



Social distance and trust: Experimental evidence from a slum in Cairo[☆]

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ABSTRACT

While strong social ties help individuals cope with missing institutions, trade is essentially limited to those who are part of the social network. We examine what makes the decision to trust a stranger different from the decision to trust a member of a given social network (a friend), by comparing the determinants of these two decisions for the same individual. We implement a binary trust game with hidden action in a lab-in-the-field experiment with residents of an informal housing area in Cairo. Our results show that trust is higher among friends than among strangers and that higher trust among friends is related to the principal's belief of trustworthiness. However, on average a principal underestimates her friend's trustworthiness leading to inefficient outcomes. Our findings suggest that even within a social network, trade may often be limited to exchanges with few information asymmetries.

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1. Introduction

In developing countries formal institutions are often weak or non-existent. As a means of coping with such an insecure environment, individuals often establish strong social ties with other members of their

immediate community and beyond. Social networks increase people's access to goods and services through reciprocal exchange (Kranton, 1996), mutual insurance (Fafchamps, 1992; Foster and Rosenzweig, 2001) and informal contract enforcement as exercised, for instance, in rotating savings and credit associations and in group banking (Cox and Fafchamps, 2008; Karlan, 2007; Karlan et al., 2009). However, one important inefficiency exhibited by social networks is that trade is essentially limited to members of a given network (Munshi, 2006). For individuals to overcome this limitation and to enter market exchanges, trust in strangers plays an important role. More generally, trust can help achieve efficient outcomes in economic exchanges when information asymmetries are present (Karlan, 2005; Karlan et al., 2009).

We examine the determinants of trust in an environment in which social networks play a crucial role. We are interested in both trust in strangers and trust within a given social network and ask what makes an individual's decision to trust a stranger different from her decision to trust a member of her own social network (henceforth, a “friend”). This question is important as data from surveys and from trust games suggest that trust in strangers – generalized trust – is low in developing countries, which is seen by many as an impediment to economic growth and development (e.g., Bohnet et al., 2010; Cardenas and Carpenter, 2008; Knack and Keefer, 1997; Sobel, 2002).

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To study this question, we implemented a binary trust game in a lab-in-the-field experiment with residents of Manshiet Nasser, an informal housing area in Cairo.² Our experimental design allows us to analyze the effect of a change in social distance between the trustor (principal) and trustee (agent) on trust behavior in a within-subject design. Variation in social distance was created by requiring residents to participate in the experiment together with a friend and to play the trust game both with their friend and with a randomly chosen, ex-ante unknown participant (i.e., a “stranger”).³ In order to ensure that the reduction in social distance between players does not affect trust through increased availability of informal enforcement mechanisms, we use a binary trust game design in which the agent can hide her behavior (for details see Section 2.1). We focus on two factors that have been shown to affect trust in strangers and that are likely to vary with social distance: expectations of trustworthiness and other-regarding preferences. That is, we are particularly interested in whether higher trust in friends results from stronger solidarity – as measured by dictator games in which the social distance between players is varied – or whether beliefs play a greater role.⁴

Our results show that, as expected, trust is higher among socially close persons than among strangers. Based on our binary belief measure, this can be explained by the fact that on average a principal is more likely to trust when she expects her friend to be trustworthy while this is not the case when the agent is a stranger. Principals thus appear to be more confident about their stated belief when interacting with a socially close person. Surprisingly, however, principals' expectations about agents' trustworthiness are not more accurate in the friend than in the stranger pairing. In particular, a principal underestimates on average the trustworthiness of her friend, leading to a substantial fraction of inefficient outcomes. We try to explain this finding by contrasting the determinants of principals' expectations about agents' trustworthiness with the determinants of agents' actual trustworthiness. While solidarity is a main determinant of an agent's trustworthiness, it does not on average correlate with a principal's expectation. This may suggest that in environments with strong norms of solidarity, agents' ability to successfully communicate their trustworthiness within their social network is limited.

Other recent studies have made use of individuals' real-world social networks in experiments both in developed and in developing countries, including Brañas-Garza et al. (2010), D'Exelle and Riedl (2010), Goeree et al. (2010), Leider et al. (2009), and Ligon and Schechter (2012). All five of these studies, however, were interested in how social distance between players affects prosocial giving in dictator games.⁵ Amongst others, they find that a decrease in social distance leads to an increase in the amount given by the dictator. The approach taken in this study resembles the trust experiment conducted by Glaeser et al. (2000), who allowed college students to self-select into pairs upon arrival at the lab, thereby raising the likelihood that students

knew each other. They find significantly higher levels of trust and trustworthiness for pairs that are closer socially, which may, however, in part be due to the observability of choices and, hence, the possibility of informal enforcement. Our design, in contrast, rules out this possibility and, by using a within-subject design, we are able to examine what drives changes in trust in response to an increase or a decrease in the social distance between players.

The rest of this paper is organized as follows: in Section 2, we give an overview of the experimental procedures along with a description of the game setups and empirical strategy. Section 3 discusses the main results, while Section 4 examines the determinants of principals' expectations in the trust game. Section 5 concludes.

2. Research design

In the following, we provide a short description of the background and the procedures of our study as well as the game designs (more detailed information can be found in the Web Appendix). The study was conducted in May 2008 in Manshiet Nasser, one of the largest and oldest informal housing areas in Cairo. Similar to other informal housing areas, Manshiet Nasser is characterized by a high population density and a lack of basic infrastructure in many of its neighborhoods.

