

# Does social capital matter? Evidence from a five-country group lending experiment

By Alessandra Cassar\* and Bruce Wydick†

\*Department of Economics, University of San Francisco;  
e-mail: [acassar@usfca.edu](mailto:acassar@usfca.edu)

†Department of Economics, University of San Francisco, 2130 Fulton Street,  
San Francisco, CA 94117, USA; e-mail: [wydick@usfca.edu](mailto:wydick@usfca.edu)

Does social capital matter to economic decision-making? We address this broad question through an artefactual group lending experiment carried out in five countries: India, Kenya, Guatemala, Armenia, and the Philippines, obtaining data on 10,673 contribution decisions from 1,554 subjects in 259 experimental borrowing groups. We carry out treatments for social homogeneity, group monitoring, and borrowing group self-selection. Results show that societal trust positively and significantly influences group loan contribution rates, that group lending appears to create as well as harness social capital, and that peer monitoring can have perverse as well as beneficial effects.

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## 1. Introduction

Economists have become increasingly fascinated by the role that social capital plays in facilitating economic transactions. Particularly in communities that are relatively homogeneous and close-knit, social capital may facilitate a general sense of trust and goodwill surrounding economic exchange. Social capital may also facilitate the flow of information, serving a screening function that curtails adverse selection. Further, it may help hold people more accountable for their actions, mitigating moral hazard as economic decisions are placed within the context of long-term relationships.

Understanding the effect of social capital on economic decision-making has been the subject of a broad literature. This literature has pointed to the positive effects of social capital on economic growth (Knack and Keefer, 1997), reducing corruption (LaPorta *et al.*, 1997), community governance (Bowles and Gintis, 2002), preventing crime (Case and Katz, 1991), curtailing moral hazard in the workplace (Ichino and Maggi, 2000), and financial development (Guiso *et al.*, 2004).

Yet it is often the case that social capital variables are endogenous to outcome variables, presenting a challenge to causal inferences. Some rigorous studies on the economic effects of social capital have used instrumental variables to address problems of correlated unobservables (e.g. Knack and Keefer, 1997) or exploited differences in regional social capital within a country to identify its effects (e.g. Putnam, 1993; Ichino and Maggi, 2000). Our study addresses the challenge of causal inference through experimental methods. We carry out a group lending experiment in five countries with five different cultural contexts to test the effect that different types of social capital have on an individual propensity to contribute to a joint liability loan.

Our experiments were carried out in Armenia, Guatemala, Kenya, India, and the Philippines among a total of 1,554 participants in 259 simulated borrowing groups across these five countries. In our group lending experiment, each subject in a group is given a loan and then must draw a ball at random from a black bag that contains five green balls and one red ball. Drawing a green ball means a successful investment from which the subject earns a positive return, giving the subject the opportunity to contribute to the repayment of the group loan. Drawing the red ball implies a negative shock to the borrower in which the borrower is unable to pay her share of the group loan. Subjects choose balls with replacement, so that there is a one-sixth probability that any of the subjects draws the red ball, even after it has already been drawn. If at least half of the subjects in a group contribute, group lending continues for a subsequent round. This process of group repayment, if sustained for more than a few rounds, can make each member better off relative to non-repayment because non-repayment increases the likelihood of group loan termination. Consequently, each individual faces a trade-off between contributing to the group loan (to help the group to continue to receive loans) and withholding her contribution (increasing her individual payoff for a particular round).<sup>1</sup> Because each group lasted an average of 6.86 rounds before breakdown from insufficient repayment occurred, our study generated 10,673 observations from which to draw in our analysis.

Information about other people, about what they are doing, and the potential to influence their behavior each represents a different facet of social capital. Accordingly, we designed our treatments in our group lending experiment around these phenomena in a between-subjects design. We implemented group self-selection treatments as part of our work in three of our countries, allowing subjects to bring to the experimental site a self-selected group of friends or acquaintances who formed their partners in the experiment. These self-selected groups comprised 16.1% of the groups in Guatemala, 50% in Kenya, and 45.5% in the

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<sup>1</sup>While this group lending game retains some of the flavor of the public good game, it departs from it in substantial ways by having dynamic incentives in the payoffs structure and introducing individual shocks (see our more detailed description in Section 2).

