Directed Altruism and Granting Favors in Social Networks*

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Abstract

We study why socially close neighbors make better agents than strangers. Using a series of modified dictator games and a new helping game we find that agents pass about 50 percent more surplus to friends compared to strangers when decision making is anonymous. This *directed altruism* effect is complemented by an *enforcement effect* which increases giving by an additional 25 percent under non-anonymous decision making. We model enforcement as the agent's ability to get compensated for costly effort by the principal. We can differentiate the enforcement effect from reputational concerns and other behavioral effects by comparing decision making in modified dictator games where altruistic behavior is efficient and inefficient (e.g. increases or decreases social surplus). Our research sheds light on the sources of trust in social networks.

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1 Introduction

Principals often cannot choose *how* to interact with an agent but only with *whom* to interact. Starting a business with a partner, buying a house or a used car, or informal lending are examples of transactions where high transaction costs limit the scope of enforceable contracts. In these situations principals often resort to dealing with socially close agents such as a direct or indirect friend. For example, 27 percent of small businesses in the US have two owners who were friends before starting the business in the majority of cases.[1] According to DiMaggio and Louch (1998) 40 percent of home buyers and 44 percent of use car buyers rely on their social network. Mobius and Szeidl (2006) calculated that 55 percent of respondents in the General Social Survey turn to their social contacts for large sums of money. In Ethiopia and Kenya respectively, 27 percent and 9 percent of small business businesses receive informal loans from within their social network (Ageba and Amha, 2006; Fafchamps and Lund, 2003).

Friends might be better agents because they like us more or because they interact more frequently with us and they expect us to compensate them for exerting costly effort. We capture these *directed altruism* and *enforcement* channels in a simple model which motivates two field-experimental designs using real-world social networks of college students. After measuring the social network agents are asked to make allocation decisions in modified dictator games and a new helping game for a series of named principals at various social distances. Only one decision is randomly selected for payment. In the anonymous treatment no player is told ex post which of the matches was selected while in the non-anonymous treatment both players are informed about the match and the agent's decision. The anonymous treatment allows us to measure directed altruism while the comparison of the non-anonymous and anonymous treatments allow us to identify the enforcement effect. We find strong evidence for directed altruism that declines with social distance: agents pass about 50 percent more surplus to friends compared to strangers. The enforcement channel increases generosity by another 25 percent.

Our experimental design allows us to differentiate the enforcement effect from reputational concerns and other behavioral effects. Unlike alternative theories enforcement predicts that agents will behave less selfishly under non-anonymity only when altruism is efficient in the sense that being generous to the principal increases total social surplus. We find this pattern confirmed in our data.

In an important methodological advance our two experiments were completely web-based. This ensured very high participation rates of between 42 percent and 71 percent which was important for generating a sufficient number of matches

[1]The National Federation of Independent Businesses conducted a survey in 2004 (reported in article "Friends Don't Always Make Good Partners" in the *New York Times* on 7 September, 2006).

between direct friends during the course of the experiment. We also used two novel coordination games for providing correct incentives to subjects to reveal their social network. In the *coordination game* approach subjects received a probabilistic small prize for listing a friend who also listed them. In the *trivia game* approach both the participant and one of her friends could receive a prize if they provided identical feedback on one of the friend's habits such as favorite foods, clothing etc.

Our paper relates to a rich experimental and theoretical literature on other-regarding preferences and cooperation. Prosocial behavior in the lab of varying magnitudes has been observed in a variety of contexts (see Camerer (2003) for an extensive survey). Our directed altruism channel is a natural refinement of preference-based altruism as modeled by Andreoni (1990) in his "warm glow" model or Fehr and Schmidt (1999) and Charness and Rabin (2002) who focus on preferences over payoff distributions. Preference-based altruism can can explain prosocial behavior in two-player games with a single decision maker such as the modified dictator games and the helping game in our anonymous treatment.[2]

Our model of the enforcement channel belongs to the large literature on repeated games where cooperation is sustained through social sanctions (Kandori, 1992; Greif, 1993; Ellison, 1994; Dixit, 2003). Our particular formulation is based on the work of Mobius and Szeidl (2006) whose notion of "trust flow" conveniently captures the enforcement capability of a principal vis-á-vis an agent in her social network. Our test for enforcement by comparing the anonymous and non-anonymous treatments implicitly relies on subjects' future interactions after the experiment has ended. This makes our design quite different from the typical experiment where all payoff-relevant interactions are tightly controlled. A notable exception is the seminal paper of Glaeser, Laibson, Scheinkman, and Soutter (2000) who also non-anonymously match subjects at various social distances to play a trust game. Our main innovation is to separate out the directed altruism effect from the enforcement effect by comparing anonymous and non-anonymous treatments. Models based on signalling a generous type (Bnabou and Tirole, 2006; Levine, 1998) and behavioral models based on reciprocity [3] make similar predictions as our enforcement model only when altruism is efficient which allows us to differentiate the theories from each other.

Our work complements the theoretical and experimental literature on trust and cooperation which developed around the trust game of Berg, Dickhaut, and McCabe (1995). While that literature tries to explain trust between strangers we are inter-

[2]The modified dictator game was derived by Andreoni and Miller (2002) from the basic dictator game of Forsythe, Horowitz, Savin, and Sefton (1994).

[3](Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006) have developed theories based on psychological games to explain prosocial behavior in games with strategic interaction such as the ultimatum game (Gth, Schmittberger, and Schwarze, 1982) and the public goods game with punishments Fehr and Gchter (2000).

ested in explaining *relative differences* in trusting friends versus strangers.

The rest of the paper is organized as follows. Section 2 introduces a simple theory of directed altruism and enforcement which motivates the experimental design in section 3. In section 4 we describe the main features of the data and we present detailed results in section 5.

2 Theory

This section develops a theory of directed altruism and enforcement. We assume that an agent who reveals selfish behavior takes out a 'loan' from the principal. As long as the principal has sufficient *extraction capability* vis-á-vis the agent she can recover this loan from their future relationship. This will induce the agent to be more generous in non-anonymous versus anonymous decision making when altruism is efficient. Our notion of extraction capability builds on the concept of "trust flow" in Mobius and Szeidl (2006). We also contrast the predictions from our enforcement model with the predictions of alternative theories.

2.1 Model Setup

2.1.1 Two-player Games

We restrict attention to simple two-player games such as the dictator game where only the first player (whom we call *agent*) takes a single action which affects both her payoff and the payoff of the second player (whom we call *principal*). Formally, the agent chooses an action x from some compact and convex action set $X \subset \Re$ which determines her payoff $\pi_A(x)$ as well as the principal's payoff $\pi_P(x)$. Both $\pi_A(\cdot)$ and $\pi_P(\cdot)$ are continuous and differentiable in x with $\pi'_A(x) < 0$ and $\pi'_P(x) > 0$. Intuitively, the agent will behave more "nicely" towards the principal if she increases x.

We denote the total surplus generated by the agent's decision with $S(x) = \pi_A(x) + \pi_P(x)$ and distinguish three important cases:

Definition 1 *Altruism is efficient (inefficient) if total surplus $S(x)$ is increasing (decreasing) in the action x. Altruism is neutral if $S(x)$ is constant.*

For example, in the classic dictator game altruism is neutral. Modified dictator games as studied in Andreoni and Miller (2002) where tokens are worth more to the principal compared to the agent exhibit efficient altruism. When the tokens are worth less to the principal than to the agent altruism is inefficient.

