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Efficiency Concern under Asymmetric Information

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Efficiency Concern under Asymmetric Information*

Evguenia Winschel† Philipp Zahn‡

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Abstract

Experimental evidence from simple distribution games supports the view that some individuals have a concern for the efficiency of allocations. This motive could be important for the implementation of economic policy proposals. In a typical lab experiment, however, individuals have much more information available than outside the lab. We conduct a lab experiment to test whether asymmetric information influences prosocial behavior in a simple non-strategic interaction. In our setting, a dictator has only limited knowledge about the benefits his prosocial action generates for a recipient. We find that a substantial share of subjects behaves proscially and a concern for efficiency plays an important role. In our experiment the information asymmetry is actually efficiency-enhancing as more subjects behave prosocially than under symmetric information.

Keywords: Asymmetric Information, Prosocial Behavior, Efficiency Concern, Dictator Game
JEL: D82, C91

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1 Introduction

In simple experiments such as the Ultimatum Game, the Trust Game, or the Dictator Game subjects regularly deviate from a selfish maximization of payoffs and behave prosocially (Camerer, 2003). To explain these deviations, it has been proposed to extend individuals' preferences by a social component while keeping the assumption of utility maximization. Prominent examples of this approach are inequality aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), efficiency concern, and maximin preferences (Charness and Rabin, 2002).

If subjects' behavior is guided by social preferences, these theories should help to understand how individuals react to policy proposals as most policies not only involve the individual's own payoff but affect others' payoffs as well. Moreover, for policy makers a concern for efficiency is a particularly interesting motive because it could allow to implement welfare increasing allocations even though standard theory based on purely selfish agents will predict these policies to fail. For instance, an economic reform may be implemented despite the fact that a majority incurs a loss: When the gains for those who profit are sufficiently large and some individuals who are negatively affected are concerned with efficiency, these individuals may tip the scales such that the reform is implemented nevertheless.

Most policy questions such as reform proposals are notoriously plagued by information asymmetries. Individuals will be better informed about how a reform affects themselves than how it affects others. The laboratory experiments providing evidence for social preferences are conducted in an environment where agents have full information about the costs and benefits of all agents. The question is whether individuals whose behavior is in line with social preference theories if they are perfectly informed about the effect of the reform, still behave prosocially when they are *not* perfectly informed about

the gains others have.

In this paper, we investigate whether asymmetric information affects prosocial behavior of subjects whose behavior is in line with an efficiency concern under symmetric information. Furthermore, as any policy that affects the efficiency of an allocation will also have distributional consequences (e.g., decrease inequality), we also investigate how subjects, whose behavior is in line with inequality aversion under symmetric information, behave under asymmetric information.

In the case of asymmetric information it is possible that subjects behave less prosocially than they do under symmetric information for two reasons. First, subjects with a concern for efficiency face the risk that their transfer produces only little value; maybe too little to make them behave prosocially if they knew the value exactly. Asymmetric information may thereby influence behavior: Instead of choosing the risky[1] (and prosocial) option they may choose the safe (and selfish) one. Secondly, cognitive dissonance theory (e.g., Konow, 2000), which has been proposed as an alternative to the utility maximization paradigm, may provide another explanation why behavior may change under asymmetric information. According to this theory, individuals experience cognitive dissonance due to the internal conflict they are exposed to. On the one hand, they want to keep their endowment, but on the other hand they feel obliged to behave prosocially. Under asymmetric information where subjects do not know the exact benefits, this dissonance may be partly resolved as they may perceive it as more justified not to transfer and therefore behave less prosocially.

We conduct a laboratory experiment with the following design: Two subjects, A and B, are matched; both subjects have an initial endowment; A makes a binary decision about a money transfer to B. Accepting the transfer causes known costs for A and

[1] Risky with respect to the other's payoff.

benefits b for B, with the benefits being larger than the costs. As treatment we vary the information A has about the benefit level b. While A is informed about the exact level of b in the control setting, he does not know the exact level in the treatment.

We focus on this simple asymmetry for three reasons. First, it is natural to assume that even if people do not know the exact effect of a policy on themselves, they still can evaluate it much better than an effect on others. Hence, for simplicity we assume that A knows the costs precisely. Secondly, with asymmetric information on both sides the identification of effects becomes more complicated and to consider only one side on its own is a necessary first step. Moreover, identification is also the reason why we focus on a simple non-strategic interaction. It is clear that once B can influence the outcome, $A's$ behavior under asymmetric information may change; and obviously it becomes even more complicated once we allow for group decision-making (i.e., voting).

Thirdly, we think that the above setting has applications. Consider, for instance, donations. While people will have a more or less clear idea of the costs of a donation, they will not be perfectly certain about the benefits their transfers generate, whereas the recipient will have a clear idea. Depending on the information available, the willingness to donate will vary. Similarly, if several options are available, a preference for a particular one may reflect that it produces a more certain effect. For instance, Jacobsson et al. (2007) find evidence that subjects donate more to smoking diabetes patients when they can do so in the form of nicotine patches instead of monetary transfers. While the authors interpret this finding as evidence for a paternalistic nature of giving, a complementary explanation is that subjects want to maximize social surplus. The nicotine patches are socially valuable (as supporting others to quit smoking and thereby reducing a negative externality) and at the same time the more certain option than giving money where it is unclear whether it is not spent in a socially less valuable way (e.g., on tobacco or sweets). The results by Eckel and Grossman (1996) point in a similar direction. They find that

dictators are more willing to donate if they know that the Red Cross receives the money and not an anonymous person in the laboratory. Again, one can interpret the Red Cross alternative as less risky with respect to its social value.

Besides the information asymmetry, we introduce a monetary reward for prosocial behavior as a further treatment variable. There is substantial experimental evidence that incentives can "crowd out" prosocial behavior (see Bowles and Polanía-Reyes (2012); Gneezy et al. (2011) for surveys of the literature). We want to test whether the incentive has the same effect under symmetric and asymmetric information. Under asymmetric information the incentive could interact with the uncertainty. Subjects could "perceive" the reward level as being related to the unknown benefit level and interpret the reward as a signal (Bolle and Otto, 2010).

In previous laboratory experiments finding crowding out, this effect cannot occur by design because there is no uncertainty. With evidence from the field this is different (e.g., Frey and Oberholzer-Gee, 1997; Gneezy and Rustichini, 2000): Subjects do not know exactly the benefits/costs they impose on others and hence could interpret the reward as a signal of them.

Our main results are that under symmetric information (i) a substantial share of individuals (36%) behaves prosocially, (ii) 18% of subjects make a choice that is consistent with a concern for efficiency, 7% of subjects make a choice that is consistent with inequality aversion, and 11% transfer independently of the value of b, their transfers are in line with an efficiency concern or maximin preferences.

Moreover, subjects on average behave more prosocially when the exact benefit level is unknown compared to a situation where the level is known. More subjects transfer under asymmetric information than for any level of b under symmetric information.

Furthermore, we do not find substantial evidence for crowding out. The monetary

reward has a positive though not statistically significant effect.

At the individual level, behavior under asymmetric information is consistent with predictions based on prominent examples of social preference theories (Fehr and Schmidt, 1999; Charness and Rabin, 2002), and we do not find evidence that information asymmetries have a negative effect.

As a consequence and given the parameters chosen in our experiment, the information asymmetry actually *improves* the efficiency of the allocation. Under symmetric information, where A knows the exact degree of efficiency, subjects, whose choices are consistent with inequality aversion, only transfer when the efficiency gain is not too large, whereas subjects, whose choices are consistent with an efficiency concern, only transfer when the degree of efficiency is sufficiently large. Under asymmetric information, however, both types tend to transfer.

To the best of our knowledge we provide the first experimental design in which an information asymmetry regarding the degree of efficiency is introduced in a basic non-strategic setting. In contrast to existing experiments, only the information which the dictator A has available varies while B is fully informed. $A's$ decision does neither make his payoff nor $B's$ payoff more risky. Moreover, this is the first experiment that investigates whether a financial incentive can have a negative effect under both asymmetric and symmetric information in order to distinguish different channels of crowding out. However, in our experiment we do not find substantial evidence for crowding out at all. Furthermore, our findings also confirm previous results (e.g., Engelmann and Strobel, 2004): A concern for efficiency plays a crucial role in explaining prosocial behavior. Lastly, our experiment provides evidence that simple information asymmetries do not reduce prosocial behavior.

The paper is organized as follows: In the next section, we discuss the related lit-

erature. In Section 3, we present the experimental design followed by a discussion of behavioral hypotheses in Section 4. Section 5 presents the results and Section 6 concludes.

2 Related Literature

The experimental evidence regarding prosocial behavior in simple two-person experiments such as the Trust Game, the Ultimatum Game, and the Dictator Game is extensive. The central and robust finding is that subjects regularly deviate from purely selfish behavior though to varying degree.[2] One motive to explain deviations from the selfish benchmark that received particular attention has been inequality aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000): Subjects are not only guided by their own payoff but experience disutility when payoffs differ between participants. More recently, the explanatory power of these theories has been questioned.[3]

The experiments by Charness and Rabin (2002) and Engelmann and Strobel (2004) discriminate between alternative theories of social preferences (inequality aversion, maximin preferences, and efficiency concern) and evaluate their explanatory power for subjects' behavior in simple distribution games. In Charness and Rabin (2002), two to three players are involved; in some of the games one subject decides alone (e.g., variants of the Dictator Game) and in some games two subjects together influence the allocation (e.g., variants of the Ultimatum Game). In Engelmann and Strobel (2004), one subject has to choose among three alternatives where each alternative allocates transfers to him and to two other subjects. Both articles report a substantial share of subjects who are willing to accept private costs when they can thereby increase the total sum of payoffs. Moreover,

[2]For reviews of the literature see Camerer (2003) and specifically for the Dictator Game see Engel (2011).

[3]See for example Engelmann and Strobel (2002) for a discussion.

maximin preferences play an important role for explaining subjects' behavior whereas - in contrast to previous experiments - inequality aversion has less explanatory power.[4]

A few papers (e.g., Mitzkewitz and Nagel, 1993; Rapoport and Sundali, 1996; Huck, 1999; Güth et al., 1996) introduce asymmetric information regarding the outcome in simple two-person games. In contrast to our experiment, however, the asymmetric information is on the other side: The proposer of a bargaining outcome is aware of the exact amount of money to be distributed while the recipient is not. Only in Klempt and Pull (2009), the information asymmetry is on the side of the proposer. They find that dictators demand a higher share of the pie compared to a situation where they know the size of the pie. As in their setting uninformed dictators run a risk that a high proposal leads to a zero transfer when the actual pie is small, it is not clear what drives the effect: information or risk attitudes.[5] In contrast to their approach, we are not concerned with a fixed pie that can be distributed but with a decision that increases the pie. In our setting, asymmetric information concerns the increase of efficiency a dictator can create by behaving prosocially.