Three female recruiters were assigned to different districts in order to recruit participants. Recruited participants (invitees) were told that participation in the experiment was only possible together with a friend, excluding direct family members and minors. In total, 144 slum dwellers from the various districts of Manshiet Nasser participated in a total of five experimental sessions. The participants exhibited substantial heterogeneity with respect to their socio-economic status (see Appendix Table 4).⁶ Educational attainment ranged from illiterates (30% of our sample) to university graduates (10%). About 40% of the participants received a regular wage, with an average monthly income of 377 Egyptian pounds (L.E.), equivalent to about 71 US\$ at the time of the experiment.⁷ In contrast, friend pairs exhibited very similar characteristics with regard to age, schooling, employment status, and wealth. All our friend pairs were same-sex pairs, which likely reflects the strong gender norms in Egypt. About 60% of friend pairs saw each other on a daily basis and most had known each other for more than five years.

The experimental sessions were run by a female instructor, who was supported by a large group of assistants, both male and female. The instructions were read aloud and the games and procedures were demonstrated in front of the participants. Participants made their decisions in private and, if necessary, an assistant answered questions and explained the tasks individually. Each session started with the trust game followed by two dictator games, a summing-up and an interview-based questionnaire, which contained questions on socio-economic characteristics, on other-regarding and risk preferences and on characteristics of their relationship to their friend. The trust game was always played first, because it involved the most effort to explain and we wanted the participants' concentrated attention. Participants received the instructions for each game separately and there was no feedback about outcomes between the games. On average, participants earned a total of 34 L.E. (about 6.4 US\$), which was more than twice a worker's daily wage.

2.1. Trust game

We used a binary trust game with hidden action similar to that conducted by Charness and Dufwenberg (2006). The trust game works as follows (see Fig. 1): the principal can choose *Distrust* or *Trust*.⁸ In the former case, both the principal and the agent receive a

² Trust is defined as placing something valuable at the disposal of another person, the trustee, without being able to ensure that she will not misuse it. Trust thus creates a situation where the trustor is vulnerable to the trustee (Coleman, 1990). In the binary trust game, placing trust pays off if the trustee is trustworthy, but not if the trustee is untrustworthy.

³ In the theoretical literature, social distance is usually defined as the path length between trading partners in social networks (e.g., Jackson, 2008). According to this definition, direct friends are connected by the shortest possible path in a network, whereas the path length to strangers is infinite.

⁴ Previous experimental studies on trust (in strangers) in developing countries have mostly used a continuous trust game (“investment game”) based on Berg et al. (1995) and have, for instance, related trust behavior to individual characteristics – such as age, gender, and risk preferences – and to beliefs (e.g., Barr, 2003; Schechter, 2007), as well as to real-world behavior (Karlan, 2005).

⁵ In previous experimental studies, the term “social distance” has mainly been used to describe changes in the degree of anonymity either between participants and the experimenter, for instance, by using double-blind procedures (e.g., Hoffman et al., 1996), or between participants, for instance, by providing certain information about the opponent (e.g., gender or last name) or by letting participants meet before taking the decision (e.g., Bohnet and Frey, 1999).

⁶ Note that we do not draw on a representative sample since we are mainly interested in a relative comparison of trust. Representative samples have recently been used in order to compare absolute levels of trust across populations (e.g., Cardenas et al., 2009).

⁷ The exchange rate was about 1 US\$ to 5.3 Egyptian pounds (L.E.).

⁸ The labels in Fig. 1 are only used for illustrative purposes. In the experiment we used neutral labels.

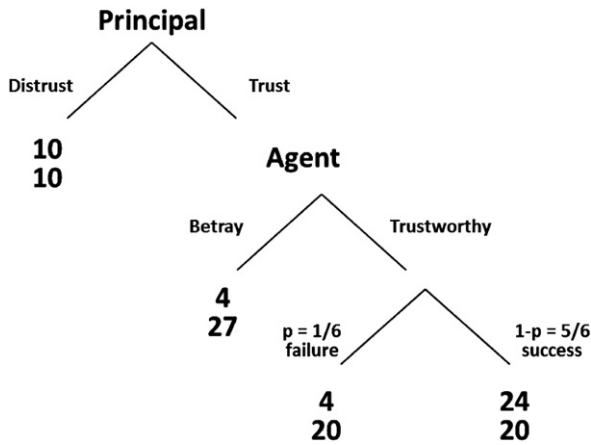


Fig. 1. One-shot binary trust game with hidden action for agents (payoffs in L.E.).

payoff of 10 L.E. In the latter case, the agent has the choice between *Betray*, yielding a payoff of 27 L.E., and *Trustworthy*, yielding a payoff of 20 L.E. If the agent chooses *Betray*, the principal receives a payoff of 4 L.E. If instead the agent chooses *Trustworthy*, the principal's trust is rewarded with a probability of $p = 5/6$, yielding a payoff of 24 L.E. In $p = 1/6$ cases, however, the principal receives a payoff of 4 L.E. only. Due to this random factor, if the principal receives a payoff of 4 L.E., she is unable to conclude with certainty whether or not the agent chose *Betray*. The possibility of agents to hide their action ensures that even when the principal and the agent know each other personally, the principal cannot retaliate against the agent in the case of a low payoff.