2.1.2 Directed Altruism

We denote the social distance between an agent and her principal with D_{AP}. We assume that agent A has monotonic preferences $U_A(\pi_A, \pi_P)$ over her own and the principal's payoff. The agent's preferences depend on social distance as well her baseline characteristics γ_A:

$$U_A(\pi_A, \pi_P) = u\left(\pi_A, \pi_P; D_{AP}, \gamma_A\right) \tag{1}$$

The function $u(\cdot)$ is strictly increasing and concave in the agent's own payoff and weakly increasing and concave in the principal's payoff.

We now analyze what action x_{AP}^{an} a rational agent will take when he makes decisions *anonymously*. Our notion of anonymity deserves some clarification: while the agent knows the identify of the principal when making a decision neither she nor the principal will be informed whether the decision is actually implemented. We implement this information structure in our anonymous treatment by having each agent make several decisions for different principals during the course of the experiment but at most one decision is picked at random by the experimenter for payment. We do not take a position on whether altruism is the result of "warm glow" as in Andreoni (1990) or arises from preferences over payoff distributions as in Fehr and Schmidt (1999) or Charness and Rabin (2002).

The rational agent will then take action $x_{AP}^{an} = x^{an}(D_{AP}, \gamma_A)$ which maximizes her utility function:

$$x_{AP}^{an} = \arg\max_{x} \left(u\left(\pi_A(x), \pi_P(x); D_{AP}, \gamma_A\right)\right) \tag{2}$$

In our experiments we observe for each agent/principal match the agent's action x_{AP}^{an} and from a baseline survey we can infer social distance D_{AP}. We cannot observe some of the agent's characteristics such as gender. However, each agent makes decisions for several principals which allows us to use capture the agent's characteristics as a fixed effect. We are estimating variants of the following empirical model using our experimental data:

$$a_{AP}^{an} = \alpha + \beta D_{AP} + \gamma_A + \epsilon_{AP} \tag{3}$$

The coefficient α captures general preference-based altruism independent of social distance. Directed altruism is captured by the relative magnitude of the coefficient β compared to general altruism.

2.1.3 Enforcement

The non-anonymous treatment is identical to the anonymous treatment except that both agent and principal are informed about which match is chosen for payment and about the agent's action in the chosen match. This information structure

Figure 1: Friendship game played between agent and principal in period $t.4$ across either a good link or bad link

Good Link

	C	D
C	T_{AP}, T_{AP}	$0, T_{AP}/2$
D	$T_{AP}/2, 0$	0,0

Bad Link

	C	D
C	−1,−1	0,0
D	0,0	0,0

allows the agent to extract a compensation payment for doing a favor to the principal.

Agent and principal play the following *enforcement game* in four stages. At time $t.1$ the agent announces a strategy (x^*, L) with $L \geq 0$ which the principal can accept or reject. If the principal agrees then the agent takes action $x_{AP}^{nan} = x_{AP}^* + L$ and otherwise action $x_{AP}^{nan} = x_{AP}^*$. We think of x^* as the voluntary contribution of the agent and L as a "loan" to the principal. In period $t.2$ with small probability $\epsilon > 0$ independent for both agent and principal a link becomes "bad". In this case either the agent or the principal no longer need the services of the other player in the future. This will affect the benefit from cooperation in the friendship stage as we describe below. In period $t.3$ the player who took the loan can either repay it in full or pay 0. In period $t.4$ agent and principal play the "friendship game" shown in figure 1. If the link between agent and principal is good then it will be optimal for both players to cooperate and receive payoff T_{AP}. Intuitively, T_{AP} captures the value of the relationship to both players. If the link has gone bad then cooperation has negative payoff.

In this game players with bad links will defect. Moreover, if the value of the debt L exceeds the value of the relationship then the debtor will optimally not repay the loan in period $t.3$. In equilibrium the lender will therefore assume that his relationship with the debtor has gone bad and she will defect in the friendship game. On the other hand, if the value of the debt is less than the value of the relationship repayment and cooperating in the friendship game is an equilibrium.

The next theorem characterizes the agent's action x_{AP}^{nan}.

Theorem 1 *Under non-anonymity and when altruism is efficient the agent's ac-*

tion x_{AP}^{nan} satisfies $x_{AP}^{nan} = x_{AP}^{an}$ if $T_{AP} = 0$ and is increasing in T_{AP}. When altruism is neutral the agent's action satisfies $x_{AP}^{nan} = x_{AP}^{an}$.

The theorem provides us with the following empirical model for estimation:

$$a_{AP}^{nan} = \delta + \theta a_{AP}^{an} + \phi T_{AP} + \epsilon_{AP} \tag{4}$$

When altruism is efficient we expect that the coefficient on the enforcement capacity is positive and zero otherwise

2.1.4 Inefficient Altruism

In our enforcement model we restricted loans to be positive. A richer model might allow the agent to take a loan *from* the principal and repay him later. If we assume that repayment requires an ongoing relationship then we expect that the agent will be more likely to pass *less* under inefficient altruism if she is socially closer to the principal. We therefore expect the coefficient on T_{AP} in the empirical model 4 to be zero *or negative* when altruism is inefficient.

2.2 Measures of Enforcement

We use two proxies for the enforcement capacity T_{AP} in this paper. First, we intuitively expect that greater social distance makes enforcement more difficult because the frequency of interaction declines. We therefore use social distance as our first enforcement proxy. However, social distance ignores much of the structural information embedded in a social network: for example, two friends might have few or many friends in common. The *trust flow* measure introduced by Mobius and Szeidl (2006) provides a micro-founded second proxy for the enforcement capacity of the other agent. Intuitively, the trust flow between the other player and the decision maker is the highest amount that can flow from borrower to lender along the edges of the network (assuming equal capacity for each link).

2.3 Alternative Theories

There are several alternative theories to explain greater generosity under non-anonymity. However, these theories do differentiate between cases where altruism is efficient and inefficient.

A simple preference-based explanation would be the need to "get credit". For example, universities and other fund-raising organizations often offer donors a plaque or sign to be attached to a some asset funded by the gift (such as a room or piece of furniture). It would be reasonably to expect that this need for approval is stronger when interacting with friends rather than strangers. Models where agents signal their generous type such as Levine (1998) and Bnabou and Tirole (2006) are alternative repeated game models.

3 Experimental Design

We use two different complementary web-based experiments to measure the directed altruism and enforcement channels. In both the *dictator game* and *helping game* experiments an allocator repeatedly takes an allocation decision which determines the relative payoffs between herself and a second player who is either a nameless, randomly selected player or a specific named player at a known social distance away from the allocator. Both experiments have two treatments where the allocator makes his decision either anonymously or non-anonymously in which case the recipient finds out the allocation decision of the allocator. However, in the dictator game the two treatments are conducted within groups while in the helping game they are conducted between groups.

3.1 Measuring Friendship in Web-Based Experiments

Sociologists typically measure social networks by asking subjects about their five or ten best friends. This technique can of course also be used for web-based studies. However, we were concerned that the lack of interaction with a human surveyor would increase misreporting unless some incentives were provided to subjects to report their friends truthfully. We developed and successfully tested two different techniques.