The paper which is closest to our design with regard to the information asymmetry is the first treatment in Dana and Weber (2007). In their setting, a dictator has to make a choice between two allocations where he initially only observes his own payoff but not the payoff for the recipient. Subjects can choose to be informed about the other's payoff before they make a decision while the recipient is neither informed about the dictator's choice to reveal nor about his transfer decision. The recipient only observes his own payoff. Hence, he cannot distinguish whether the dictator behaved selfishly or chose to stay uninformed and decided without knowing what would be the prosocial choice. They

[4]Other experiments also find evidence that individuals' choices are in line with an efficiency concern (e.g., Kritikos and Bolle, 2001).

[5]In their setting, the pie can take on two values, 8 and 20. When a dictator is not informed about the value and, for instance, proposes 9 for himself but the actual pie is 8, then he receives nothing.

find that a significant share of dictators prefers to be uninformed and decides more often to behave selfishly compared to a benchmark where dictators are informed about the other's payoff right from the beginning. Hence, they provide evidence that subjects want to appear as prosocial instead of "truly" being altruistic.[6]

In our experiment, the information asymmetry differs. Player B is perfectly informed about the level of benefit and about $A's$ decision. A in contrast, does not know the benefit level and he has no possibility of learning the value. Moreover, in Dana and Weber (2007) the equal and the efficient choice are the same (versus a more selfish and inequality increasing outcome). In contrast, in our case the benefit can take on different values. While the choice is always efficiency increasing, its distributional consequences vary over different values of b.

A recent strand of literature (Brennan et al., 2008; Güth et al., 2008; Bradler, 2009) investigates how risk regarding other subjects' payoffs affects prosocial behavior. In these experiments, a dictator has to make choices among lotteries instead of outcomes. Hereby, attitudes towards private and collective risks can be evaluated. The paper which is closest to ours is Brennan et al. (2008).[7] In their experiment, each dictator is required to evaluate four different allocations. Each allocation assigns a payoff to the dictator and to the recipient either in a probabilistic or in a deterministic way. The experiment shows that dictators' behavior is significantly different when they face risks regarding their own payoff compared to a situation with no risk. Yet, the authors do not find evidence that the risk

[6]There are several papers that investigate whether subjects are more selfish when the actions of dictators are not fully observable (e.g., Andreoni and Bernheim (2009) and the "multiple dictator" treatment as well as the "plausible deniability" treatment in Dana and Weber (2007)). They find a significantly less generous behavior of dictators relative to the standard game thus also supporting the view that subjects are not truly prosocial but want to appear as if. In contrast to these papers, we are not concerned with uncertainty about the decision. In our setting, subjects know exactly whether the other subject behaved prosocially or not; asymmetric information only concerns the possible allocation outcomes.

[7]Güth et al. (2008) conducted a similar experiment where they added another dimension: time preferences. Regarding risk, with which our analysis is concerned, they obtain similar results.

recipients are exposed to affects dictators' decisions.[8]

In our setting, under asymmetric information A has to make a decision when he does not know the exact efficiency parameter. The main difference between our analysis and the latter strand of literature is that dictators affect the risks of others while in our setting they do not. In these papers two different kind of risk concerns regarding the others' payoff are intertwined. First, as those papers posit, it may be that dictators put themselves in the shoes of others and do not want to expose recipients to risk. Secondly, however, if subjects exhibit social preferences based on outcomes, then they face a risk themselves: When choosing a lottery, they face an uncertain outcome regarding the others' payoff directly affecting their own utility. In the above designs, both effects are mixed and not distinguishable. Moreover, A is exposed to direct risks that affect his own payoff as well, which can influence his attitude towards the risk of B. In our approach, these effects are disentangled. Subject A is not exposed to risks regarding his own payoff. We also do not consider a situation in which A affects the risk of B: In our setting, the gain B receives when A transfers is determined before A makes a decision.

Lastly, our experiment is related to the literature on crowding out.[9] For instance, Gneezy and Rustichini (2000) find that a financial punishment for late-comers actually increases late-coming by parents in an Israeli kindergarden. Similarly, Frey and Oberholzer-Gee (1997) conducted a study in Switzerland where subjects were offered a compensation for the willingness to accept a nuclear waste facility in their community. The willingness to accept the facility decreased from 50% to 25% when a financial compensation was offered. Besides, numerous laboratory experiments exist which find a similar effect, typically in simple 2-persons-interactions such as the Gift Exchange Game (e.g., Fehr and

[8]Rohde and Rohde (2011) similarly find only weak evidence that the risk recipients' are exposed to influences dictators. Results by Bradler (2009) indicate that subjects are willing to risk parts of their own payoff when they can thereby increase the payoff of the recipient from zero (respectively, from a very small amount).

[9]For surveys of the literature see Bowles and Polanía-Reyes (2012) and Gneezy et al. (2011).

Part 1	b is *not* known to A
Part 2	b is *not* known to A. A receives a reward if he transfers.
Part 3	b is known to A. A receives a reward if he transfers.
Part 4	b is known to A.

Table 1: Overview over Parameters in the 4 Parts of the Experiment

Rockenbach, 2003) or even simpler interactions regarding control mechanisms (e.g., Falk and Kosfeld, 2006).

3 Experimental Design

We implement the following experimental design: There are two agents, A and B. A has an endowment, e_A, of 100 points (100 points are equivalent to 10 EUR), B has an endowment, e_B, of 50 points. Only A makes a (binary) decision. He can decide whether he wants to transfer 20 points. If A transfers, B receives a benefit b, with $b \in \{25, 30, 40, 50, 60, 70\}$. The decision reflects a situation where an efficiency gain is possible. We chose the initial endowments such that a transfer will result in an efficiency gain *and* a decrease in inequality for low values of b ($b \leq 30$). For values of $b > 30$ inequality increases in b. Hence, depending on the exact value of b a decision to transfer can be motivated by a concern for efficiency or by a concern for equality.[10]

The experiment consisted of 4 parts. Table 1 provides an overview over the parameters that change in each part.

[10] If endowments were such that A had an endowment smaller than or equal to B, any transfer would always increase inequality. Then, we could only focus on the efficiency motive.

3.1 Treatments

The main treatment variable in our experiment is whether A knows the exact benefit b when he makes a decision or whether his knowledge about b is limited to the distribution from which b is drawn.

In part 1, participants in the role of A have to make a decision under asymmetric information with respect to b. The exact value of b is determined in the following way: Participants are presented an urn from which a value for b is drawn *before* subjects make a decision. The urn contains the following balls each representing one value of b: $25, 30, 40, 50, 60, 70$. Agent A is not informed about the ball which is drawn while it is disclosed to agent B. Moreover, it is public information that B knows the exact benefit. Subjects make only one decision whether to transfer or not.

In part 4, participants in the role of A make decisions under symmetric information. That is, A knows the exact value of b. We use the strategy method for a complete response by subject A for each value of b $(25, 30, 40, 50, 60, 70)$. This is crucial because it allows us to describe the values of b for which subjects are willing to transfer under symmetric information and whether their behavior is consistent with their decision under asymmetric information. Subjects had to make one decision (transfer yes/no) for each level of b. After they had made their decisions, one ball from the urn was drawn which determined which decision was payoff-relevant for part 4.

Part 2 (3) is identical to part 1 (4), but as an additional treatment we introduce a reward for A if he transfers the 20 points. The goal is to investigate whether a reward has a differential effect under asymmetric and symmetric information. In part 2, the reward r could take on two values, $r_L = 5$ and $r_H = 10$. The subjects only knew that it holds that $r \in [5, 10]$ and that the exact value of r was determined after b had been drawn, but they did not know how the reward was chosen. In fact, the reward was determined by a

lottery after b had been drawn and in all cases $r = 5$ was drawn.[11] After the reward was determined, all subjects were informed about the exact value of r. In part 3, the reward was fixed with $r = 5$. Before making a decision, subjects knew the exact value of r.

At the end of the experiment, one of the four parts was randomly drawn. This part determined the final payoff of participants.

3.2 Procedural Details

Subjects were randomly assigned to either role A or role B at the beginning of the experiment.[12] They kept this role over the course of the experiment. Subjects knew that the experiment comprised four parts, but they did not know the content of each part in advance. Subjects received separate instructions at the beginning of each part with the information that instructions for subsequent parts would follow.

As we are interested in whether crowding out could occur under asymmetric information due to a signaling effect of the reward, we let subjects choose under asymmetric information first. Symmetric information followed afterwards because we wanted to avoid that the randomly determined benefit level would influence subjects' beliefs under asymmetric information. Since we similarly cannot exclude the possibility that behavior under asymmetric information affects behavior under symmetric information, we also did a robustness check where we changed the sequence of parts. Subjects then first decided under symmetric information (see Section 5.4). So, in addition to analyzing behavior from four subsequent parts one can also compare the first decisions from our baseline sessions and the robustness sessions without the problem that they may have been affected by previous actions or parameters.

[11] Probability 1/10 for the high reward and 9/10 for the low reward.

[12] Subjects in the role of B had no decision to make in the experiment, but we elicited their beliefs about what they thought subjects A would do.

We ran five sessions with 90 subjects in the sequence of parts described above and three more robustness sessions with 60 subjects. The experiments were conducted at the experimental laboratory at the University of Mannheim in March to May 2012 (baseline sessions) and November 2012 (robustness sessions). The experiment was computerized using z-tree (Fischbacher, 2007). Subjects were students from the University of Mannheim from different fields. They were recruited using the online system ORSEE (Greiner, 2004). Each session took between 35 and 40 minutes and comprised 16-20 subjects. The average earnings were 7.80 EUR.

4 Behavioral Predictions

Under asymmetric information subjects make one choice: Whether they want to transfer or not. To understand whether the information asymmetry has an effect on behavior, it is crucial to put it into context with behavior when subjects know the benefit level. For instance, suppose subject i does not transfer under asymmetric information. Without further information it is not clear whether the subject behaves generally selfishly (independently of the asymmetric information) or whether asymmetric information has an effect on his behavior. Suppose, as an extreme example, that the same subject, who did not transfer under asymmetric information, transfers for all benefit levels when he knows b exactly. Then, we can argue that asymmetric information had an effect on his behavior. The information what subjects do under symmetric information is necessary to evaluate the effect of the information asymmetry. Hence, we begin with a discussion how subjects in the role of A behave under symmetric information (part 4). To understand what behavior we can expect, we follow the literature and base our predictions on prominent social preference theories.