Philippines. In India (52.9%) and the Philippines (11.0%) a portion of our experimental groups were comprised of actual self-selected group borrowers from a local microfinance institution (MFI).

In two countries we implemented a monitoring treatment, comprising 14.5% of the groups in Guatemala and 25.5% in the Philippines. In our normal set-up, chairs were facing away from the other subjects around a circle, so that subjects chose balls and made contributions choices privately with the experimenter. In the monitoring treatment, subjects performed both of these tasks in front of the group so that others could observe not only what color ball each drew, but whether or not another member drawing a green ball was choosing to use her good fortune to contribute to the group loan. After observing contributions of the other members, we allowed subjects to alter their decisions by flipping contribution decision cards until subject decisions converged to a Nash equilibrium.

To test for the importance of social homogeneity, we exogenously formed the remaining groups in terms of homogeneity and heterogeneity over key social reference groups. In our 26 groups in Armenia, we formed groups exogenously over a main source of social conflict in that country, between pre-Perestroika and post-Perestroika generations. In Guatemala we formed homogeneous and heterogeneous groups based on religion (Evangelical and Catholic), and residence in one of two rival adjacent towns. In 23 of our 46 groups in Kenya we did the same with Muslims and Christians, and similarly in 30 of our 55 groups in the Philippines with homogeneous and heterogeneous groups of Muslims and Christians. In Chennai (India) our most religiously diverse site, among 33 of our 70 groups in Chennai were homogeneous groups of Hindus, Muslims, and Christians along with groups of half Hindus and Christians and half Hindus and Muslims. Each subject announced his or her residence and religion to the others before the experiment as part of the treatment.

In each of our country sites we had subjects fill out a survey in which they answered questions about the depth of their relationship with others in the group, how long they had lived in the area, the depth of their religious commitment, their views of people from other groups, their answers to the three standard questions on societal trust from the General Social Survey, and information on other standard control variables.

Our research finds some basic factors to influence contribution decisions in virtually every context. We find strong evidence of reciprocity: subjects victim to a greater number of negative shocks (red balls) contribute more often when they draw a green ball and have the opportunity to contribute. In virtually all of our estimations across countries we find a significant and positive correlation between a person being more trusting of others in society (based on their answers to the standard GSS questions) and group loan contribution decisions. We find this effect across groups, within groups (using group-level fixed effects), and positive point estimates in virtually every type of country estimation. We also find in our group self-selection treatments that when subjects self-selected with borrowers with whom they knew, contribution rates increased.

But there are also a number of surprising results, some of which yield new insights into the relationship between social capital and economic decision-making. One of these regards the dramatically lower rates of individual contribution rates and lending group duration in the Kenya experiments, 41.8% among the 276 subjects in Nairobi compared with 87.5% for the 1,278 subjects in the other four countries ( $p$ -value = 0.000). This was driven by a lack of confidence that other members would contribute to the group loan, a result that we discuss more fully in Section 3.

We observe furthermore that the effects of different types of social capital are highly contextualized. That different aspects of social capital appear to exhibit diverse effects across cultures suggests that the external validity of work in behavioral economics and social capital carried out in a single context may be quite limited. In this respect our results support existing research such as Henrich *et al.* (2001), in which the authors found substantial differences in plays of the ultimatum game when carried out in 15 different small-scale societies across Africa, Asia, and Latin America.

We also discover that certain types of social capital may exhibit surprising effects when isolated experimentally. An example from our study concerns the effects of monitoring. We find that there appear to be two counteracting effects from peer monitoring: a shame effect, which tends to encourage members to contribute their share (especially when others in the group are contributing), and a retaliation effect, in which other members retaliate in response to a defection. While peer monitoring results in higher repayment conditional upon every other member in the group contributing, when even a single other individual in the group refuses to repay after drawing a green ball, the repayment rate quickly becomes lower than with no peer monitoring at all. All told, we find that the retaliation effect at least counteracts the shame effect, and if anything outweighs it.

Following this introduction, Section 2 of our paper presents a description of our group lending experiment, subjects and experimental settings. (A more detailed description of our five experimental sites and a mathematical derivation of the incentives in our game are provided in Appendices 1 and 2, which is available online at the OUP website) Section 3 presents our experimental results and Section 4 summarizes and concludes.