For the dictator game we used the *coordination game* technique. Each subject is told to list her 10 best friends. Each subject is paid some small amount A (we chose 50 cents) with 50 percent probability for each listed friend who also lists them. The expected payoff $\frac{A}{2}$ should be sufficiently large to give subjects an incentive to report their friends truthfully but not large enough to induce 'gaming'. The randomization was included to help avoid disappointment if a subject is named by few friends.[4]

For the helping game we developed the *trivia game* technique. Subjects are also asked to list 10 friends. Over the course of several weeks a web server randomly selects some of these subject-friend links and sends an email to the friend asking her one multiple choice questions such as what time she gets up in the morning, for example. Once a friend has answered the subject receives an email which directs him to a web page with a 15 second time out where he can answer the same question about the friend. If their answers coincide they both win a prize. The trivia game gives subjects incentives to list friends they spend a lot of time with and whose habits they are therefore familiar with.

[4] An advantage of this technique that it can be easily modified to collect further attributes about each reported friendship. For example, subjects can be asked to report the amount of time spent together each week or where the subjects first met and the probability of winning the small prize A increases with the number of dimensions on which both subjects agree.

In our experiments the social subjects of 167 undergraduates at a large private university were measured twice using the coordination technique in December 2003 and the trivia game technique in December 2004. The 2003 experiment only allowed students to choose friends living in two neighboring dormitories who comprise about 17 percent of the student population. On average a subject listed 3.37 friends in 2004 whom they could have listed as a friend in 2003. Among this pool of friends, 64 percent were actually listed in 2003. 34 percent of all subjects listed all their 2004 friends in 2003 and 77 percent listed at least half of them. This implies that over the course of the year subjects on average gained one new friend in their house which seems plausible.

3.2 AND versus OR network

The friendship data can be used to construct either an *OR-network* or an *AND-network*. In the OR-network a link between two subjects A and B exists if either of them names each other as a friend. In the AND-network both subjects have to name each other.

In our experiments we focus on the OR-network because it has desirable monotonicity properties. Friendship data is typically highly incomplete: the social network survey only allows subjects to list a limited number of friends and subjects might find it difficult to rank-order friendships in importance. In such a setting subjects with many friends can appear to have few friends in AND-network. To see this, consider an example where subjects are either in a large "clique" where they have 20 random friends inside the clique or in a small clique where they have 10 random friends. Friendship is assumed to be mutual. In this example, a small-clique subject can list all her friends while a large-clique subject has to randomly select 10 out of her 20 friends. In the AND-network a small-clique subject will have 10 direct links in the social network while a large-clique subject will have only 5 on average. In contrast, in the OR-network the large-clique subject will have 15 links on average. While censoring also drops social links in the OR-network it does respect monotonicity in the number of friends while the AND-network does not.[5]

3.3 Dictator Game

After measuring the social network we randomly assign each subject the role of allocator and recipient. Each allocator makes several decisions over a period of several days while recipients make no decisions. Only one of the decisions is randomly

[5]Note, that both the OR and the AND networks deal correctly with the case of subjects reporting *fewer* than 10 friends (and reporting random people to report a list of 10): subjects with fewer real friends will have fewer measured links in both types of networks.

selected at the end of the experiment and the respective allocator and recipient are paid accordingly.

Each allocator is first invited by email to play modified dictator games with a *nameless* recipient who is a randomly selected student from her dormitory. She is asked to make allocation decisions in two *situations*: in the anonymous situation the recipient does not find out the identify of the allocator and in the non-anonymous situation the recipient does find out the allocator's identity. In each situation the allocator divides 50 tokes between herself and the recipient. In the first decision each token is worth 30 cents to the other player and 10 cents to herself. In the second decision each token is worth 20 cents to both players. In the third decision each token is worth 30 cents to the allocator and 10 cents to the recipient; as a result the maximum winnings of a subject in one match are $15. Note, that for each of the three decisions altruism is efficient, neutral and inefficient respectively.

A few days after the first round of decisions all allocators are invited by email again to a second round. In this round they face five different *named* recipients: a direct friend, an indirect friend, a friend of an indirect friend, a student in the same staircase/floor who is at least distance 4 removed from the student, and a randomly selected student from the same house who falls into none of the above categories. The allocator is again asked to make allocation decisions in two situations - if the non-anonymous situation is selected for payment both the recipient and the allocator are informed by email that their specific match was implemented for payment. In the non-anonymous situation neither the recipient nor the allocator are informed that their match was implemented. In both situations the allocators makes the same three decisions as in the first round and allocates tokens at exchange rates of 1:3, 1:1 and 3:1.

While it is conceivable that subjects can identify the implemented match in the anonymous treatment our design with multiple exchange rates and multiple recipients make it quite difficult. In order to reliably identify the match the allocator would have to 'code' each anonymous decision by making some unique allocation decision (such as passing 26 instead of 25 tokens) and then recall these decisions when payments were made. We informed subjects in advance that payments would take two to three weeks to process.

3.4 Helping Game

Like the dictator game the helping game is designed to measure altruistic preferences of decision makers. The decision maker starts with an endowment of $15. The experimenter secretly chooses a random price between $0 and $15. The decision maker is asked to report the maximum price she would be willing to pay so that the recipient receives a gain of $30. If her maximum willing to pay is below the price chosen by the experimenter the recipient get $0 and the decision maker gets her endowment.

Effectively, the decision maker in the helping game reveals how much she values $30 to the other player. In contrast, the dictator game reveals the allocation at which the decision maker is indifferent to allocating one more token to the other player at the current exchange rate.

Our helping game design has a similar structure as the dictator game design. Subjects are invited twice to make two rounds of decisions: in the first round they play with a nameless second player while in the second round they face four named players.

However, we chose a between-groups design: while the decisions for the nameless player in the first round are always anonymous the second round decisions are either all anonymous or all non-anonymous.

4 Data Description

All experiments were conducted with undergraduates at Harvard University who had at least started their sophomore year.

4.1 Dictator Games

In December 2003 Harvard undergraduate at two (out of 12) upperclass houses were recruited through posters, flyers and mail invitation and directed to a website. A prospective subjects was asked to provide her email address and was sent a password. Subjects without a valid email address were excluded. All future earnings from the experiment were transferred to the electronic cash-card account of the student. These prepaid cards are widely used on campus as cash substitute and many off-campus merchants accept the cards as well.

Subjects who logged onto the website were asked to (1) report their best friends using the coordination game technique described in the previous section and (2) fill in a questionnaire asking basic demographic information. Subjects were restricted to naming friends from the two houses where our experiment was conducted. Subjects were paid their earnings from the coordination game plus a flat earning of $10 for completing the survey. Moreover, they were eligible to earn cash prizes in a raffle which added on average another $3 to their earnings.

Out of 806 students in those two houses 569 (or 71 percent) participated in the social network survey. The survey netted 5690 one-way links. Of those, 2086 links were symmetric links where both agents named each other. For symmetric links, the two parties' assessment of the time they spend together in a typical week was within half and hour in 80 percent of all cases. The resulting OR-network consists of a single connected component with 802 subjects. 51 percent of subjects in the baseline survey were women. 31 percent of subjects were sophomores, 30 percent were juniors and 39 percent were seniors.