Applying backward induction and assuming selfish and risk-neutral participants, a principal will choose *Distrust*, since the agent will maximize her payoff by choosing *Betray*. Note that this unique equilibrium (*Distrust*, *Betray*) is inefficient and that choosing *Trust* will always lead to a higher sum of payoffs. In fact, if the principal chooses *Trust* and the agent chooses *Trustworthy*, this yields ex-ante the highest sum of payoffs.

At the beginning of each session the recruited participants (invitees) were seated separate from their friends. A coin flip determined which group (invitees or friends) played the trust game as a principal. Principals and agents made their decision simultaneously, that is, agents made their decision assuming a trusting principal. We thus obtained an observation for each agent.⁹

Each principal and each agent made two decisions; they played the game once with their friend (friend pairing) and once with some other randomly chosen person ("stranger") from the other group (stranger pairing). The order of the two decisions (stranger versus friend pairing) was randomized. We explained to participants that only the decision in one pairing (stranger or friend) would determine their payoff and that the relevant pairing would be randomly selected in public at the end of the session. Furthermore, if the stranger pairing was selected for payment, they knew they would also learn about the identity of the other player.

After making their decisions, principals were asked what decision they expected from both their friend and the stranger. This binary belief measure is easy to implement, but it likely captures less variation in principals' beliefs.¹⁰ However, given the high share of participants with no or little formal education, and the time constraints we faced,

we refrained from eliciting principals' subjective probability of agents' trustworthiness.¹¹

2.2. Dictator games

In the standard dictator game, a decision maker (i.e., the dictator) has to decide how to allocate a certain amount of money (20 L.E. in our study) between himself and a passive recipient. We modified the dictator game in order to measure other-regarding preferences for both principals and agents. To do so, we asked all participants to make an allocation decision, while their particular, randomly selected role (decision maker or recipient) was revealed to them only at the end of the session.¹² Furthermore, and analog to the trust game, we collected allocation decisions for friends and strangers. That is, decision makers had to decide how much to transfer to a friend and how much to transfer to a stranger, while only one of the two decisions was randomly selected for payment.

Finally, participants played two versions of this modified dictator game. In the anonymous dictator game (DGA), the recipient did not learn about the identity of the decision maker. To ensure anonymity, we only revealed the assigned role (decision maker or recipient) after the session was over, but not whether the friend or the stranger pairing was chosen for payment. In view of the role uncertainty and the fact that giving cannot be motivated by potential future rewards, we refer to the motive of giving in the DGA as solidarity. In the non-anonymous treatment (DGNA), in contrast, the recipient learned about the identity of the decision maker at the end of the session. Due to the possibility of future interaction and enforcement, we refer to the motive of giving in the DGNA as reciprocity. We add the labels "stranger" and "friend" in order to specify whether we refer to the amount given to a stranger or to the friend in either of the dictator games (DGA or DGNA).¹³

2.3. Empirical model

Making use of the within-subject design, we first estimate the following binary choice model for principals' propensity to trust:

$$Trust_{ij} = \alpha + \beta_1 Friend_{ij} + \beta_2 Exp_{ij} + \beta_3 SocPref_{ij} + \beta_4 RiskPref_i + X_i' \delta + \epsilon_{ij} \quad (1)$$

where *Friend* is a dummy variable equal to one for the friend pairing. *Exp* refers to the principal *i*'s expectation that the agent *j* – i.e., her friend or a stranger – will choose *Trustworthy*, which we elicited after the principal made her decisions (see Section 2.1). *SocPref* stands for other-regarding preferences, *RiskPref* for risk preferences, and *X* for the principal's individual characteristics, i.e., age, gender and years of schooling. Additionally, we estimate a regression for the stranger and the friend pairing separately, in which we also control

⁹ After the agent made her decision in private, the assistant drew one of six numbered cards (1–6) to determine whether the principal would receive 24 L.E. ($p = 5/6$) or 4 L.E. ($p = 1/6$) in the event *Trustworthy* had been chosen.

¹⁰ There may also be some measurement error if principals have different cutoff probabilities in mind when reporting their binary belief. Both issues will make it harder to trace any relationship between principals' stated beliefs and their actual choices. We will get back to this in Section 3 when discussing the results.

¹¹ Recently, some progress has been made on measuring subjective expectations in developing countries – for example, by making the elicitation task more tangible through visual aids and less abstract formulations and by providing training and exercises beforehand. The implementation of these methods, however, requires substantial time and it is unclear how sensitive the elicited probabilities are to certain design choices, such as the form of the visual aid (for an excellent review see Delavande et al., 2011).

¹² It is conceivable that this role uncertainty leads to higher transfers than in a standard dictator game with role certainty, as it may increase decision makers' awareness of, or empathy for, the plight of the recipient. Evidence supporting this hypothesis has recently been provided in Andreoni and Rao (2011). We should note, however, that our dictator game results (see Table 5) are well in line with previous findings for dictator games (with role certainty) in developing countries (see e.g., Cardenas and Carpenter, 2008; Ligon and Schechter, 2012).

