player 1:	<input style="width: 60%; border: 1px solid black;" type="text"/> <span style="float: right; font-size: small;">(Please enter an amount between 0 and 25. )</span>

How many Taler are you willing to give to Player 1 if they have chosen **Investment Y (Costs = 5 Taler)** ?

Your income from Player 1's decision:	25
Project:	50
Endowment:	30
Sum to allocate:	25
Share for Player 1:	<input style="width: 60%; border: 1px solid black;" type="text"/> <span style="float: right; font-size: small;">(Please enter an amount between 0 and 25. )</span>

Figure 10: Player 2's main decision screen HIDDENINFO

Now you need to make your allocation decision

You have an endowment of 30 Taler. You will always keep 5 Taler for yourself.

You have to decide how to split the remaining 25 Taler between yourself and Player 1.

You do not know which investment (X or Y) Player 1 has chosen. You can reveal their investment decision by clicking the button "Decision Player 1". Clicking costs 0.1 Taler. You can also make your allocation decision without clicking the button.

How many Taler are you willing to give to Player 1?

Your income from Player 1's decision:	5
Project:	10
Endowment:	30
Sum to allocate:	25
Share for Player 1:	<div><div></div></div> <div>(Please enter an amount between 0 and 25. )</div>

Decision Player 1

unknown

Continue

## **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 be 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.