The dictator game experiment was conducted in May 2004 over a period of one week. Half of all subjects who participated in the baseline were randomly selected to be allocators. 193 out of 284 eligible subjects participated in round 1 and 181 subjects participated in round 2. The gender and age distribution of the students was not significantly different from the baseline survey.

Tables 1 and 2 summarize the average number of passed tokens across all allocator-recipient pairs for the anonymous treatment (ANALLOC) and the non-anonymous treatment (NONALLOC). Figure 2 plots the averages by social distance. For both treatments the average number of passed tokens decline with social distance and with the efficiency of altruism. With an exchange rate of 1:3 the allocator passes about 19.19 tokens to a friend versus 12.20 tokens to a recipient at social distance 4. With an exchange rate of 3:1 the allocator passes only 8.03 versus 6.15 tokens. In the non-anonymous treatment the allocator passes about 5 tokens more when altruism is inefficient for all social distances and about 4 tokens more when altruism is inefficient.

4.2 Helping Game

Information on social networks was collected through an online Trivia Game at the website `facebook.com`. This website was launched in February 2004 by Harvard student Mark Zuckerberg, in order to promote social networking among college students. As of September 2006, membership at `facebook.com` has expanded to about 9 million students at over 2,100 campuses nationwide. Members post an online profile of themselves, including a photograph, biographical data, and information about activities and interests. The facebook.com also allows members to create a list of their friends and to view the friends of their friends. In this way, members construct a map of the relationships among students at their campuses. More than 90 percent of Harvard undergraduates are members of `facebook.com`.

As Ward (2004) notes, however, members often compile lists of over 100 friends, containing many people with whom they maintain only weak social ties. The trivia game technique provides a particularly convenient method to identify the subset of strong friendships among facebook friends. In December 2004 an invitation to the trivia game appeared for a four-week period on the home page of `facebook.com` after a member logged in. 2,360 students completed the trivia game signup process. Upperclassmen had higher participation rates than freshmen, with only 34 percent of freshman responding, but 45 percent, 52 percent, and 53 percent of sophomores, juniors, and seniors participating, respectively.

There were 12,782 links between participants out of a 23,600 total links and

6,880 of these links were symmetric. In total, 5,576 out of the 6,389 undergraduates at Harvard College had either participated or been named by a participant. The social OR-network of 5,576 individuals contains a single component having a mean path length of 4.2 between participants.

The helping game experiment was conducted in May 2006 over a period of one week with all Juniors and Seniors who had participated in the trivia game of the previous year. Tables 1 and 2 summarize the average cutoff across all allocator-recipient pairs for the anonymous treatment (ANALLOC) and the non-anonymous treatment (NONALLOC). Figure 2 plots the averages by social distance. As in the dictator game, allocators become less generous as social distance decreases and are more generous under non-anonymity: the average cutoff of 12.77 for a friend decreases to 7.09 for a recipient at social distance 4. Non-anonymity increases the cutoff by about $2.

5 Results

5.1 Directed Altruism

We start by estimating the empirical altruism model of equation 3.

$$a_{AP}^{an} = \alpha + \beta D_{AP} + \gamma_A + \epsilon_{AP}$$

Table 5 shows the estimates for the three types of dictator games and the helping game where we also control for the allocator's and recipient's generosity in the anonymous nameless decision. Table 6 shows the estimates without controlling for nameless decisions. The omitted categories are $SD = 4$ (dictator games) and $SD = 5$ (helping game). The estimates on $SD1$, for example, should therefore be interpreted as the excess tokens passed to a direct friend compared to a distant recipient.

For all decision problems generosity is decreasing with social distance. In terms of magnitude allocators behave about 50 per cent more generously towards a direct friend compared to a distant recipient measured by the constant in the regressions of table 6.

5.2 Enforcement

We start by comparing the difference NALLOC-ALLOC in the three dictator game decisions. Our theory model informs us that we have to control for the underlying generosity of allocators. In figures 4 and 5 we divide allocators into five groups depending on whether they pass 0 to 9, 10 to 19, 20 to 29, 30 to 39 or 40 to 50 tokens. Within each group we then calculate the mean of NALLOC-ALLOC by social distance (figure 4) or by trust flow (figure 5). In the case of trust flow we distinguish whether the flow between allocator and recipient is above the median of 3 or less or equal to the median.

Both figures show that the effect of the non-anonymous treatments is declining with social distance and trust flow when altruism is efficient. This pattern is weakly present when altruism is neutral and reverses when altruism is inefficient. In figure 6 we average the graphs by using the allocator distribution of selfishness versus friends or strangers respectively.

We next turn to the regressions estimates where we focus on variants of the empirical model of equation 4:

$$a_{AP}^{nan} = \delta + \theta a_{AP}^{an} + \phi T_{AP} + \epsilon_{AP}$$

Tobit regressions are presented in table 7. When altruism is efficient allocators pass about 4.3 more tokens to recipients which is about half of the effect of directed altruism. The effect is no longer present when altruism is inefficient.

Since in about 50 percent of all cases allocators make the same decision in the anonymous and non-anonymous treatments we also estimate a probit regression in table 8 where we test for $NALLOC > ALLOC$. The results are inline with the tobit regression with decreasing social distance estimates when altruism is efficient and *increasing* estimates when altruism is inefficient.

We also estimate a probit regression to test for $NALLOC < ALLOC$ in table 9. Consistent with the theory we find that when comparing the treatment of friends versus strangers subjects are less likely to pass fewer tokens in the non-anonymous treatment when altruism is efficient and are more likely to do so when altruism is inefficient.

6 Conclusion

We design a unique field web-based experiment to analyze why friends make better agents than strangers. The first and strongest channel we find is the directed altruism effect: friends treat us better because they like us more. The second and more subtle effect arises from the ongoing relationship we have with friends. This allows friends to do us "favors" which they can expect to be repaid in the future. This effect is about half as large as the directed altruism effect.

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Table 1: Summary statistics for allocator decisions in dictator and helping games

	Anonymous Treatment					
	SD = 1	SD = 2	SD = 3	SD = 4	SD = 5	Nameless
Dictator Game	($N = 206$)	($N = 286$)	($N = 312$)	($N = 97$)	($N = 4$)	($N = 193$)
Ex. Rate = 1:3	19.19	16.80	15.14	12.20	12.50	17.42
	(19.63)	(19.30)	(18.79)	(15.47)	(25.00)	(18.21)
Ex. Rate = 1:1	11.96	10.79	9.39	8.79	6.25	11.61
	(13.53)	(12.68)	(11.89)	(10.25)	(12.50)	(12.83)
Ex. Rate = 3:1	8.03	7.28	5.66	6.15	0.00	8.31
	(13.55)	(12.88)	(11.10)	(10.72)	(0.00)	(13.23)
Helping Game	($N = 876$)	($N = 149$)	($N = 73$)	($N = 181$)	($N = 78$)	($N = 776$)
	12.77	8.96	7.13	7.68	7.09	9.52
	(8.14)	(7.11)	(6.80)	(7.16)	(6.95)	(7.24)

Table shows averages of number of passed tokens (dictator games) and average cutoffs (helping game) by social distance (OR-network). Standard deviations are in parenthesis. Nameless refers to decisions where the identity of the other player is not known to the decision maker.