¹³ The non-anonymous treatment was inspired by the experimental design of Leider et al. (2009). Note that we randomized the order of the dictator games (DGA versus DGNA) as well as the order of the decisions (stranger versus friend pairing). Participants were paid for one decision in each game (DGA and DGNA).

for the principal's social network (*Net*) and, in the case of the friend pairing, for the relationship to her friend (*Friendship*):

$$\text{Trust}_i = \alpha + \beta_1 \text{Exp}_i + \beta_2 \text{SocPref}_i + \beta_3 \text{RiskPref}_i + X_i' \delta + \beta_4 \text{Net}_i + \beta_5 \text{Friendship}_i + \epsilon_i \quad (2)$$

To control for other-regarding preferences we rely on participants' stranger and friend solidarity, as revealed in the anonymous dictator game (DGA). This measure is complemented with dummy variables indicating whether the participant volunteers for a non-profit organization and the frequency of lending money to friends (never, once or several times per year, or once a month or more).¹⁴ We anticipate a positive relationship between each of these variables and trust (e.g., Ashraf et al., 2006; Castillo and Carter, 2002).

Risk preferences were elicited through an attitudinal question in the post-experimental questionnaire.¹⁵ The literature provides mixed evidence of the influence of risk attitudes on trust behavior (Eckel and Wilson, 2004; Houser et al., 2010; Karlan, 2005; Schechter, 2007). For instance, Schechter (2007) finds a positive impact of risk on trusting behavior for rural villagers in Paraguay, whereas Houser et al. (2010) find that risk preferences, albeit explaining behavior in a risk game, have no explanatory power in the trust game.

General network characteristics may also affect trust (Glaeser et al., 2000; Karlan et al., 2009). We therefore control for the number of close friends aside from family members, the primary borrowing source and an individual's level of integration in her immediate neighborhood. We assume that having few close friends, borrowing money primarily from friends and relatives and perceiving neighbors as strangers (i.e., being less integrated in one's community) are indicators of a higher dependence on existing relationships and thus for strong social ties. This is likely to be associated with a lower probability to trust strangers and a higher probability to trust friends (Alesina and Giuliano, 2011; Ermisch and Gambetta, 2010).^{16,17}

Finally, to understand how repeated interaction between friends may foster trust (Homans, 1950; Karlan et al., 2009; Kranton, 1996; Kreps et al., 1982; Marmaros and Sacerdote, 2006), we use the frequency of interaction and the length of the relationship as proxies for the quality of a relationship.

3. Experimental results: social distance and the determinants of trust

Fig. 2 presents the aggregate results for the trust game. Only 17 out of 72 principals (24%) chose *Trust* when confronted with a stranger. The trust rate increased substantially to 40% (29 out of 72) when principals were confronted with a socially close person (paired t-test $t_{(71)} = 2.54, p < 0.015$). Albeit a principal is unable to determine

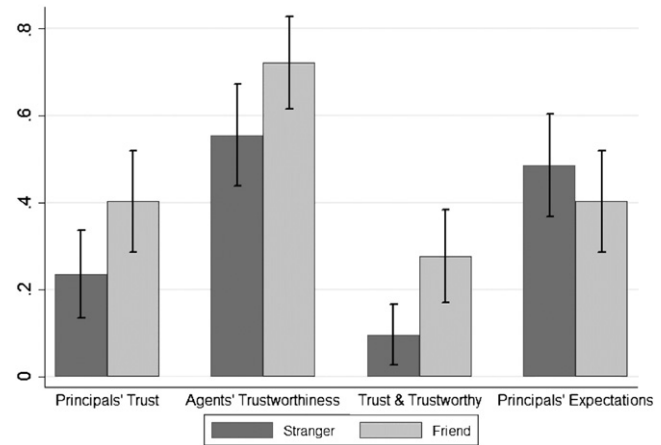


Fig. 2. The effect of social distance on expectations and behavior in the trust game.

the action chosen by the agent (*Betray* or *Trustworthy*), about 55% of agents (40 out of 72) chose *Trustworthy* when the principal was a stranger. This share increased to 72% (52 out of 72) when the principal was their friend (paired t-test $t_{(71)} = 2.54, p < 0.015$). Reduced social distance also led to a higher share of (*Trust*, *Trustworthy*) outcomes. When the principal and the agent did not know each other, only seven out of 72 pairs (10%) succeeded in implementing the (*Trust*, *Trustworthy*) outcome compared to 20 pairs (28%) when they knew each other. Even though the share of principals choosing *Trust* increased when they interacted with a friend, a substantial gap between trust and trustworthiness remained. A similar gap is also apparent between the share of principals expecting their friend to choose *Trustworthy* and the actual share of friends choosing *Trustworthy*. That is, principals tend to have too pessimistic expectations about the trustworthiness of their friends (paired t-test $t_{(71)} = 3.94, p < 0.01$), which is not the case for strangers (paired t-test $t_{(71)} = 0.84, p < 0.02$).