## 2. The experiment

Our experiment sought to test the following hypotheses regarding the effect of social capital on group lending from the microfinance literature:

*Hypothesis 1* Homogeneity of groups and greater social trust among borrowers leads to a higher level of social capital and hence group loan repayment. Interpersonal trust, which is critical for successful group borrowing, may be stronger in a socially homogeneous group. Moreover, the greater potential for sanctions between homogeneous members may also help mitigate moral hazard problems in joint liability lending contracts when borrowers enjoy a social leverage with one

another that extends beyond the lending contract (Floro and Yotopolous, 1991; Besley and Coate, 1995; Zeller, 1998; Wydick, 1999; Cassar *et al.*, 2007). We carry out homogeneity treatments in all five of our country sites.

*Hypothesis 2* Group lending does not only harness social capital, but creates it. Much of the academic literature emphasizes the ability of the group lending to harness the social capital that exists naturally in traditional societies. However many microfinance institutions claim that group lending actually creates social capital rather than merely harnessing the social capital that already exists. We test this in India, where we experiment among both newly formed groups and experienced borrowers.

*Hypothesis 3* Reciprocity plays an important role in facilitating group loan repayment. As borrowers are subject to individual idiosyncratic shocks within groups, they must rely on others to help them repay so that the group is able to maintain access to credit. The study of reciprocity among the poor has a long history beginning with the seminal work of Scott (1976). We predict that a borrower will be more likely to contribute in a given round if he or she has received a shock in the recent past.

*Hypothesis 4* Borrower self-selection increases repayment by mitigating adverse selection problems. Work by Van Tassel (1999) and Ghatak (1999) argues that self-selection of borrowing groups generates an assortative matching process based on local information in which safe borrowers join with other safe borrowers in borrowing groups, mitigating adverse selection in the lending relationship and boosting loan repayment. The borrower self-selection treatment was implemented in Guatemala, Kenya, and the Philippines.

*Hypothesis 5* Monitoring between borrowers reduces moral hazard and increases group loan repayment. Theoretical models by Stiglitz (1990), Banerjee *et al.* (1994), and Wydick (2001) posit that peer monitoring between jointly liable borrowing group members helps mitigate the hidden action that spawns moral hazard in credit transactions. We carried out our monitoring treatment in Guatemala and the Philippines.

## 2.1 Sites and subjects

Our experiment was carried out in five country sites by our team of faculty and graduate students: Armenia (Berd, population: 8,700), Guatemala (San Pedro and San Juan La Laguna, both approximately pop. 4,000), India (Chennai, formerly known as Madras, pop. 4.3 million), Kenya (Nairobi, pop. 3 million), and the Philippines (Davao City, pop. 1.4 million, Panabo City, pop. 134,000, and Cotabato City, pop. 162,000). Details of these sites are given in the online Appendix 1. In Appendix 1 we also describe some small differences in the details of the experiment as it was carried out in the different countries. Although any impacts of these differences are subsumed by the country fixed effect, any specifically cross-country comparison of results should take these into consideration.

In each of our country sites our subjects were borrowers who fit the typical profile of a microfinance borrower: living in a relatively poor neighborhood with relatively low levels of formal schooling, average age about 34 years old, and disproportionately women (80.8%). Subjects were typically recruited in collaboration with local NGOs (non-government organizations). In India and the Philippines we ran a large fraction of our experiments on actual microfinance borrowers who were current borrowers with a local MFI, such that real microfinance borrowers make up 16.6% of our subjects in the study as a whole. Some of the non-microfinance borrowers had participated in programs of the local NGO or were recruited off the street for the experiment. When we ran treatments allowing for self-selection of borrowers, we spread the word generally among a segment of the local population fitting our profile, giving a rough description of the activity, and encouraged subjects to arrive at the experiment site in self-selected groups of six.