Table 2: Summary statistics for allocator decisions in dictator and helping games

	Non-anonymous Treatment					
	SD = 1	SD = 2	SD = 3	SD = 4	SD = 5	Nameless
Dictator Game	($N = 206$)	($N = 286$)	($N = 312$)	($N = 97$)	($N = 4$)	($N = 193$)
Ex. Rate = 1:3	24.32	21.67	19.79	14.80	37.50	19.87
	(18.91)	(18.75)	(18.54)	(15.72)	(25.00)	(18.21)
Ex. Rate = 1:1	16.33	14.62	13.99	12.16	18.75	13.98
	(12.90)	(12.34)	(12.45)	(10.68)	(12.50)	(12.82)
Ex. Rate = 3:1	10.52	9.88	9.18	10.15	0.00	9.62
	(13.56)	(13.17)	(13.18)	(12.77)	(0.00)	(13.80)
Helping Game	($N = 625$)	($N = 96$)	($N = 42$)	($N = 132$)	($N = 62$)	
	14.54	11.28	9.26	8.83	7.54	
	(8.13)	(7.25)	(7.04)	(7.22)	(6.83)	

Table shows averages of number of passed tokens (dictator games) and average cutoffs (helping game) by social distance (OR-network). Standard deviations are in parenthesis. Nameless refers to decisions where the identity of the other player is not known to the decision maker (only dictator game).

Table 3: Summary statistics for recipients' expectations in dictator games

	Anonymous Treatment			
	SD = 1	SD = 2	SD = 3	SD = 4
Dictator Game	($N = 196$)	($N = 276$)	($N = 288$)	($N = 95$)
Ex. Rate = 1:3	18.18	13.87	11.85	12.39
	(16.25)	(14.43)	(14.51)	(12.74)
Ex. Rate = 1:1	16.84	14.69	10.95	12.55
	(11.48)	(11.97)	(11.38)	(11.76)
Ex. Rate = 3:1	13.74	12.59	8.92	10.13
	(14.48)	(14.16)	(12.89)	(13.34)

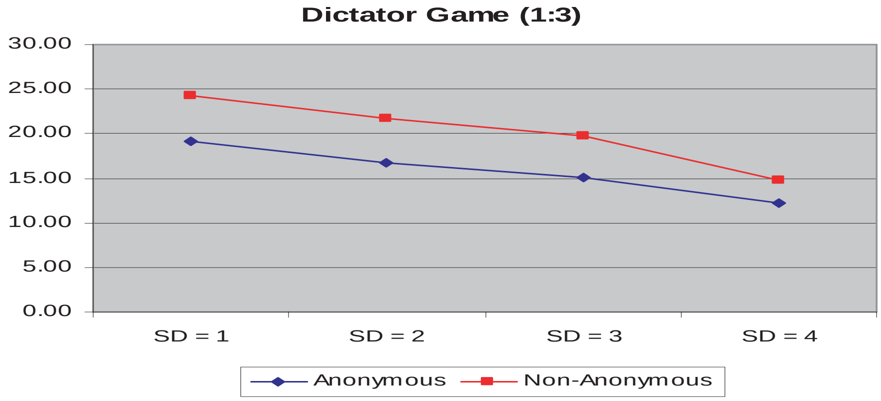
Table shows averages of number of expected tokens (dictator games) by social distance (OR-network). Standard deviations are in parenthesis.

Table 4: Summary statistics for recipients' expectations in dictator games

	Non-anonymous Treatment			
	SD = 1	SD = 2	SD = 3	SD = 4
Dictator Game	($N = 196$)	($N = 276$)	($N = 288$)	($N = 95$)
Ex. Rate = 1:3	22.70	18.97	15.72	17.77
	(16.81)	(14.88)	(15.57)	(13.38)
Ex. Rate = 1:1	21.30	19.01	14.99	17.73
	(9.76)	(9.89)	(11.34)	(9.55)
Ex. Rate = 3:1	15.92	15.58	11.16	13.82
	(14.65)	(13.85)	(12.37)	(13.22)

Table shows averages of number of expected tokens (dictator games) by social distance (OR-network). Standard deviations are in parenthesis.

Figure 2: Average number of tokens passed by allocators (dictator game) and average cutoff chosen by allocators (helping game) by social distance



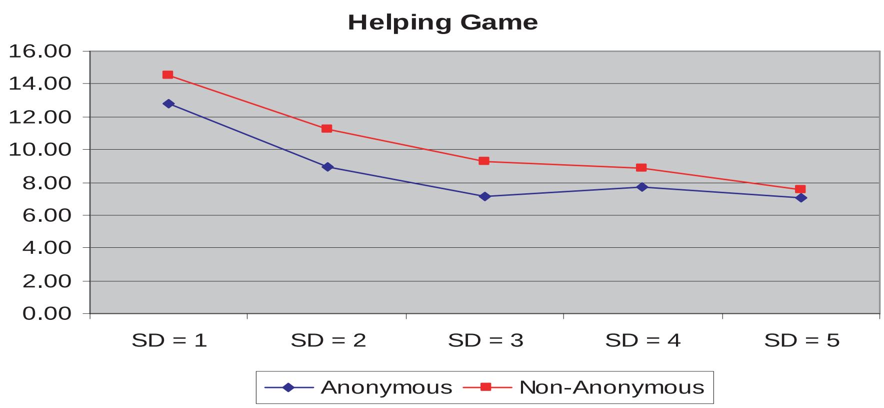


Figure 3: Average number of tokens expected by recipients (dictator game) by social distance

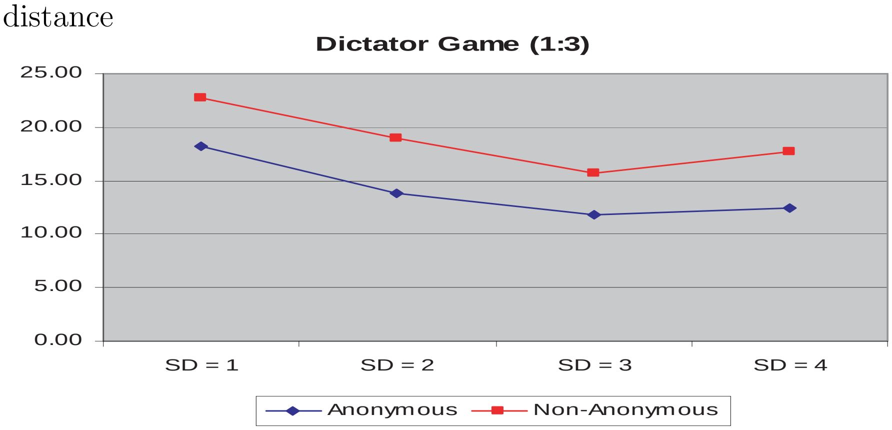


Table 5: Directed altruism estimates derived from allocators' decisions in anonymous treatment (dictator and helping game)

Variable	Dictator Game			Helping Game
	Ex. Rate 1:3	Ex. Rate 1:1	Ex. Rate 3:1	
	(1)	(2)	(3)	(4)
SD1	7.858**	5.373**	6.344**	8.207**
	(1.94)	(1.31)	(1.63)	(0.73)
SD2	0.371	1.928	3.415*	3.386**
	(1.91)	(1.27)	(1.59)	(0.85)
SD3	-1.864	0.232	3.183*	1.090
	(1.89)	(1.27)	(1.58)	(1.02)
SD4				1.593†
				(0.84)
BASE	0.739**	0.744**	0.789**	0.435**
	(0.040)	(0.038)	(0.041)	(0.034)
RBASE				-0.053*
				(0.025)
N	836	836	836	1357

Significance levels: † : 10% ∗ : 5% ∗∗ : 1%

The dependent variable is the number of tokens passed by the allocator in the anonymous dictator games and the maximum cost the allocator is willing to pay in the helping game. Omitted distance is SD4 (dictator game) and SD5 (helping game). All regressions reported are Tobit regression with random effects on allocators. Standard errors are reported in parenthesis. BASE is the decision made by the allocator in phase 1 (anonymous treatment) for a nameless recipient. RBASE is the corresponding decision made by recipients in phase 1 (only available for helping game). The coefficients on SD1 are significantly different from SD2 at the 5 percent level for all columns. The coefficients on SD2 are significantly different from SD3 at the 10 percent level for all columns.