Table 1 provides a more detailed analysis of the actions taken by both the principals and agents conditional on the principals' expectations. The first two columns show the share of principals choosing *Distrust* or *Trust* in the friend and the stranger pairing conditional on their stated belief. The last two columns give the share of agents choosing *Betray* or *Trustworthy*, again conditional on principals' stated belief. The table illustrates that, first, principals who believe that the agent will choose *Betray* mostly choose *Distrust*, and this is the case in both the stranger pairing (81%) and friend pairing (77%). Second, principals who believe that the agent will choose *Trustworthy* are much more likely to choose *Trust* when the agent is their friend rather than a stranger ($\chi^2_{(1)} = 8.74, p < 0.01$). Note also that in the friend pairing the share of principals choosing *Trust* increases from 23%, when they expect their friend to choose *Betray*, to 66%, when they expect their friend to choose *Trustworthy*. Third, the share of agents choosing *Trustworthy* in the friend pairing is remarkably high, irrespective of the principals' beliefs. While this means that principals who expect their friend to choose *Trustworthy* had "correct" expectations in 69% of cases, principals who expect their friend to choose *Betray* had "correct" expectations in only 26% of cases. This suggests that, based on our binary belief measure, principals have difficulties in forming accurate expectations of their friend's behavior. Interestingly, principals do not have more accurate expectations in the friend than in the stranger pairing (paired t-test $t_{(71)} = 0.92, p < 0.17$).

Following the empirical specifications in Section 2.3, Table 2 presents the estimation results for principals' propensity to trust.¹⁸ The estimates

¹⁴ Note that these additional measures do not vary with social distance. Unless otherwise stated, all control variables are constructed from the data that we collected through an interview-based socio-economic questionnaire at the end of each session (see also Section 2).

¹⁵ Participants were asked the following question taken from the German Socio-Economic Panel: "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" Answers are given on an 11-point scale that ranges from risk avoidance ("0") to fully prepared to take risks ("10"). Dohmen et al. (2011) and Hardeweg et al. (2011) validated the same risk question with experimental data from Germany and, respectively, rural Thailand. Ideally, we would have liked to elicit risk attitudes through actual behavior in a risk game (Bohnet et al., 2010; Schechter, 2007), but we abstained from doing so since such a game could be associated with gambling, which is forbidden in Islam.

¹⁶ Given these different predictions for the friend and the stranger pairing, we do not include network characteristics (*Net*) in the panel regressions.

¹⁷ Alberto and La Ferrara (2002) suggest that trust is influenced by how long an individual has lived in a community. Controlling for being born in Manshiet Nasser as an indicator for an individual's integration in her community instead of perceiving one's neighbors as strangers does not change our results qualitatively.

¹⁸ The summary statistics for the dictator games and for participants' network and friendship characteristics are presented in Appendix Table 5. A more detailed discussion of the dictator game results is available in Binzel and Fehr (2010).

Table 1
Principals' and agents' decisions in the trust game conditional on the principals' expectations.

Principals expecting the agent to choose			Share of principals choosing		Share of agents choosing	
			<i>Distrust</i>	<i>Trust</i>	<i>Betray</i>	<i>Trustworthy</i>
<i>Betray</i>	Stranger	(<i>N</i> = 37)	0.81	0.19	0.46	0.54
	Friend	(<i>N</i> = 43)	0.77	0.23	0.26	0.74
<i>Trustworthy</i>	Stranger	(<i>N</i> = 35)	0.71	0.29	0.43	0.57
	Friend	(<i>N</i> = 29)	0.34	0.66	0.31	0.69

from the first two specifications in Table 2 confirm that a decrease in social distance leads to a statistically significant increase in the likelihood that principals choose *Trust*. Moreover, principals who expect the agent to choose *Trustworthy* are more likely to choose *Trust*. This relationship between the binary belief measure and trust, however, only holds true for the friend pairing (see column 3), which is consistent with the descriptive results presented in Table 1. Furthermore, differences in trust across the friend and the stranger pairing can be explained by the different role expectations play in the two pairings. A principal's solidarity, in contrast, is not significantly correlated on average with her trust decision. Results are similar when we add further controls for other-regarding and risk preferences and for individual characteristics (column 4).

The last three columns (columns 5–7) of Table 2 show the results separately for the stranger and the friend pairing. Column (5) reveals that only variables related to a principal's other-regarding preferences are significantly correlated with her decision to trust a stranger. More specifically, the frequency of lending money and volunteering significantly increase the probability that principals choose *Trust* when paired with a stranger and these two coefficients and the coefficient on stranger solidarity are jointly significant.¹⁹ While there is no economically and statistically significant association between principals' stated belief and trust in strangers, principals who expect their friend to choose *Trustworthy* are .47 to .49 more likely to choose *Trust*, which is also statistically significant. In the last column, we additionally control for differences in friendship characteristics. However, neither coefficient is statistically significant.

Overall, the results suggest that principals are more likely to follow their stated belief when interacting with a socially close person as compared to a stranger. However, since we do not have information about the underlying belief distribution(s), it could be the case, for example, that principals state that they expect both their friend and a stranger to choose the same action, e.g., *Trustworthy*, even though they have different likelihoods of choosing *Trustworthy* for their friend and a stranger in mind (see also Section 2.1). In order to gain some additional insights, we draw on the principals' expectations about their friend's and a stranger's transfer in the DGNA, which provide us with a continuous measure in contrast to the binary measure in the trust game. We find evidence that principals who correctly predict their friend's transfer in the DGNA are significantly more likely to choose an action in the trust game that is in line with their binary belief than principals with accurate expectations about a stranger's transfer.²⁰ This may suggest that in the trust game principals are indeed more confident in their stated binary belief when the agent is their friend. When the agent is a stranger, principals seem uncertain about what to expect; they are split almost equally between expecting the agent to be trustworthy and not expecting her to be trustworthy (see Fig. 2). It may then come at little surprise that their beliefs have little predictive power for their decision to trust and that other-regarding preferences become more important.