Next, we extrapolate these theories to the asymmetric information case and discuss

what behavior these theories predict when subjects do not know the exact benefit level b (part 1) conditioning on their behavior under symmetric information. Moreover, we will argue why we may observe a deviation from these predictions when subjects react to the risk they are exposed to and we will also contrast the predictions with an alternative explanation of why behavior may change under asymmetric information, a cognitive dissonance approach. Lastly, we will discuss how the introduction of the reward (parts 2 and 3) can affect behavior.

4.1 Symmetric Information

We focus on three possible motives for prosocial behavior that are prominent in the literature: efficiency concern, maximin preferences, and inequality aversion. We will first discuss the simple utility specification of Charness and Rabin (2002) modeling a concern for efficiency and maximin preferences. Secondly, we will discuss inequality aversion as modeled by Fehr and Schmidt (1999). In both cases we will briefly describe the utility functions and state which transfer patterns are predicted. All derivations can be found in Appendix B.

4.1.1 Efficiency Concern and Maximin Preferences

Following Charness and Rabin (2002), the utility of an individual i in the role of A is:

$$U_A^i(\pi_A, \pi_B) = (1 - \lambda^i)\pi_A + \lambda^i \left[\delta^i \cdot \min\left[\pi_A, \pi_B\right] + \left(1 - \delta^i\right)(\pi_A + \pi_B)\right]$$

where π_A and π_B are the monetary payoffs of A and B, respectively. Parameter $\lambda^i = 0$ corresponds to purely selfish preferences. For $0 < \lambda^i < 1$, $\delta^i = 0$ means that prosocial behavior is only driven by an efficiency concern, i.e., a desire to maximize total

payoffs, and $\delta^i = 1$ means that prosocial behavior is only driven by maximin preferences, i.e., a desire to maximize both players' minimal payoff.

Applied to our setting, subject i has to compare two levels of utility. The utility $U_A^i(100, 50)$ if i does not transfer:

$$U_A^i(100, 50) = (1 - \lambda^i)100 + \lambda^i \left[\delta^i 50 + \left(1 - \delta^i\right)(100 + 50)\right] \tag{1}$$

and for a given value of b the utility $U_A^i(80, 50 + b)$ if i transfers.

$$U_A^i(80, 50 + b) = (1 - \lambda^i)80 + \lambda^i \left[\delta^i \cdot \min\left[80, 50 + b\right] + \left(1 - \delta^i\right)(80 + 50 + b)\right] \tag{2}$$

Given the utility function, when do subjects transfer? For the sake of exposition, we focus on two discrete cases: Subjects either have a pure efficiency concern ($\delta^i = 0$) or have pure maximin preferences ($\delta^i = 1$).

Efficiency Concern When subjects have a concern for efficiency, they will trade-off their costs with the benefits and the consequent efficiency gain. Given their individual parameter λ^i and the value of b, they will transfer if

$$U_A^i(80, 50 + b) > U_A^i(100, 50) \Leftrightarrow \lambda^i > \frac{20}{b}. \tag{3}$$

Hence, the more an individual i cares for efficiency (the higher λ^i) the lower the minimal value of b for which i would transfer. Thus, subjects with an efficiency concern should exhibit the following transfer pattern: Either they do not transfer at all or they transfer for a particular value of b^* and all values $b > b^*$.

Maximin Preferences Subjects with maximin preferences will transfer the 20 points if it holds that:

$$U_A^i(80, 50+b) > U_A^i(100, 50) \Leftrightarrow (1-\lambda^i)80 + \lambda^i \min[80, 50+b] > 100 - \lambda^i 50 \quad (4)$$

The transfer pattern of subjects with maximin preferences is similar to the transfer patterns of efficiency concern: Either they do not transfer at all, or they transfer for a particular value of b^* and all values $b > b^*$. In contrast to efficiency concern, there are only two thresholds: either $b = 30$ or $b = 25$.[13]

4.1.2 Inequality Aversion

In contrast to maximin preferences, the specification of Fehr and Schmidt (1999) can lead to behavior that is consistent with transfers for low values of b but no transfers once the benefit level is above 50. The utility function by Fehr and Schmidt (1999) is as follows,

$$U_A^i(\pi_A, \pi_B) = \pi_A - \alpha^i \max[0, \pi_B - \pi_A] - \beta^i \max[0, \pi_A - \pi_B]$$

with the assumption that $\beta^i \leq \alpha^i$ and $0 \leq \beta^i < 1$. Based on this utility function, the following transfer patterns are possible: Individual i either never transfers or he transfers for $b = 30$ alone, or for $b = 30$ and $b = 25$, or for $b = 30$, $b = 25$, and $b = 40$, or for $b = 30$, $b = 25$, $b = 40$, and $b = 50$. However, he will never transfer for values of $b = 60$ or $b = 70$.[14]

[13] In the case where prosocial behavior is not solely driven by an efficiency concern, respectively maximin preferences, ($\delta^i \in (0,1)$) the transfer pattern is analogous: Either subjects do not transfer at all, or they transfer for a particular value of b^* and all values $b > b^*$.

[14] See Appendix B for the details.

The social preference theories which we discuss share that - depending on the unobserved utility parameters $\lambda^i, \delta^i, \alpha^i, \beta^i$ - subjects behave either selfishly or prosocially. The theories, however, differ with regard to the transfer patterns they predict over the range of possible values of b if subjects are sufficiently prosocial. In particular, inequality aversion and efficiency concern predict differing patterns. As indicated in the theoretical discussion above and supported by the empiricial evidence (cf. Engelmann and Strobel (2007)), we do not expect that behavior will only follow one type of preferences. Instead, we expect heterogeneity with respect to selfishness as well as with respect to the type of social preferences.

To summarize our discussion, social preference theories predict the following patterns:

Hypothesis 1:

a) Efficiency concern: Subjects either *will transfer for a certain level of* b *and for all values of* b *above this threshold* or *will not transfer at all.*

b) Maximin preferences: Subjects either *will transfer for a certain level of* b *and for all values of* b *above this threshold* or *will not transfer at all. The threshold is either* $b = 25$ *or* $b = 30$.

c) Inequality aversion: Subjects either *will transfer for* $b = 30$, *or for* $b = 30$ *and* $b = 25$, *or for* $b = 30$, $b = 25$, *and* $b = 40$, *or for* $b = 30$, $b = 25$, $b = 40$, *and* $b = 50$, or *will not transfer at all.*

4.2 Asymmetric Information

Under asymmetric information A does not know the value of b. Given the lottery which determines the value of b, the expected value is roughly 45. We will discuss first how subjects should behave according to the social preference theories presented above. As

before, for details of the derivations see Appendix B. Then, we will outline explanations why they could deviate from these predictions.

4.2.1 Social Preferences

Charness and Rabin (2002) and Fehr and Schmidt (1999) Predictions What behavior can we expect for different types of social preferences under asymmetric information? For an individual i who behaves according to inequality aversion one can show that the expected utility from transferring under asymmetric information is smaller than the utility from transferring for $b = 40$ under symmetric information but larger than the utility from transferring for $b = 50$ under symmetric information. Hence, if i transfers for $b = 50$, he should transfer under asymmetric information. If, however, i does not transfer for $b = 40$, he should not transfer under asymmetric information.

For an individual whose behavior is in line with an efficiency concern the situation is analogous. One can show that the expected utility from transferring under asymmetric information is smaller than the utility from transferring for $b = 50$ under symmetric information but larger than the utility from transferring for $b = 40$ under symmetric information. Hence, if i transfers for $b = 40$, he should transfer under asymmetric information. If, however, i does not transfer for $b = 50$, he should not transfer under asymmetric information.

Thus, we can formulate the following hypothesis for efficiency concern and inequality

aversion:

Hypothesis 2: *CR/FS Asymmetric Information*

a) Efficiency concern: Subjects will not transfer under asymmetric information if they do not transfer for $b = 50$ *under symmetric information.*

b) Efficiency concern: Subjects will transfer under asymmetric information if they transfer for $b = 40$ *under symmetric information.*

c) Inequality aversion: Subjects will not transfer under asymmetric information if they do not transfer for $b = 40$ *under symmetric information.*

d) Inequality aversion: Subjects will transfer under asymmetric information if they transfer for $b = 50$ *under symmetric information.*

For maximin preferences, the hypotheses one can derive are weaker as one can only observe three patterns under symmetric information: Subjects either do not transfer at all, or they transfer for all values of b, or they transfer for all values of b larger than 25. In the case that subjects do not transfer at all, they should obviously not transfer under asymmetric information. Similarly, if subjects transfer for all values of b, obviously they should transfer under asymmetric information. If subjects only transfer for $b > 25$, there exists a narrow parameter range of λ^i such that they should not transfer under asymmetric information whereas otherwise they should.[15] In our experiment, however, the last case does not play a role because we do not observe subjects who do not transfer

[15] More precisely, when $\frac{24}{60} < \lambda^i < \frac{24}{59}$. Then the utility from not transferring $(100-50\lambda^i)$ is smaller than the utility from a transfer with 30, 40, 50, 60, or 70 (80) but larger than the expected utility $(80 - \frac{5}{6}\lambda^i)$.

for $b = 25$ but for all values above 25.

Hypothesis 3: *CR Asymmetric Information II*

a) Maximin preferences: Subjects will not transfer under asymmetric information if they do not transfer for any value of b under symmetric information.

b) Maximin preferences: Subjects will transfer under asymmetric information if they transfer for all values of b under symmetric information.

Deviations from CR/FS Asymmetric Information Prediction The utility functions we consider are not linear, but given our parameters they imply that under asymmetric information subjects behave as under symmetric information when the benefit is equal to the expected value. In contrast to the decision under symmetric information however, under asymmetric information subjects face a risk: If subjects transfer, a value of b can realize for which they would not transfer if they knew it for certain. Alternatively, they can behave selfishly and do not transfer. Then, they risk that they choose not to transfer for a value of b under which they would transfer if they had the information available. As it is the case with decisions in other settings where solely their own payoff is at risk, in our design subjects may be affected by the risk regarding the others' payoff and deviate from the CR/FS predictions.[16] In this case, we will observe a more selfish behavior at the individual level when they are negatively affected by risk: Subjects who transfer for both $b = 40$ and $b = 50$ may not transfer under asymmetric information.[17]

[16] Note that neither Fehr and Schmidt (1999) nor Charness and Rabin (2002) discuss the possibility of risk regarding the others' payoffs and it is not obvious how to implement it within their framework.