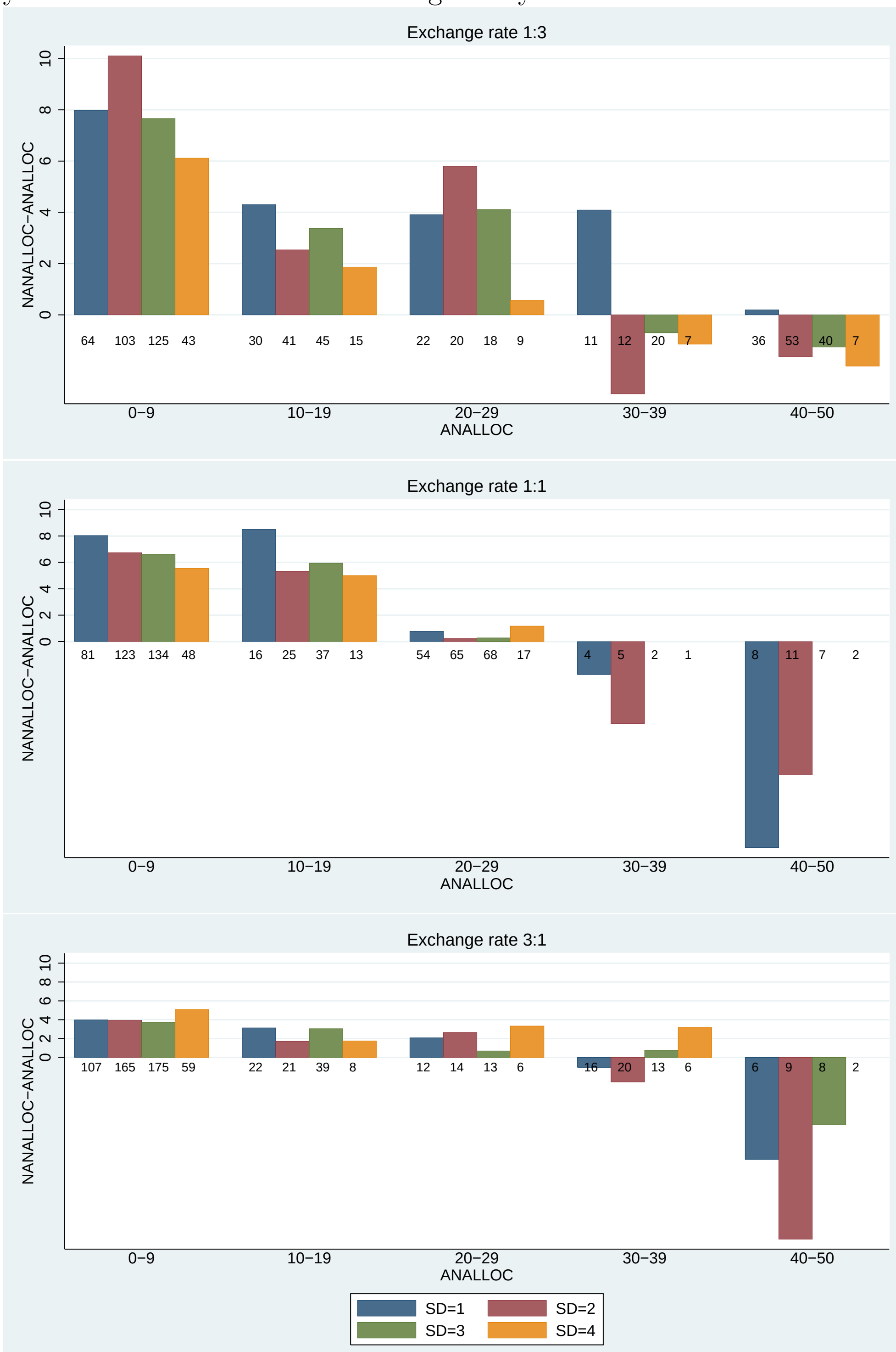
Table 6: Directed altruism estimates derived from allocators' decisions (column A) and recipients' expectations (column R) in anonymous treatment (dictator games)

	Dictator Game					
Variable	Ex. Rate 1:3		Ex. Rate 1:1		Ex. Rate 3:1	
	(A1)	(R1)	(A2)	(R2)	(A3)	(R3)
SD1	8.350**	11.52**	4.934**	5.973**	5.593**	5.942**
	(2.08)	(1.56)	(1.22)	(1.31)	(1.48)	(1.78)
SD2	1.681	5.536**	1.359	3.389**	2.904*	3.313†
	(2.04)	(1.50)	(1.19)	(1.27)	(1.45)	(1.73)
SD3	-1.176	2.358	-0.227	-0.741	2.337	-0.171*
	(2.00)	(1.50)	(1.20)	(1.27)	(1.44)	(1.74)
Constant	15.54**	9.601**	9,638**	13.25**	3.062*	9.914**
	(1.79)	(1.33)	(1.08)	(1.14)	(1.30)	(1.52)
N	901	855	901	855	901	855