4. Expected and actual trustworthiness

The previous analysis suggests that expectations are a key determinant of trust among socially close persons. Yet, as illustrated in Fig. 2 and Table 1, principals underestimate their friends' trustworthiness, so that a substantial share of principals forgoes the opportunity of a high payoff by realizing the (*Trust*, *Trustworthy*) outcome. In an attempt to understand why this may be the case, we examine the determinants for agents' trustworthiness by estimating models similar to those for principals' decision to trust (see Section 2.3). We then ask which of these determinants principals incorporate into their expectations.

Columns (1) to (6) in Table 3 show the estimation results for modeling agents' trustworthiness. Without controlling for other factors (column 1), we find that the average increase in the agent's likelihood to choose *Trustworthy* following a reduction in social distance is similar in size and statistical significance to the principal's response to a change in social distance. Once we include the amount given in the DGA, we find that differences in trustworthiness toward strangers and friends can be fully explained by differences in agents' solidarity toward strangers and friends.²¹ Each additional Egyptian pound the agent gives in the DGA increases the agent's probability of choosing *Trustworthy* by about .06 on average. This positive correlation between agents' solidarity and agents' decision to be trustworthy is also reflected in the regressions using data only from the stranger (column 4) or from the friend pairing (columns 5 and 6), and is in line with previous evidence from trust games with strangers (e.g., Ashraf et al., 2006; Castillo and Carter, 2002). Furthermore, whereas friendship characteristics do not explain variation in trust among friends, agents are more likely to choose *Trustworthy* if they see their friend on a daily basis (column 6). Thus, more frequent interaction between friends may increase the cost of lying and, in turn, reduce agents' willingness to choose *Betray*.

Based on the findings above, we may assume that principals expect that friends who exhibit greater friend solidarity are more likely to choose *Trustworthy*. To test this, we now turn to the principals' expectations of agents' trustworthiness (Table 3, column 7). The regression uses the actual characteristics of the friend as explanatory variables, which we take as a proxy for the principals' assessment of their friend, while also controlling for the principals' individual characteristics.²²

The regression results reveal that principals' expectations in the trust game are not statistically significantly correlated with their friend's solidarity. More generally, there is no statistically significant correlation between principals' expectations and their friend's other-regarding preferences as the coefficients for volunteering, lending money and friend solidarity are jointly insignificant (Wald test $\chi^2_{(3)} = 4.94$, $p = 0.18$). Nevertheless, principals seem to recognize that having more close friends may reduce trustworthiness and that less integrated friends, i.e., friends with limited outside options and thus greater dependence on established relationships, are more likely to be

¹⁹ A Wald test is significant at the 5 percent level ($\chi^2_{(3)} = 9.9$, $p < 0.02$). The same test is not significant for the friend pairing ($\chi^2_{(3)} = 3.5$, $p > 0.33$).

²⁰ The corresponding χ^2 -test statistic is significant at the 1% level ($\chi^2_{(1)} = 7.72$, $p < 0.01$). We thank an anonymous referee for suggesting the essence of this analysis.

²¹ Indeed, in the DGA, agents' transfers to friends (44%) are significantly larger than their transfers to strangers (36%). Running a paired t-test yields a $p < 0.01$ for a reduction in social distance in the DGA.

²² Principal's risk and other-regarding preferences should not affect the formation of beliefs (see Fehr, 2009; Naef et al., 2009).

Table 2
Determinants of principals' behavior in the trust game.

	Dependent variable: principals' decision to trust (d)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel	Panel	Panel	Panel	Stranger	Friend	Friend
Paired with friend (d)	0.204** (0.082)	0.223*** (0.083)	0.039 (0.123)	0.047 (0.123)			
Principal expects the agent to choose <i>Trustworthy</i> (d)		0.273*** (0.092)	0.066 (0.139)	0.100 (0.143)	0.122 (0.097)	0.491*** (0.119)	0.474*** (0.123)
Interaction: Paired with friend x Principal's expectations			0.441* (0.232)	0.430* (0.231)			
Other-regarding preferences:							
Stranger/friend solidarity (Transfer in DGA)		0.012 (0.016)	0.010 (0.017)	0.006 (0.016)	−0.003 (0.014)	0.008 (0.019)	0.009 (0.019)
Volunteer for NGO (d)				0.284* (0.146)	0.270* (0.146)	0.241* (0.144)	0.231 (0.150)
Frequency of lending				0.114 (0.074)	0.170** (0.070)	0.030 (0.093)	0.024 (0.095)
Risk preferences				0.001 (0.016)	−0.007 (0.014)	0.007 (0.019)	0.008 (0.019)
Individual characteristics:							
Age				−0.002 (0.006)	0.000 (0.006)	−0.000 (0.007)	−0.001 (0.008)
Female (d)				−0.046 (0.109)	−0.055 (0.102)	−0.056 (0.145)	−0.075 (0.157)
Years of Schooling				−0.013 (0.013)	−0.013 (0.012)	−0.012 (0.015)	−0.010 (0.014)
Social network characteristics:							
Close friends (#)					−0.007 (0.005)	−0.011 (0.007)	−0.012 (0.008)
Borrowing within network (d)					−0.017 (0.109)	0.162 (0.140)	0.158 (0.138)
Neighbors like strangers (d)					−0.143 (0.082)	0.264* (0.143)	0.272* (0.142)
Friendship characteristics:							
Daily visits (d)							−0.086 (0.155)
Long-term relation (d)							−0.082 (0.122)
N	144	144	144	144	72	72	72
Pseudo R ²					0.17	0.22	0.22