[17] Alternatively, we can also observe a more prosocial behavior when subjects react positively to the risk: Subjects who do neither transfer for $b = 40$ nor for $b = 50$ under symmetric information, will then transfer under asymmetric information.

4.2.2 Cognitive Dissonance Approach

So far we assumed that behavior follows the standard approach: maximization of utility functions with the additional ingredient of social preferences. There is, however, an alternative approach based on cognitive dissonance theory (Konow, 2000) which has been used to explain behavior in the dictator game and which could become relevant in particular under asymmetric information. According to this theory, subjects want to achieve a high payoff for themselves and to behave fair at the same time. They experience dissonance when decisions have to be made where these two objectives are in conflict. Moreover, "[t]he agent is motivated to reduce dissonance and may, generally speaking, do so by altering behavior, e.g., when the dictator takes less, and/or by changing beliefs, e.g., when the dictator believes it is fair to take more than the fair amount." (Konow, 2000, p. 1076). The experiment by Dana and Weber (2007) provides evidence for such a mechanism as a substantial share of dictators decides not to get informed about the consequences of their decision and also behaves less prosocially.[18]

Under symmetric information subjects are exposed to dissonance of being nice and keeping the money for themselves. Under asymmetric information the dissonance may be partly resolved by the uncertainty about b. Subjects have some "moral wiggle room" to justify selfish behavior, because values of b may realize under which they feel less compelled to transfer. Hence, they may reduce transfers compared to the symmetric information situation and behave less prosocially than the CR/FS predictions. Summarizing the

[18]More supportive evidence can be found in Haisley and Weber (2010). In their experiments dictators form self-serving beliefs about the likelihood that a positive payoff of the recipient realizes under ambiguity. Subjects also behave more selfishly compared to a situation where the likelihood is known.

alternatives to the CR/FS predictions:

> **Hypothesis 4:** *Subjects deviate from the CR/FS predictions and behave less prosocially: Subjects who transfer under both $b = 40$ and $b = 50$ may not transfer under asymmetric information.*

4.3 Effect of Reward

In part 2, we introduce a reward for prosocial behavior. The reward r can take on two values, $r_L = 5$ and $r_H = 10$. The introduction of the reward can affect behavior in two ways. First, the reward alters the price of transferring money: The prosocial action costs less, it may thereby shift thresholds at which subjects are willing to transfer downwards in the case of an efficiency concern and in the case of maximin preferences. In the case of inequality aversion it may increase the set of values under which an individual is willing to transfer. Thus, we can formulate the following hypothesis:

> **Hypothesis 5:** *The reward decreases the costs of behaving prosocially under asymmetric and symmetric information and will have two effects: The number of subjects who transfer weakly increases as some subjects who did not transfer before may be willing to transfer with reward. Moreover, under symmetric information for subjects whose behavior is in line with social preferences and who transferred without the reward, the set of values of b for which they transfer weakly increases.*

Instead of merely changing the cost parameter - which would have the same effect on payoffs as the reward - we introduce this change as a reward to test whether an incentive can lead to crowding out in our setting. Under asymmetric information the incentive could interact with the uncertainty. Subjects may "perceive" the reward level as being related to the unknown benefit level and interpret the reward as a signal (Bolle and Otto, 2010) (a low reward level as a signal for low values of b). In previous laboratory

experiments that find crowding out, this effect is ruled out because by design there is no uncertainty. Looking at the evidence from the field (e.g., Frey and Oberholzer-Gee, 1997; Gneezy and Rustichini, 2000), however, where subjects have private information about the benefits/costs they impose on others, a signal effect can play a role. We also introduced a fixed reward in part 3, where information is symmetric, as a control. On the one hand, we want to check whether there is a price effect under symmetric information and on the other hand we want rule out that crowding out - so we observed it under asymmetric information - is driven by factors which occur under symmetric information as well, for instance framing effects (see Bowles and Polanía-Reyes, 2012). Hence, our alternative hypothesis is:

> **Hypothesis 6:** *The reward crowds out subjects' willingness to transfer, i. e., the number of subjects who transfer weakly decreases and the set of values under which a subject is willing to transfer will weakly shrink under symmetric information. If crowding out is driven by a signaling effect, it should be limited to transfers under asymmetric information.*

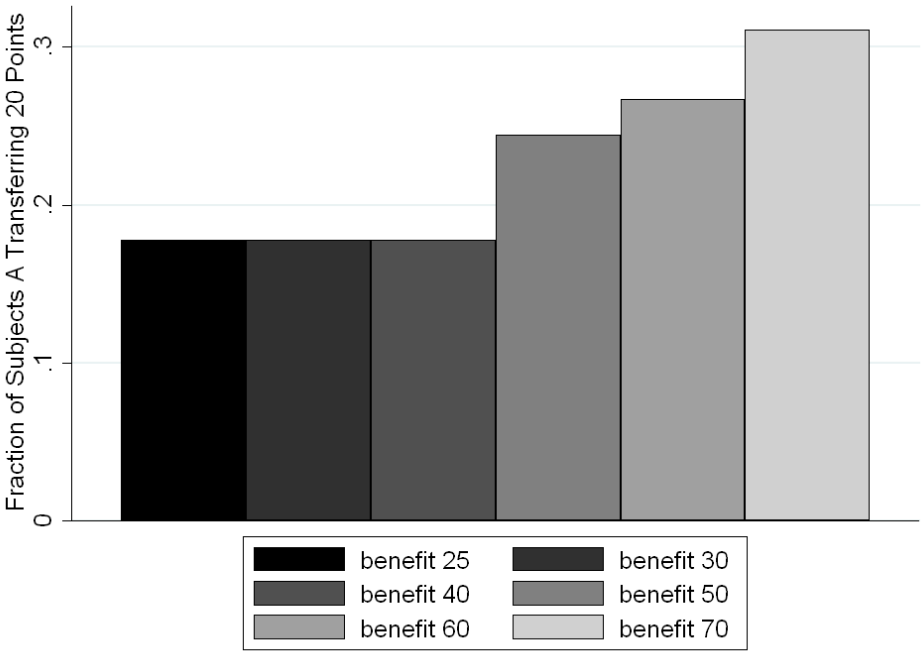
5 Results

We begin our discussion with behavior under symmetric information, then we discuss behavior under asymmetric information and the effect of the reward. Lastly, we will compare results from our baseline sessions to the robustness sessions.

5.1 Symmetric Information

In part 4, where participants A had to make a decision for different known levels of benefits, between 17% and 31% of subjects transfer 20 points. As depicted in Figure 1

Figure 1: Percentage of Transfers - Symmetric Information



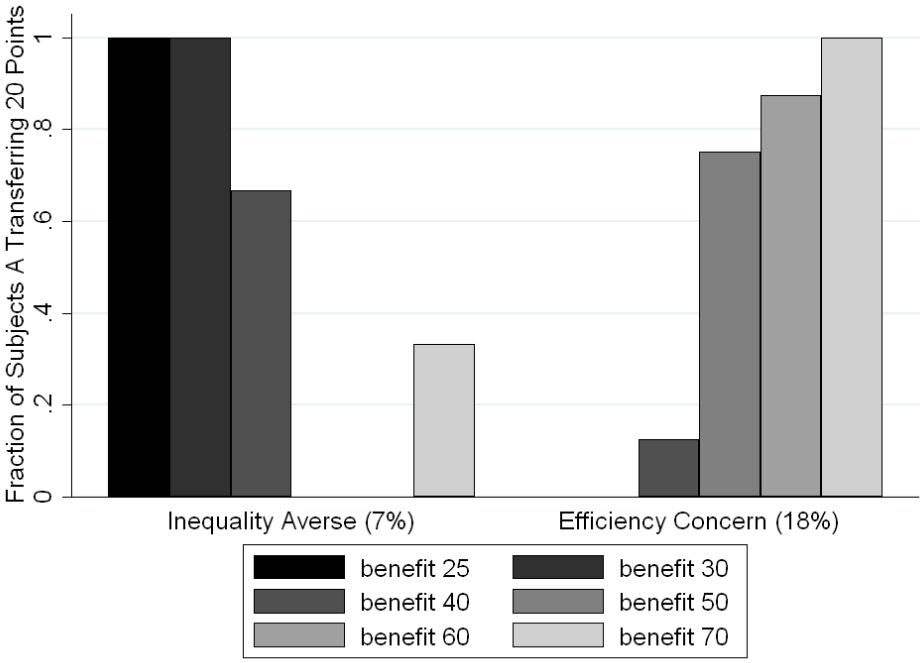
Notes: The figure depicts the share of individuals who transfer for each level of benefit in part 4. The exact level of b is known. N = 45.

the share of individuals behaving prosocially depends on the benefit level. The first bar represents the share of individuals transferring when $b = 25$, the second bar when $b = 30$, and so on. The rate of transfers is highest when the benefit level is at its maximum and lowest for benefit levels below 50 points.

We observe transfer patterns as predicted by social preferences (Hypothesis 1): We can assign each dictator to one of four patterns.[19] Subjects who do not transfer independently of the benefit level (64% of all subjects), subjects who transfer for all values of b and whose behavior is thereby in accordance with a concern for efficiency as well as maximin preferences (11%). Moreover, we observe subjects whose behavior is in line

[19]The assignment is based on behavior in part 4. As we will discuss in section 5.3 below, we thereby have an upper bound on selfish behavior. Some subjects behave prosocially when they are given a reward in part 3.