Significance levels: † : 10% ∗ : 5% ∗∗ : 1%

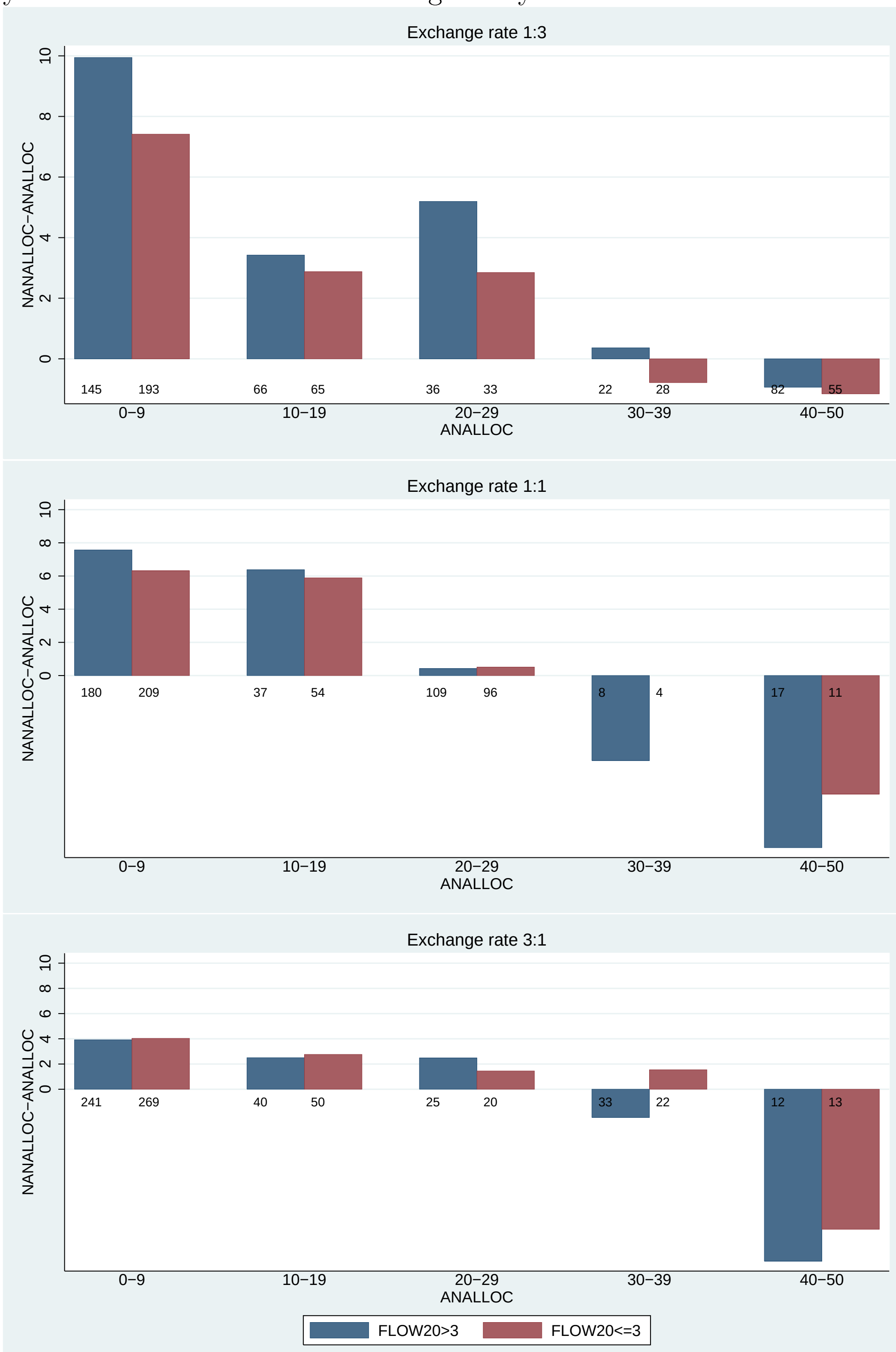
The dependent variable is the number of tokens passed by allocator (column A) or the number of tokens the recipient expects the allocator to pass (column R) in the anonymous dictator games. Omitted distance is SD4. All regressions reported are Tobit regression with random effects on allocators. Standard errors are reported in parenthesis. The coefficients on SD1 are significantly different from SD2 at the 5 percent level for all columns. The coefficients on SD2 are significantly different from SD3 at the 10 percent level for all columns.

Figure 4: Difference between number of passed tokens in the non-anonymous and anonymous treatments in the dictator game by social distance



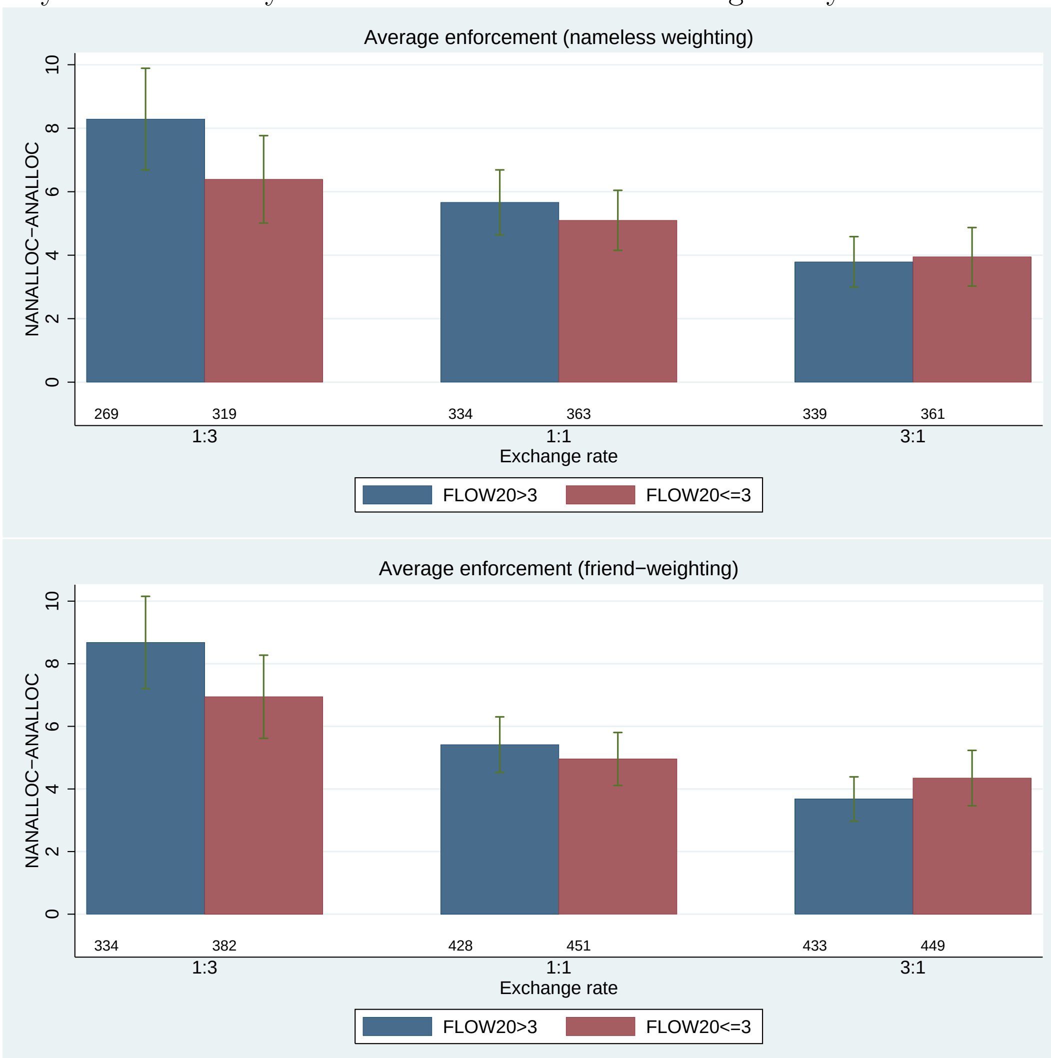
For each subject NANALLOC-ANALLOC was calculated. All observations with negative differences were dropped (less than 5 percent of observations for each exchange rate). Bars show average difference grouped by contribution level in the anonymous treatment and by social distance.

Figure 5: Difference between number of passed tokens in the non-anonymous and anonymous treatments in the dictator game by FLOW20



For each subject NANALLOC-ANALLOC was calculated. All observations with negative differences were dropped (less than 5 percent of observations for each exchange rate). Bars show average difference grouped by contribution level in the anonymous treatment and by FLOW20 (median of FLOW20 is 3).