(d) Dummy variable. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Marginal effects are reported with standard errors in parentheses from estimating random-effects probit models (columns 1–4) and simple probit models (columns 5–7) for the probability that the principal opts for trust. “Stranger” refers to the stranger pairing; “friend” to the friend pairing. Standard errors in columns (5) to (7) are heteroskedasticity-robust. “Frequency of lending” is a categorical variable for lending money (never, once/several times per year, or once per month or more). “Risk preferences” refers to an 11-point scale ranging from trying to avoid risks (“0”) to fully prepared to take risks (“10”). “Close friends (#)” is the number of close friends besides the family and “borrowing within network” indicates whether the first two sources of borrowing money are family and close friends. “Neighbors like strangers” indicates the perception of immediate neighbors, while “long-term relation” indicates whether friends know each other for 5 years or longer.

trustworthy. The results also indicate that female principals are significantly more likely to expect their friends to be trustworthy. This could reflect general characteristics of female principals or agents, but it may equally be the case that female pairs are different from male pairs.²³

The preceding analysis hinges, of course, on the assumption that principals can assess their friend's characteristics sufficiently well. This assumption may not be too farfetched, at least with regard to more observable characteristics, such as whether their friend volunteers for an NGO.²⁴ However, the finding that principals' expectations in the trust game are not significantly correlated with their friend's solidarity could also be due to an inaccurate assessment of their friend's solidarity.

²³ For instance, informal savings groups called *gam'iyyaat* (Singerman, 1995) are predominantly organized by women in the informal housing areas, and this requires a good ability to assess people. Furthermore, there is empirical evidence from microfinance programs and informal savings groups that women exhibit higher repayment rates than men (Anderson and Baland, 2002; Morduch, 1999). That is, independent from the principal's gender, principals may expect higher levels of trustworthiness from a female agent. Unfortunately, our study design does not allow us to examine this question more thoroughly.

²⁴ Also, in the non-anonymous dictator game (DGNA), a substantial fraction of principals (63%) correctly predict the amount that their friend transfers to them. Principals also have more accurate expectations about their friends' transfer than about the transfer from a stranger as the difference between the expected and the actual transfer is significantly smaller in the friend pairing than in the stranger pairing (paired t-test $t_{(71)} = 3.99$, $p < 0.01$).

Nonetheless, our results support the idea expressed in Wydick (2008), among others, that low trust and, more generally, lower levels of economic development, may be related to the inability of agents to successfully signal, or communicate, their trustworthiness. While the literature has so far focused on trust in strangers, our results indicate that this may also matter for trust within a given social network in environments where solidarity norms are strong.

5. Conclusions

Understanding the determinants of trust toward strangers in relation to socially close persons is of possible importance for the formulation of policies in environments with weak formal institutions. Based on a binary trust game with hidden action, which we implemented in a lab-in-the-field experiment in Cairo, we find that an increase in trust following a decrease in social distance is related to the principals' beliefs: the expectation that an agent will choose *Trustworthy* is associated with a greater probability to choose *Trust* among friends but not among strangers. Principals thus seem to face difficulties in forming expectations when interacting with strangers and, consequently, put less weight on their beliefs in the decision making process. They may also have less precise beliefs about the trustworthiness of a stranger as compared to a friend. We do not find any evidence that higher trust among

Table 3

Determinants of agents' behavior and principals' expectations in the trust game.

	Dependent variable: agents' decision to be trustworthy (d)						Principals' expectation (d)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel	Panel	Panel	Stranger	Friend	Friend	Friend
Paired with friend (d)	0.221** (0.089)	0.114 (0.092)	0.125 (0.093)				
Other-regarding preferences:							
Stranger/friend solidarity (Transfer in DGA)		0.061*** (0.017)	0.056*** (0.018)	0.070*** (0.020)	0.070*** (0.024)	0.077*** (0.023)	−0.030 (0.020)
Volunteer (d)			0.016 (0.134)	−0.152 (0.152)	0.104 (0.100)	0.138 (0.103)	0.270* (0.153)
Frequency of lending			0.022 (0.072)	−0.051 (0.087)	0.028 (0.065)	0.052 (0.067)	0.062 (0.088)
Risk preferences			0.008 (0.015)	0.021 (0.018)	−0.010 (0.016)	−0.018 (0.016)	0.017 (0.019)
Individual characteristics:							
Age			0.010 (0.006)	0.013* (0.008)	0.002 (0.006)	−0.000 (0.006)	−0.008 (0.007)
Female (d)			−0.034 (0.111)	−0.116 (0.130)	0.041 (0.111)	0.081 (0.113)	0.289** (0.113)
Years of Schooling			0.015 (0.013)	0.022 (0.016)	0.009 (0.013)	0.008 (0.012)	−0.021 (0.017)
Social network characteristics:							
Close friends (#)				−0.004 (0.004)	0.005* (0.003)	0.004 (0.002)	−0.016** (0.008)
Borrowing within network (d)				−0.156 (0.139)	0.146 (0.125)	0.086 (0.124)	−0.139 (0.132)
Neighbors like strangers (d)				0.250* (0.137)	0.277*** (0.091)	0.292*** (0.084)	0.293** (0.145)
Friendship characteristics:							
Daily visits (d)						0.250** (0.119)	
Long-term relation (d)						0.094 (0.107)	
N	144	144	144	72	72	72	72
Pseudo R ²				0.21	0.26	0.32	0.20