Figure 2: Transfer Patterns for Different Values of b



Notes: The sample is restricted to those subjects whose behavior follows the prediction by either efficiency concern or inequality aversion. The exact level of b is known. The percentage indicates the frequency in the overall population. $N = 11$. One subject only transferred at b smaller than 40 but also for the value of $b = 70$ in part 4. We assigned this subject to pattern "inequality aversion".

with an efficiency concern (18%) and subjects whose behavior is in line with inequality aversion (7%).[20]

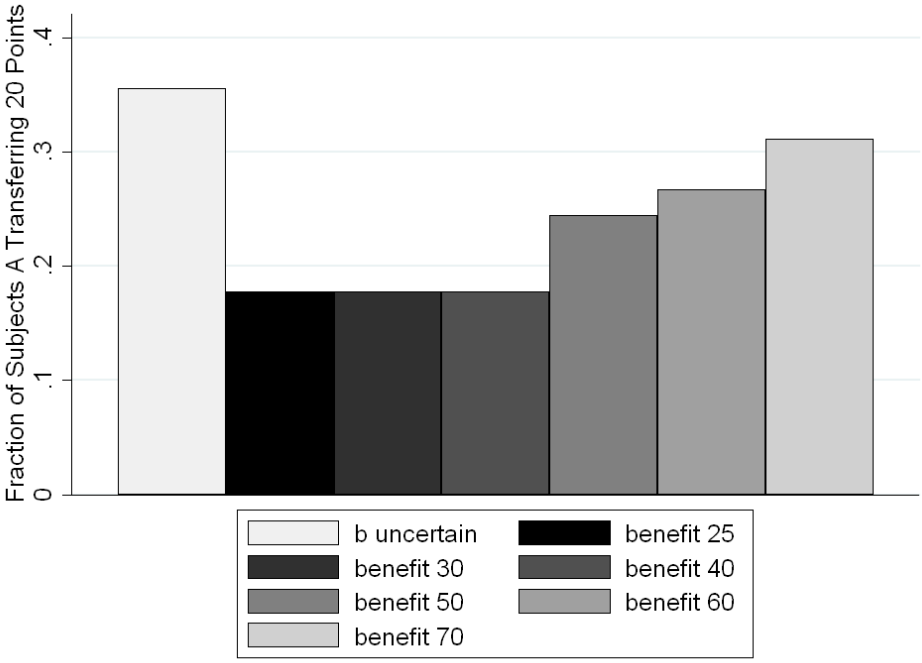
In Figure 2 we depict the behavior of these last two subgroups for all values of b.[21]

Result 1: *Without reward 18% of subjects show a behavior which is in line with an efficiency concern; 7% behave in a way that is predicted by inequality aversion; 11 % behave in a way that is both in line with an efficiency concern and maximin preferences; and 64% behave selfishly.*

[20]We have 90 pairs and thereby 45 dictators. 29 are selfish, 8 behave according to efficiency concern, 5 to either efficiency concern or maximin preferences, and 3 acccording to inequality aversion.

[21]By definition the patterns for the other groups are degenerate. Either subjects transfer for all values of b or for none.

Figure 3: Percentage of Transfers - Symmetric vs Asymmetric Information



Notes: The figure depicts the share of individuals in the role of A who transfer. The first bar refers to transfers in part 1 under asymmetric information. Bars 2-7 depict transfers for each level of benefit in part 4. $N = 45$.

5.2 Asymmetric Information

Turning to behavior under asymmetric information, it becomes evident that the share of subjects transferring is larger than under each value of b under symmetric information. The first bar in Figure 3 depicts the fraction of individuals transferring in part 1 under asymmetric information. Comparing it to behavior under symmetric information (part 4, represented by bars 2 to 7), in particular when the benefit level is low, subjects are more likely to transfer money.

When the benefit level is between 25 and 40 points, only 17% of subjects are willing to transfer compared to 36% under asymmetric information. Table 2 depicts results of an OLS regression with the individual transfer decision as dependent variable. As regressors

Table 2: Dictators' Transfer Decision

	(1)
Transfer when benefit=25 (=1)	-0.178**
	(0.0665)
Transfer when benefit=30 (=1)	-0.178**
	(0.0665)
Transfer when benefit=40 (=1)	-0.178**
	(0.0665)
Transfer when benefit=50 (=1)	-0.111*
	(0.0659)
Transfer when benefit=60 (=1)	-0.0889
	(0.0627)
Transfer when benefit=70 (=1)	-0.0444
	(0.0638)
Constant	0.356***
	(0.0729)
N	315

Notes: Standard errors are in parentheses. Table reports results from an OLS regression. Dependent variable is the individual transfer decision. Explanatory variables are the benefit levels under symmetric information. The omitted category is the asymmetric information case. Standard errors are clustered at the subject level.
Level of significance: * p<0.10, ** p<0.05, *** p<0.01

we include the benefit levels under symmetric information, the omitted category is the decision under asymmetric information. The regression confirms what the graph already pointed out: Fewer prosocial decisions are made under symmetric information compared to the case of asymmetric information. The differences for benefit levels below 60 are statistically significant.[22]

[22] We also estimated a random effects model. The results are very similar. Furthermore, we did a Wilcoxon signed-rank test. For benefit levels 25, 30, and 40 the null-hypothesis can be rejected at the 5% level, for $b = 50$ at the 10% level.

Result 2: *Under asymmetric information more subjects transfer than under each single value of b under symmetric information. For $b < 60$ the effect is statistically significant.*

From Figure 3 it is clear, that in the aggregate subjects do not behave less prosocially under asymmetric information. On the contrary, on average they are more willing to transfer when they do not know the exact value of b.

The reason why we observe this is a combination of two effects: First, as is clear from the previous section, when b is known, different subjects transfer for different values of b. For low values of b subjects whose behavior is consistent with inequality aversion transfer. They do not transfer, though, when the benefit reaches a certain threshold. In contrast, subjects whose behavior is in line with an efficiency concern transfer from a certain threshold on but not when the value is low. Secondly, individual transfers are not reduced by asymmetric information. We observe six subjects who, given their choices under symmetric information, should transfer under asymmetric information according to social preferences. All of them transfer. Hence, no subject who should behave prosocially according to social preferences chooses not do so. Moreover, we observe seven subjects for whom, given their behavior under symmetric information, both a transfer and no transfer under asymmetric information would be in line with social preferences. In fact, four out of these seven transfer. Lastly, we find 32 subjects who transfer *neither* for $b = 40$ *nor* for $b = 50$. Five of them transfer nevertheless. So, if at all, we find some evidence for increased prosocial behavior and therefore evidence against Hypothesis 4.

Result 3: *For most subjects behavior is consistent with social preference theories and their choices under symmetric information. There is no evidence for a negative effect of asymmetric information.*

Combining that subjects are not negatively affected by asymmetric information and

that we observe different types which separate when information is symmetric but both transfer when information is asymmetric, results in higher transfers under asymmetric information in the aggregate. As a consequence, earnings for subjects in the role of B are substantially higher when A decides under asymmetric information. Each value of b is equally likely and the unconditional decision to transfer (0.36) is the same for all values of b. Under symmetric information, each value of b is also equally likely as before. Yet, as subjects make a transfer decision for each value of b, the conditional probability may vary over b and is smaller than the probability under asymmetric information. Hence, players B have a higher chance to obtain a transfer: 36% under asymmetric information versus 22% under symmetric information.[23] And their expected transfer is 45% higher: 11 points under symmetric information versus 15 points under asymmetric information.[24]

5.3 Reward

In the second and third part of our experiment, we introduce a reward for participant A if he chooses the prosocial action. In all cases, the reward was 5 points.

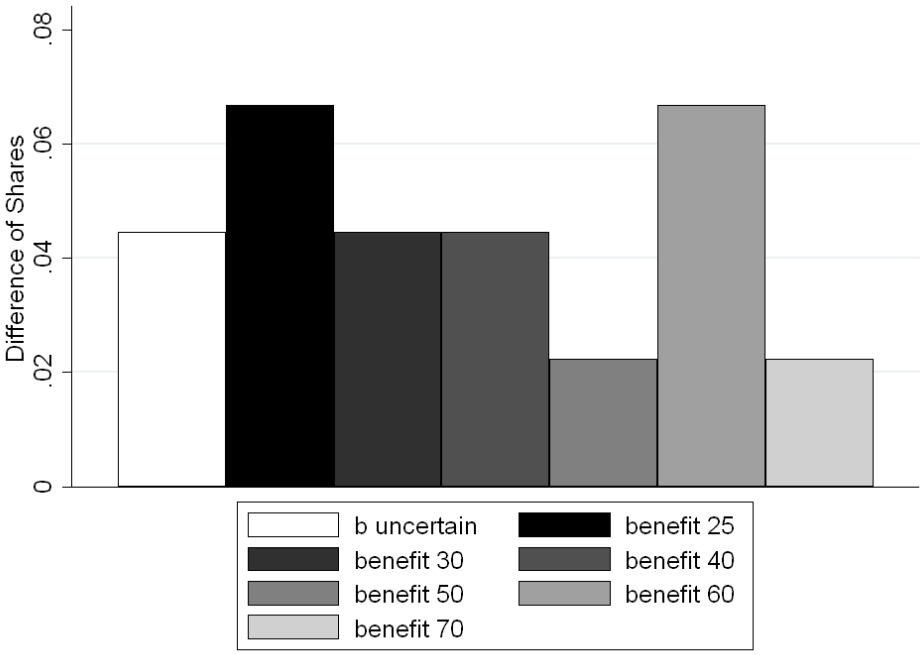
Figure 4 depicts the difference between shares of subjects who transfer with and without reward. The first bar depicts the comparison of transfers under asymmetric information (part 2 versus part 1) and bars 2-7 represent the comparison of transfers under symmetric information (part 4 versus part 3) for each level of benefit.

The reward has a positive effect but it is small: More subjects choose to transfer money in part 2 compared to part 1. Mirroring the positive effect, when the reward is withdrawn, we observe a negative effect: The willingness to transfer decreases. For each value of b we observe fewer transfers in part 4 than in part 3. On the one hand, the effect is

[23] Probability to obtain a transfer is equal to $\frac{1}{6}(17+17+17+24+26+31)\% = 22\% < 36\%$

[24] $E[b] = \frac{1}{6}(0.17 \cdot 25 + 0.17 \cdot 30 + 0.17 \cdot 40 + 0.24 \cdot 50 + 0.26 \cdot 60 + 0.31 \cdot 70) = 11 < 0.36 \cdot 45 = 16$

Figure 4: The Effect of Reward on Transfers



Notes: Bar 1 depicts the difference between the shares of individuals who transfer in part 2 and the share of individuals who transfer in part 1. Bars 2-7 depict the differences between the shares of individuals who transfer in part 3 and the share of individuals who transfer in part 4 for each level of benefit. $N = 45$.