Figure 6: Average difference between number of passed tokens in the non-anonymous and anonymous treatments in the dictator game by FLOW20



For each subject NANALLOC-ANALLOC was calculated as in figure 5. All observations with negative differences were dropped (less than 5 percent of observations for each exchange rate). For each contribution level in the anonymous treatment observations were weighed by the distribution over contribution levels to nameless recipients in the anonymous treatments (top graph) and by the distribution of contribution levels to direct friends in the anonymous treatment (bottom graph).

Table 7: Enforcement estimates from comparing anonymous and non-anonymous treatments (dictator and helping game)

Variable	Dictator Game									Helping Game		
	Ex. Rate 1:3			Ex. Rate 1:1			Ex. Rate 3:1					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ANALLOC	0.615^{**}	0.603^{**}	0.605^{**}	0.391^{**}	0.393^{**}	0.391^{**}	0.649^{**}	0.652^{**}	0.647^{**}	0.397	0.758^{**}	0.770^{**}
	(0.031)	(0.031)	(0.031)	(0.034)	(0.034)	(0.034)	(0.038)	(0.038)	(0.038)	(0.60)	(0.11)	(0.13)
SD1	4.296^{**}		-0.150	2.939^{**}		2.707	0.283		2.995	4.759		2.567
	(1.29)		(2.44)	(1.07)		(1.97)	(1.33)		(2.53)	(4.32)		(4.36)
SD2	2.898^{*}		0.409	$1.715^{\dagger}$		1.602	0.967		2.610	1.578		0.771
	(1.24)		(1.72)	(1.03)		(1.41)	(1.28)		(1.78)	(1.61)		(1.62)
SD3	-0.364		-0.279	1.069		1.107	0.512		0.485	$2.025^{\dagger}$		2.069^{*}
	(1.23)		(1.23)	(1.02)		(1.04)	(1.26)		(1.28)	(1.04)		(1.04)
FLOW		0.401^{**}	$0.384^{\dagger}$		0.150^{**}	0.0224		-0.0331	-0.228		0.218^{**}	0.216^{**}
		(0.068)	(0.17)		(0.056)	(0.14)		(0.070)	(0.18)		(0.079)	(0.080)
BASE	0.289^{**}	0.296^{**}	0.294^{**}	0.380^{**}	0.375^{**}	0.379^{**}	0.341^{**}	0.338^{**}	0.335^{**}	0.281	0.125^{*}	$0.122^{\dagger}$
	(0.032)	(0.032)	(0.032)	(0.038)	(0.038)	(0.038)	(0.035)	(0.035)	(0.035)	(0.27)	(0.062)	(0.068)
RBASE										0.006	0.0329	0.0314
										(0.044)	(0.030)	(0.030)
N	840	836	836	840	836	836	840	836	836	957	957	957

Significance levels: $\dagger$: 10% $*$: 5% $**$: 1%

The dependent variable is the number of tokens passed by the allocator in the non-anonymous dictator games and the maximum cost the allocator is willing to pay in the non-anonymous helping game. Random-effects tobit regression used with random effects on allocators. Standard errors are reported in parenthesis. In the dictator games, ANALLOC is the allocation decision for the particular recipient in the anonymous treatment. In the helping game, ANALLOC is the predicted anonymous decision for the non-anonymous allocator/recipient pair, using a panel regression on the anonymous data with social distance dummies, BASE, RBASE and allocator random effects. Omitted distance dummies are SD4 and SD5. FLOW is the trust flow for $K = 2$. BASE is the decision made by the allocator in phase 1 (anonymous treatment) for a nameless recipient. RBASE is the corresponding decision made by recipients in phase 1 (only available for helping game).

Table 8: Comparing anonymous and non-anonymous treatments (dictator game only) and testing for $NALLOC > ALLOC$

Variable	Dictator Game					
	Ex. Rate 1:3		Ex. Rate 1:1		Ex. Rate 3:1	
	(1)	(2)	(3)	(4)	(5)	(6)
ANALLOC	-0.0432**	-0.0459**	-0.103**	-0.115**	-0.0408**	-0.0507**
	(0.012)	(0.012)	(0.013)	(0.018)	(0.011)	(0.012)
SD1	0.851*		-0.0392		-0.181	
	(0.33)		(0.28)		(0.29)	
SD2	0.498		-0.168		0.0798	
	(0.32)		(0.28)		(0.28)	
SD3	0.177		-0.489†		-0.642*	
	(0.32)		(0.28)		(0.28)	
FLOW		0.0628**		0.0243		0.0212
		(0.017)		(0.016)		(0.016)
BASE	0.051**	0.0515**	0.0746**	0.0698**	0.0886**	0.0899**
	(0.011)	(0.011)	(0.013)	(0.018)	(0.013)	(0.014)
N	669	666	814	810	817	813

Significance levels: † : 10% ∗ : 5% ∗∗ : 1%

The dependent variable is a dummy variable which equals 1 if the number of tokens passed in the non-anonymous treatment is *strictly greater* than the number of tokens passed in the anonymous treatment and zero otherwise. Random-effects probit regression (marginal effect reported) used with random effects on allocators. Standard errors are reported in parenthesis. In the dictator games, ANALLOC is the allocation decision for the particular recipient in the anonymous treatment. Only data points with ANALLOC > 40 are included. Omitted distance dummies are SD4 and SD5. FLOW is the trust flow for $K = 2$. BASE is the decision made by the allocator in phase 1 (anonymous treatment) for a nameless recipient.

Table 9: Comparing anonymous and non-anonymous treatments (dictator game only) and testing for $NALLOC < ALLOC$

Variable	Dictator Game					
	Ex. Rate 1:3		Ex. Rate 1:1		Ex. Rate 3:1	
	(1)	(2)	(3)	(4)	(5)	(6)
ANALLOC	0.0876**	0.0820**	0.0801**	0.0757**	-0.0408**	-0.0507**
	(0.020)	(0.018)	(0.016)	(0.015)	(0.011)	(0.012)
SD1	-1.160*		0.209		0.291	
	(0.52)		(0.52)		(0.43)	
SD2	-0.318		0.781		0.172	
	(0.41)		(0.49)		(0.43)	
SD3	-0.251		0.424		-0.00771	
	(0.45)		(0.50)		(0.43)	
FLOW		-0.0458†		0.0203		0.0382†
		(0.028)		(0.021)		(0.020)
BASE	-0.0379*	-0.0341*	-0.0413**	-0.0396**	-0.0191†	-0.0191†
	(0.018)	(0.011)	(0.016)	(0.015)	(0.011)	(0.011)
N	840	836	840	836	840	836

Significance levels: † : 10% $*$: 5% $**$: 1%

The dependent variable is a dummy variable which equals 1 if the number of tokens passed in the non-anonymous treatment is *strictly less* than the number of tokens passed in the anonymous treatment and zero otherwise. Random-effects probit regression (marginal effect reported) used with random effects on allocators. Standard errors are reported in parenthesis. In the dictator games, ANALLOC is the allocation decision for the particular recipient in the anonymous treatment. Omitted distance dummies are SD4 and SD5. FLOW is the trust flow for $K = 2$. BASE is the decision made by the allocator in phase 1 (anonymous treatment) for a nameless recipient.