(d) Dummy variable. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Marginal effects are reported with standard errors in parentheses from estimating random-effects probit models (columns 1–3) and probit models (columns 4–6) for the probability that an agent opts for *Trustworthy* and from estimating a probit model for the probability that a principal expects her friend to choose *Trustworthy* (column 7). “Stranger” refers to the stranger pairing; “friend” to the friend pairing. Standard errors in columns (4)–(7) are heteroskedasticity-robust. “Frequency of lending” is a categorical variable for lending money (never, once/several times per year, or once per month or more). “Risk preferences” refers to an 11-point scale ranging from trying to avoid risks (“0”) to fully prepared to take risks (“10”). “Close friends (#)” is the number of close friends besides the family and “borrowing within network” indicates whether the first two sources of borrowing money are family and close friends. “Neighbors like strangers” indicates the perception of immediate neighbors, while “long-term relation” indicates whether friends know each other for 5 years or longer. The variables in column (7), except age, female and years of schooling, refer to the characteristics of the friend.

friends is due to greater solidarity. Rather, it seems that other-regarding preferences play a greater role in the decision to trust when there is uncertainty about the agent's behavior as in the stranger pairing. From a policy perspective, our results suggest that trust may be fostered through changing beliefs. Previous research has shown that information policies can, for example, affect an individual's perceived returns to education (Jensen, 2010). How beliefs about trustworthiness may be changed, however, and, for instance, which role prior beliefs may play in building up trust are areas for future research.

Despite the increase in trust, we observe a significant gap between trust and trustworthiness among friends as well as between a principal's expectation about her friend's trustworthiness and her friend's actual trustworthiness. Because principals who choose to distrust are unable to learn whether their lack of trust was justified, a self-reinforcing cycle may set in, preventing trusting behavior in future transactions. Such a dynamic seems particularly likely in environments characterized by strong solidarity norms, in which costs to credibly signal one's trustworthiness are likely high. This may explain why we observe a relatively low willingness among friends to trust when enforcement mechanisms are absent, even though most friend pairs had known each other for several years.

The fact that principals underestimate their friend's trustworthiness suggests that social networks may be unable to completely resolve inefficiencies due to information asymmetries. On a more general level, our

results may thus provide a further explanation for why social networks are not a perfect substitute for formal institutions: not only is trade essentially limited to members of a given social network (e.g., Munshi, 2006), economic exchanges within a network may only take place when transactions require little trust.

Appendix A

Table 4

Participants' characteristics.

Variable	N	Mean	Std. dev.	Min	Max
Female	144	53%			
Muslim	144	94%			
Born in Manshiet Nasser	144	39%			
Age	144	30	11	17	64
Years of schooling	144	9	6	0	16
Illiteracy	144	31%			
Innumeracy	144	12%			
Ever-married	144	53%			
Volunteer	144	29%			
Frequency of lending	144	2.10	0.79	1	3
Risk preferences	144	5.68	3.71	0	10

(continued on next page)

Table 4 (continued)

Variable	N	Mean	Std. dev.	Min	Max
Wage income (in L.E.)	59	377	263	70	1690
Nr of children	64	3	2	1	8
Nr of siblings	144	5	2	0	10
Nr of persons per household	144	6	2	1	11
Rooms per household	144	3	1	1	6

Notes: "Volunteer" indicates volunteering for an NGO and "frequency of lending" is a categorical variable for lending money (never, once/several times per year, or once per month or more). "Risk preferences" refers to an 11-pointscale ranging from trying to avoid risks ("0") to fully prepared to take risks ("10").

Table 5

Summary statistics for the dictator games and for participants' network and friendship characteristics (N = 144).

Explanatory variable	Mean	Std. dev.
<i>Anonymous dictator game</i>		
Amount given to a stranger (stranger solidarity)	7.29	3.55
Amount given to the friend (friend solidarity)	8.85	3.12
<i>Non-anonymous dictator game</i>		
Amount given to a stranger (stranger reciprocity)	7.90	3.10
Amount given to the friend (friend reciprocity)	9.21	2.60
Expected amount from a stranger	6.67	2.99
Expected amount from their friend	9.26	2.66
<i>Network and friendship characteristics</i>		
Close friends (#)	4.75	11.17
Borrowing within network (d)	0.60	0.49
Neighbors like strangers (d)	0.26	0.44
Daily visits (d)	0.60	0.49
Long-term relation (d)	0.51	0.50

Notes: In the dictator game, decision makers received an endowment of 20 L.E. (Egyptian Pound). "Close friends (#)" is the number of close friends besides the family and "borrowing within network" indicates whether the first two sources of borrowing money are family and close friends. "Neighbors like strangers" indicates the perception of immediate neighbors. "Daily visits" indicates daily interaction with their friend and "long-term relation" indicates whether they know each other for 5 years or longer.

Appendix B. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jdeveco.2013.01.009>.

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