Table 3: Dictators' Transfer Decision - Reward

	(1)
Transfer when benefit=25 (=1)	-0.167***
	(0.0505)
Transfer when benefit=30 (=1)	-0.178***
	(0.0484)
Transfer when benefit=40 (=1)	-0.178***
	(0.0427)
Transfer when benefit=50 (=1)	-0.122**
	(0.0534)
Transfer when benefit=60 (=1)	-0.0778
	(0.0504)
Transfer when benefit=70 (=1)	-0.0556
	(0.0535)
Reward (=1)	0.0444
	(0.0350)
Constant	0.356***
	(0.0615)
N	630

Notes: Standard errors are in parentheses. Table reports results from an OLS regression. Dependent variable is the individual transfer decision. Explanatory variables are the benefit levels under symmetric information. The omitted category is the asymmetric information case. Standard errors are clustered at the subject level.
Level of significance: * p<0.10, ** p<0.05, *** p<0.01

Part 1 [4]	b is known to A.
Part 2 [1]	b is *not* known to A
Part 3 [3]	b is known to A. A receives a reward if he transfers.
Part 4 [2]	b is *not* known to A. A receives a reward if he transfers.

Table 4: Overview over Parameters in the Robustness Sessions

driven by individuals who transfer in part 3 but stop transferring in part 4. On the other hand, for subjects, who still transfer in part 4, the set of values for which they transfer decreases. In Table 3 we depict results of an OLS regression similar to the baseline in Table 2. We include the reward as a dummy variable. It confirms that the reward has a positive effect but also shows that the effect is not statistically significant.[25]

Hence, we do not find significant evidence that a reward has a negative effect on prosocial behavior in our experiment (Hypothesis 6), the incentive works as standard price theory would predict (Hypothesis 5) and we also do not observe a differential effect of the price under symmetric and asymmetric information (when comparing part 2 with 3 versus 1 with 4).

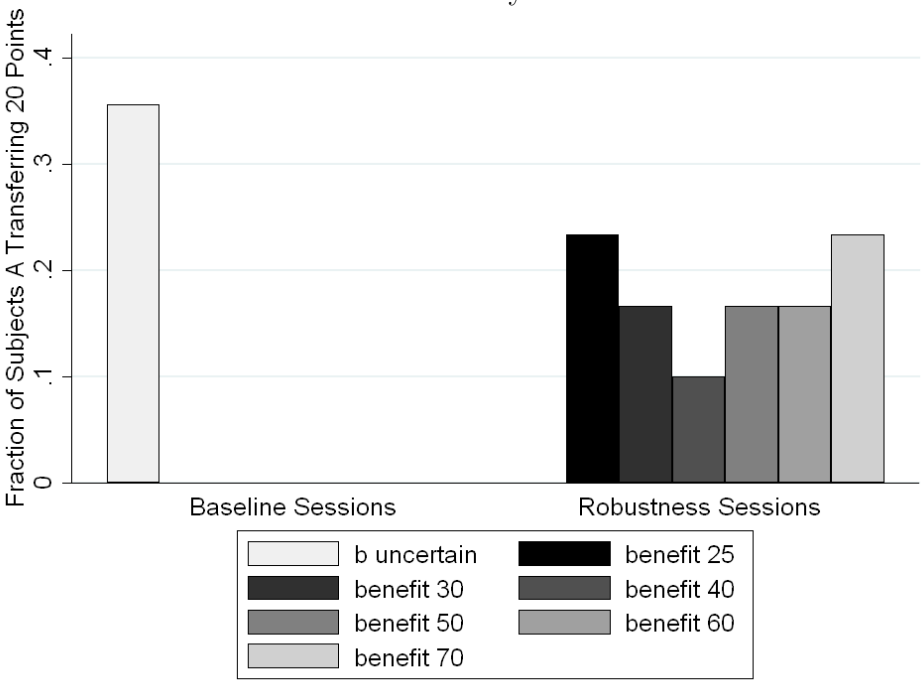
> **Result 4:** *The reward increases the number of subjects who transfer and the set of values of b for which subjects are willing to transfer under both symmetric and asymmetric information.*

5.4 Robustness Check - Sequence of Parts

As in our experiment subjects participate in the different treatments in a sequence, it may be possible that subjects' behavior is influenced by the order of treatments. For instance, there may be a decay of prosocial behavior over time and the difference which we observe between part 1 and 4 merely an artefact of the design. To check the robustness of our

[25] As before we also estimated a random effects model (cf. Footnote 5.2). We also did a Wilcoxon signed-rank test. There was no significant difference.

Figure 5: Percentage of Transfers under Symmetric and Asymmetric Information - 1st Part only



Notes: The figure depicts the share of individuals in the role of A who transfer for the baseline sessions and the robustness sessions in part 1. The first bar refers to transfers under asymmetric information in the baseline sessions. Bars 2-7 depict transfers for each level of benefit under symmetric information in the robustness sessions.

results, we ran three more sessions with 60 participants where we changed the order of the parts. Table 4 provides an overview of the new order (the old order is depicted in "[]"). Most importantly, we let subjects decide first under symmetric information. So, we can compare this decision to the baseline sessions where subjects decided under asymmetric information in part 1 to see whether it still holds that in the aggregate subjects behave less prosocially under symmetric information.

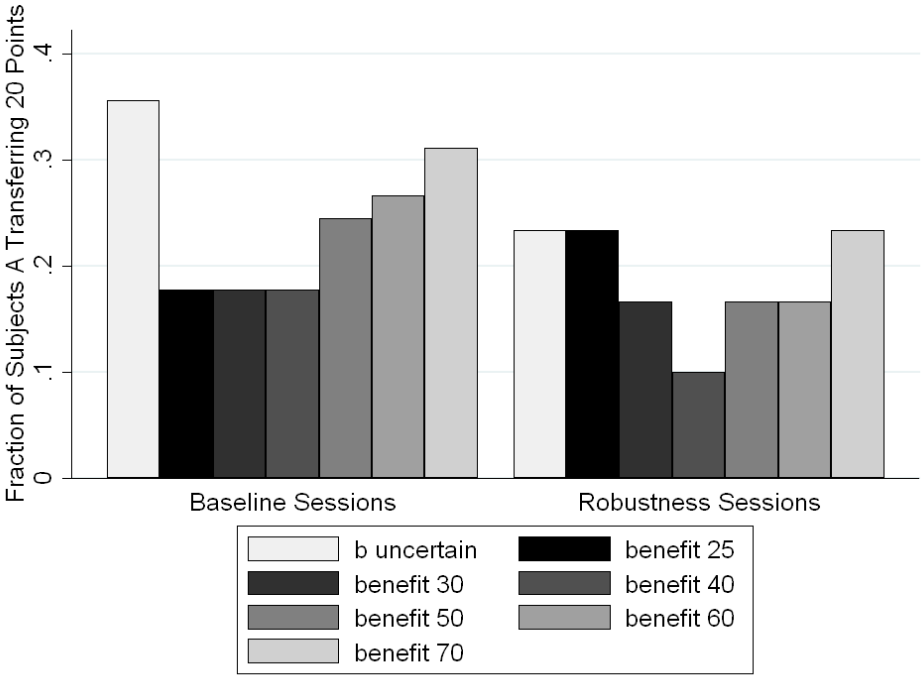
In Figure 5 we depict only part 1 for both the baseline as well as the robustness sessions. A direct comparison between transfer levels reveals that under asymmetric information subjects transfer more than for each level of benefit b under symmetric infor-

mation. In fact, the difference is even more pronounced than in the comparison of part 1 and 4 within the baseline sessions. For $b = 30$, $b = 50$, and $b = 60$ the difference is statistically significant (Fisher's exact test, $p < 0.07$) and for $b = 40$ as well (Fisher's exact test, $p < 0.02$).

In Figure 6 we depict the decision to transfer under asymmetric information (bar 1) and the decisions to transfer under symmetric information for different values of b (bars 2 - 7). In the robustness sessions, subjects transfer under asymmetric information at least as much as for each level of b under symmetric information; for $b = 40$ the difference is statistically significant at the 5% level (Wilcoxon signed-rank test). So, as before the expected income for subjects in the role of B is higher under asymmetric information. However, in general there are lower transfers and smaller differences in the robustness sessions than in the baseline sessions.

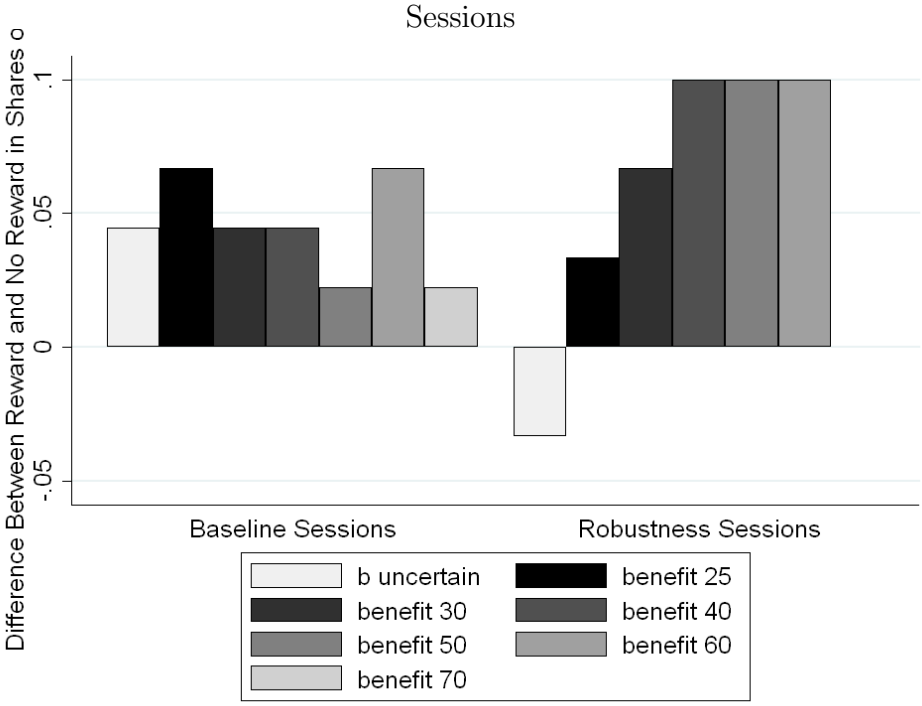
What is the reason for this difference? If we look at what happens under symmetric information, it becomes apparent that there is a further difference. Relative to the baseline sessions more subjects transfer for low levels of b. What is different is the composition of types: In contrast to the baseline sessions, we observe more inequality averse subjects and no subject who always transfers (independently of the exact value of b). At the individual level, the behavior under asymmetric information is very similar to what we observe in the baseline sessions. We observe two subjects who, given their choices under symmetric information, should transfer under asymmetric information. Both of them transfer. Hence, no subject who should behave prosocially according to social preferences chooses not do so. Moreover, we observe five subjects who conditional on their transfer decision under symmetric information may either transfer or not transfer. Four out of these five subjects transfer. Lastly, we find 23 subjects who transfer *neither* for $b = 40$ *nor* for $b = 50$. Two of them transfer nevertheless under asymmetric information.

Figure 6: Percentage of Transfers - Baseline versus Robustness Sessions



Notes: The figure depicts the share of individuals in the role of A who transfer for the baseline sessions and the robustness sessions. The first bar refers to transfers under asymmetric information. Bars 2-7 depict transfers for each level of benefit under symmetric information.

Figure 7: The Effect of Reward on Transfers - Baseline Sessions versus Robustness Sessions



Notes: Bar 1 depicts the difference between the shares of individuals who transfer with reward and the share of individuals who transfer without reward under asymmetric information. Bars 2-7 depict the difference between the shares of individuals who transfer with reward and the share of individuals who transfer without reward for each level of benefit under symmetric information.

So, regarding individual behavior, the reaction to asymmetric information is very close to the baseline sessions. Yet, as we observe a different composition of types and thereby a different behavior under symmetric information, it is not surprising that there is also a difference under asymmetric information.

In Figure 7 the effect of the reward is depicted. There are slight differences between the robustness and the baseline sessions. Under symmetric information the effect of the reward is positive in both experiments even though the effect is stronger in the robustness sessions. Under asymmetric information, the effect actually has a negative effect in the robustness sessions. However, the overall magnitude of the reward's effect is small. Moreover, the difference is far from being statistically significant (Wilcoxon signed-rank test).

6 Conclusion

Economic experiments indicate that people regularly deviate from purely selfish behavior; they care not only about their own payoff but also about the payoff of others. When individuals face the decision to support a policy proposal, they find themselves in a similar situation: The proposal will have consequences for themselves but at the same time for others. Hence, when we observe in the laboratory that subjects behave prosocially and transfer patterns follow predictions by social preference theories, these theories can help to understand individual support for certain policies. Moreover, they can allow to implement policies that would fail under purely selfish behavior.

In this paper, we investigate one aspect which plays a role in decisions in the field and has not yet been addressed in the context of laboratory experiments that try to measure social preferences: asymmetric information. In the field, decisions have to be

made under a different information setting than in the laboratory. The gains and costs a person will realize when a policy is implemented will often be private information. In contrast, in most laboratory experiments subjects have plenty of information about the exact outcomes available. With this experiment we take a first step to investigate whether information asymmetries influence prosocial behavior of individuals. We compare transfers when a dictator has perfect information about the benefit he generates for the recipient with a situation where he only knows the distribution of benefits that may realize. The recipient, however, is fully informed about the benefit he receives.

We find that (i) in this setting 36% of subjects behave prosocially and transfer, (ii) 18% of subjects make choices that are consistent with a concern for efficiency, 7% make choices which are consistent with inequality aversion, and 11% transfer independently of the value of b, whose choices are therefore in line with an efficiency concern or maximin preferences, and (iii) under asymmetric information transfers do not decline. Even though subjects face the risk of transferring at a benefit level which they would not choose if they knew the level for sure, the level of transfers is stable and in fact even slightly higher than at the highest level under symmetric information. Lastly, the introduction of a reward weakly increases transfers. Only under asymmetric information in the robustness sessions there is a negative effect of the reward. However, as it is the case when the reward has a positive influence, the overall effect of the reward is small and not statistically significant.

Our results suggest that individual behavior is not negatively affected by asymmetric information. In the aggregate, subjects, whose behavior is either in line with inequality aversion or with an efficiency concern, tend to transfer both under asymmetric information. Consequently, more subjects transfer under asymmetric information than for any single value of b under symmetric information.

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A Descriptive Statistics

Table 5: Dictators' Transfer Decisions - Summary Statistics Baseline Sessions

	Mean	Standard Deviation	Median
1st Part			
Transfer (=1)	.3555556	.4840903	0
2nd Part (with reward)			
Transfer (=1)	.4	.4954337	0
3rd Part (with reward)			
Benefit=25: Transfer (=1)	.2444444	.4346135	0
Benefit=30: Transfer (=1)	.2222222	.4204375	0
Benefit=40: Transfer (=1)	.2222222	.4204375	0
Benefit=50: Transfer (=1)	.2666667	.4472136	0
Benefit=60: Transfer (=1)	.3333333	.4767313	0
Benefit=70: Transfer (=1)	.3333333	.4767313	0
4th Part			
Benefit=25: Transfer (=1)	.1777778	.3866458	0
Benefit=30: Transfer (=1)	.1777778	.3866458	0
Benefit=40: Transfer (=1)	.1777778	.3866458	0
Benefit=50: Transfer (=1)	.2444444	.4346135	0
Benefit=60: Transfer (=1)	.2666667	.4472136	0
Benefit=70: Transfer (=1)	.3111111	.4681794	0
$N = 45$			

Table 6: Dictators' Transfer Decisions - Summary Statistics Robustness Sessions

	(1)		
	mean	sd	p50
Transfer (=1)	.2333333	.4301831	0
Transfer (=1)	.2	.4068381	0
Benefit=25: Transfer (=1)	.2666667	.4497764	0
Benefit=30: Transfer (=1)	.2333333	.4301831	0
Benefit=40: Transfer (=1)	.2	.4068381	0
Benefit=50: Transfer (=1)	.2666667	.4497764	0
Benefit=60: Transfer (=1)	.2666667	.4497764	0
Benefit=70: Transfer (=1)	.2333333	.4301831	0
Benefit=25: Transfer (=1)	.2333333	.4301831	0
Benefit=30: Transfer (=1)	.1666667	.379049	0
Benefit=40: Transfer (=1)	.1	.3051286	0
Benefit=50: Transfer (=1)	.1666667	.379049	0
Benefit=60: Transfer (=1)	.1666667	.379049	0
Benefit=70: Transfer (=1)	.2333333	.4301831	0
N	30		

B Derivations Section 4

In this section, we show under which parameters individuals are willing to transfer with efficiency concern, maximin preferences, and inequality aversion. Moreover, we derive the conditions that allow us to formulate Hypotheses 2 and 3.

B.1 Symmetric Information - Efficiency Concern and Maximin Preferences

Efficiency Concern Given his individual parameter λ^i and the value of b, player i will transfer if

$$U_A^i(80, 50 + b) > U_A^i(100, 50) \Leftrightarrow \lambda^i > \frac{20}{b}. \tag{5}$$

Given λ^i, i will transfer at least for $b = 70$ if $\lambda^i > \frac{2}{7}$. If $\lambda^i > \frac{4}{5}$ holds, then individual i will transfer for all values of b. For $\frac{2}{7} < \lambda^i < \frac{4}{5}$ let b^* denote the lowest value of b for which i is willing to transfer. Individual i will transfer for b^* and all values of b with $b > b^*$. If, however, $\lambda^i < \frac{2}{7}$ holds, then i does not weight the efficiency gain highly enough for any b in the experiment that the possible values of b suffice to compensate individual i for his own payoff loss. In that case i will never transfer. Hence, subjects with an efficiency concern should exhibit the following transfer pattern: Either they do not transfer at all, or they transfer for a particular value of b^* and all values $b > b^*$.

Maximin Preferences Subjects with maximin preferences will transfer the 20 points if it holds that:

$$U_A^i(80, 50+b) > U_A^i(100, 50)$$

$$(1-\lambda^i)80 + \lambda^i \min[80, 50+b] > 100 - \lambda^i 50$$

$$\lambda^i(\min[80, 50+b] - 30) > 20$$

$$\lambda^i > \frac{20}{(\min[80, 50+b] - 30)}$$

If $\lambda^i > \frac{2}{5}$, i will transfer to achieve a more equal allocation for values of $b > 25$. If $\lambda^i > \frac{20}{45}$, i will also transfer for $b = 25$. If, however, $\lambda^i < \frac{2}{5}$, i will not transfer as selfishness motives dominate.

B.2 Symmetric Information - Inequality Aversion

In this section, we derive what transfer patterns we should observe for inequality aversion. To begin with, note that it holds that $U_A(80, 80) > U_A(80, 75) > U_A(80, 90) > U_A(80, 100)$ for all parameters as one can directly see from the following equations (and using that $\alpha^i \geq \beta^i$):

$$U_A(80, 80) = 80$$

$$U_A(80, 75) = 80 - 5\beta^i$$

$$U_A(80, 90) = 80 - 10\alpha^i$$

$$U_A(80, 100) = 80 - 20\alpha^i$$

Hence, whenever an individual is willing to transfer for $b = 50$, he will be willing to transfer for values of $b < 50$ as well. Next, we show that there actually exist parameters such that subjects may transfer for $b = 50$.

$$
\begin{aligned}
U_A(80, 100) &> U_A(100, 50) \\
80 - 20\alpha^i &> 100 - 50\beta^i \\
50\beta^i - 20\alpha^i &> 20 \\
50\beta^i - 20 &> 20\alpha^i \\
\frac{5}{2}\beta^i - 1 &> \alpha^i \\
\frac{5}{2}\beta^i - 1 > \alpha^i &\geq \beta^i \\
\frac{5}{2}\beta^i - 1 &> \beta^i \\
\frac{3}{2}\beta^i &> 1 \\
\beta^i &> \frac{2}{3}
\end{aligned}
$$

For values of $b > 50$, however, no parameters exist such that individuals will transfer. Suppose $U_A(80, 110) > U_A(100, 50)$ held, then

$$
\begin{aligned}
U_A(80,110) &> U_A(100,50) \\
80 - 30\alpha^i &> 100 - 50\beta^i \\
50\beta^i - 30\alpha^i &> 20 \\
50\beta^i - 20 &> 30\alpha^i \\
\frac{5}{3}\beta^i - \frac{2}{3} &> \alpha^i \\
\frac{5}{3}\beta^i - \frac{2}{3} > \alpha^i &\geq \beta^i \\
\frac{2}{3}\beta^i &> \frac{2}{3} \\
\beta^i &> 1
\end{aligned}
$$

Yet, by assumption $\beta^i < 1$. Thus, for $b = 60$ no admissible parameters exists, such that a transfer makes an individual better off.

B.3 Asymmetric Information

Inequality Aversion We will proceed as follows. We will show it always holds that the utility from transferring under asymmetric information $E(U_A(\pi_A, \pi_B)|transfer = YES)$ is smaller than the utility from transferring for $b = 40$ but larger than for $b = 50$ under symmetric information, that is, it holds that $U_A(80, 90) > E(U_A(\pi_A, \pi_B)|transfer = YES) > U_A(80, 100)$. Hence, if it holds that player i transfers for $b = 50$, i.e., $U_A(80, 100) > U_A(100, 50)$, then it also holds that $E(U_A(\pi_A, \pi_B)|transfer = YES) > U_A(100, 50)$. Thus, a transfer for $b = 50$ then implies that a player should transfer under asymmetric information. On the other hand, if player i does not transfer for $b = 40$, i.e., $U_A(80, 90) < U_A(100, 50)$, it implies that

$E(U_A(\pi_A, \pi_B)|transfer = YES) < U_A(100, 50)$ and therefore a player will also not transfer under asymmetric information.

For $\alpha^i, \beta^i > 0$ consider:

$$\begin{aligned} U_A(80, 90) - E(U_A(\pi_A, \pi_B)|transfer = YES) &= \\ 80 - 10\alpha^i - \left(80 - \frac{1}{6}\left[5\beta^i + 100\alpha^i\right]\right) &= \\ -10\alpha^i + \frac{5}{6}\beta^i + \frac{100}{6}\alpha^i &= \\ \frac{40}{6}\alpha^i + \frac{5}{6}\beta^i > 0 \end{aligned}$$

And lastly, as $\beta^i \leq \alpha^i$:

$$\begin{aligned} E(U_A(\pi_A, \pi_B)|transfer = YES) - U_A(80, 100) &= \\ 80 - \frac{1}{6}\left[5\beta^i + 100\alpha^i\right] - \left[80 - 20\alpha^i\right] &= \\ -\frac{5}{6}\beta^i + \frac{20}{6}\alpha^i > 0 \end{aligned}$$

Efficiency Concern For efficiency concern, it holds that an individual i who transfers for $b = 40$ should transfer under asymmetric information. However, an individual who does not transfer for $b = 50$, should not transfer under asymmetric information. The argument is analogous to the inequality aversion case. First, note that it holds that $U(80, 100) > E(U(\pi_A, \pi_B)|transfer = YES) > U(80, 90)$ (for $\lambda^i > 0$).

$$
\begin{aligned}
E(U(\pi_A, \pi_B)|transfer = YES) - U(80, 90) &= \\
(1-\lambda^i)80 + \frac{1}{6}\lambda^i\left[155 + 160 + 170 + 180 + 190 + 200\right] - \left[(1-\lambda^i)80 + \lambda^i(170)\right] &= \\
80 - 80\lambda^i + \frac{1055}{6}\lambda^i - \left[80 + 90\lambda^i\right] &= \\
80 + \frac{575}{6}\lambda^i - \left[80 + 90\lambda^i\right] &= \\
\frac{35}{6}\lambda^i > 0
\end{aligned}
$$

$$
\begin{aligned}
EU(\pi_A, \pi_B) - U(80, 100) &= \\
80 + 96\lambda^i - \left[80 + 100\lambda^i\right] &= \\
-4\lambda^i < 0
\end{aligned}
$$

So, if it holds that i transfers for $b = 40$, i.e., $U(80, 90) > U(100, 50)$ which is fulfilled for $\lambda^i > \frac{1}{2}$, then i will also transfer under asymmetric information. On the other hand, if it holds that i does not transfer for $b = 50$, i.e., $U(80, 100) < U(100, 50)$ which holds for $\lambda^i < \frac{2}{5}$, i will not transfer under asymmetric information.

C Instructions

The original instructions were in German. In the following, we provide an English version.

General Instructions for Participants

You are now participating in an economic experiment. Please, read the following instruction carefully. It explains everything what you need to know for the participation in the experiment. If you have any question, please, just raise your hand. Your question will be answered at your workplace. Apart from that, any sort of communication during the experiment is forbidden. If you violate this rule, you will be excluded from the experiment and will not receive any payment.

The experiment consists of four parts. You obtain a separate instruction for each part.

In all four parts you can earn points. It holds that:

10 Points = 1 Euro

Your final payment will be determined by the payment earned in one out of the four parts comprising the experiment. At the end of the experiment, the experimenter draws from an urn. The draw will determine one out of the four parts for all participants. You will receive the payment which you earned for this part in cash.

After each part you will be informed how many points you earned for this part. You obtain no information concerning the earnings of other participants.

The Experiment

The computer randomly assigns either the role of Participant A or Participant B to each participant. At the beginning of the experiment, your computer will inform you whether you are Participant A or Participant B.

This assignment does not change during the experiment. Each participant will stay either Participant A or Participant B during all four parts of the experiment.

In all four parts two participants, A and B, are randomly assigned to each other.

In each part of the experiment, another Participant B is assigned to a participant A. As a result, the same two participants will never be assigned to each other more than once.

No participant knows whom he is assigned to. That means all decisions are anonymous.

Do you have any questions? If yes, please raise your hand. The experimenter will answer your question at your workplace.

Please, read the instruction for part 1 of the experiment on the next pages.

You obtain the instructions for parts 2 to 4 at the beginning of the respective part.

Part 1

Participant **A** obtains an amount of 100 points. Participant **B** obtains an amount of 50 points.

The Decision of Participant A

A has to decide if he is ready to spend 20 points in order to increase the payment of **B** by **b** points. That means instead of the amount of 50 points **B** obtains the payoff of **50 + b**. **A** can spend either 20 points or nothing.

If **A** decides not to spend 20 points, both participants obtain their original payoffs: **A** receives 100 and **B** 50 points.

The exact value of **b** is determined before the start of the actual experiment: the experimenter draws one ball from an urn.

The urn contains the following balls, each represents one value of **b**:

1 ball with b=25, 1 ball with b=30, 1 ball with b=40,

1 ball with b=50, 1 ball with b=60, 1 ball with b=70

Participant **B** will be informed on his screen which ball has been drawn. Participant **A** however, will not be informed about the exact value of **b**.

The Decision of Participant B

In contrast to Participant **A**, Participant **B** is informed about the exact value of **b** at the beginning of part 1.

Participant **B** makes no decisions.

Please, answer the following control questions. These question do not influence your payments and only serve to check if all participants understood the rules of the experiment correctly.

Question 1. Assume that Participant A decides to spend 20 points. What will be the payoffs if the ball with b = 30 is drawn?

Payoff for A:
Payoff for B:

Question 2. Assume that Participant A decides *not* to spend 20 points. What will be the payoffs if the ball with b = 50 is drawn?

Payoff for A:
Payoff for B:

After you have answered the questions, please, raise your hand. The experimenter will check your answers at your workplace. When all the participants are ready, we start with the actual experiment.

Part 2

Participant **A** obtains an amount of 100 points. Participant **B** obtains an amount of 50 points.

The Decision of Participant A

A has to decide if he is ready to spend 20 points in order to increase the payment of **B** by **b** points. That means instead of the amount of 50 points **B** obtains the payoff of 50 + b. **A** can spend either 20 points or nothing.

If **A** decides not to spend 20 points, both participants obtain their original payoffs: A receives 100 and **B** 50 points.

The exact value of **b** is determined before the start of the actual experiment: the experimenter draws one ball from an urn.

The urn contains the following balls, each represents one value of **b**:

1 ball with b=25, 1 ball with b=30, 1 ball with b=40,

1 ball with b=50, 1 ball with b=60, 1 ball with b=70

Participant **B** will be informed on his screen which ball has been drawn. Participant **A** however, will not be informed about the exact value of **b**.

If **A** decides to spend 20 points, he obtains a reward - **r** points. It holds that **5 points ≤ r ≤ 10 points.** The exact value of **r** will be determined after b is determined. Participant **A** will be informed about the value of **r** on his display.

The Decision of Participant B

In contrast to Participant **A**, Participant **B** is informed about the exact value of **b** at the beginning of part 1. Participant **B** will be informed about the value of **r** on his display.

Participant **B** makes no decisions.

Part 3

Participant **A** obtains an amount of 100 points. Participant **B** obtains an amount of 50 points.

The Decision of Participant A

A has to decide if he is ready to spend 20 points in order to increase the payment of **B** by **b** points. That means instead of the amount of 50 points **B** obtains the payoff of 50 + **b**. **A** can spend either 20 points or nothing.

If **A** decides not to spend 20 points, both participants obtain their original payoffs: **A** receives 100 and **B** 50 points.

b can obtain different values. **A** has to make a decision for each of the following cases:

1. **b = 25**
2. **b = 30**
3. **b = 40**
4. **b = 50**
5. **b = 60**
6. **b = 70**

In the end of part 3, the experimentator draws one ball from the urn, which will determine the decision problem, relevant for the payoff in this part of the experiment.

If **A** decides to spend 20 points, he obtains a reward - **r** points. It holds that **5 points ≤ r ≤ 10 points.** Participant **A** will be informed about the value of **r** on his display.

The Decision of Participant B

Participant **B** makes no decisions. Participant **B** will be informed about the value of **r** on his display.

.

Please, answer the following control questions. These question do not influence your payments and only serve to check if all participants understood the rules of the experiment correctly.

Question 1. Assume that Participant A decides to spend 20 points. What will be the payoffs in the case (1)?

Payoff for A:
Payoff for B:

Question 2. Assume that Participant A decides *not* to spend 20 points. What will be the payoffs in the case (4)?

Payoff for A:
Payoff for B:

After you have answered the questions, please, raise your hand. The experimenter will check your answers at your workplace.

Part 4

Participant **A** obtains an amount of 100 points. Participant **B** obtains an amount of 50 points.

The Decision of Participant A

A has to decide if he is ready to spend 20 points in order to increase the payment of **B** by **b** points. That means instead of the amount of 50 points **B** obtains the payoff of **50 + b**. **A** can spend either 20 points or nothing.

If **A** decides not to spend 20 points, both participants obtain their original payoffs: **A** receives 100 and **B** 50 points.

b can obtain different values. **A** has to make a decision for each of the following cases:

1. **b = 25**
2. **b = 30**
3. **b = 40**
4. **b = 50**
5. **b = 60**
6. **b = 70**

In the end of part 3, the experimentator draws one ball from the urn, which will determine the decision problem, relevant for the payoff in this part of the experiment.

The Decision of Participant B

Participant **B** makes no decisions.