Table 1 shows that the mean age of our subjects varied little between the five countries, ranging from 30.2 years in Kenya to 36.1 years in Armenia. The fraction of female subjects ranged from 0.41 in Kenya, 0.70 in the Philippines, and 0.90 in Guatemala, to entirely female in Armenia and India. The average fraction of a subject's life lived in the region of the experiment varied from 0.44 in Kenya, where many slum dwellers had relocated to Nairobi from outlying areas, to 0.95 in Guatemala, in which there is traditionally very little mobility between rural towns. Roughly half of our sample subjects operated their own enterprises and about one-quarter were wage workers.

We compiled a simple index of societal trust for each subject based on the number of yes (trusting) answers to the three standard GSS questions. Overall Hindu subjects made up 17.1% of our total sample (coming only from India), Muslims made up 16.7% of our sample (coming from India, Kenya, and the Philippines), Catholics 28.1% (in Guatemala and the Philippines), and Evangelical Protestants 25.2% (in Guatemala, India, and Kenya).

## 2.2 Experimental design

The group lending experiment that we employ in each of our five country sites is the group lending game originally developed by Abbink *et al.* (2006) with some modifications and adjustments for particular treatments. We favor the game because it contains three important properties that capture key aspects of group lending: the first is that it incorporates dynamic incentives. Field research has indicated that a major reason borrowers repay group loans is to maintain access to future loans.<sup>2</sup> The second is that it incorporates an important form of moral hazard: difficulty in eliciting repayment even when a project yields a sufficient return. The third is that the structure of the game allows for private information; investment

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<sup>2</sup>See for example, Wydick (2001) which reports that 86% of microfinance borrowers when asked why they choose to repay their share of a group loan respond that they do so to maintain access to MFI credit.

Table 1 Summary statistics

| Variable                            | Armenia                    | Guatemala       | India              | Kenya          | Philippines        | 5 Countries     |
|-------------------------------------|----------------------------|-----------------|--------------------|----------------|--------------------|-----------------|
| Num. of groups                      | 26                         | 62              | 70                 | 46             | 55                 | 259             |
| Num. of subjects                    | 156                        | 372             | 420                | 276            | 330                | 1,554           |
| Total num. of observations          | 666                        | 3,450           | 3,449              | 498            | 2,610              | 10,673          |
| <i>Experimental variables</i>       |                            |                 |                    |                |                    |                 |
| Num. of rounds exp. lasted          | 4.269                      | 9.242           | 8.214              | 1.804          | 7.909              | 6.861           |
| Avg. subject contribution rate      | 0.754                      | 0.903           | 0.854              | 0.387          | 0.740              | 0.755           |
| Mean shocks received—self           | 0.187                      | 0.182           | 0.199              | 0.156          | 0.153              | 1.176           |
| <i>Demographic variables</i>        |                            |                 |                    |                |                    |                 |
| Age                                 | 36.141 (13.831)            | 34.215 (10.661) | 35.325 (10.005)    | 30.228 (8.914) | 34.019 (10.572)    | 33.955 (10.702) |
| Female fraction                     | 1.000 (0.000)              | 0.901 (0.300)   | 1.000 (0.000)      | 0.413 (0.493)  | 0.698 (0.460)      | 0.808 (0.394)   |
| Mean education                      | 1.984 (0.144)              | 0.934 (0.665)   | —                  | 1.618 (0.770)  | 2.234 (0.802)      | 1.606 (0.864)   |
| (1=primary, 2=mid, 3=high school)   |                            |                 |                    |                |                    |                 |
| <i>Economic variables</i>           |                            |                 |                    |                |                    |                 |
| Business owner fraction             | 0.154 (0.362)              | 0.411 (0.493)   | 0.688 (0.464)      | 0.482 (0.501)  | 0.476 (0.500)      | 0.486 (0.450)   |
| Wageworker fraction                 | —                          | 0.161 (0.368)   | 0.145 (0.353)      | 0.322 (0.468)  | 0.37 (0.483)       | 0.237 (0.426)   |
| Fraction with loan in past          | 0.051 (0.221)              | 0.338 (0.474)   | 0.523 (0.381)      | 0.100 (0.301)  | 0.424 (0.495)      | 0.241 (0.428)   |
| <i>Social variables</i>             |                            |                 |                    |                |                    |                 |
| Fraction of life lived in area      | 0.486 (0.305)              | 0.946 (0.178)   | 0.793 (0.296)      | 0.439 (0.346)  | 0.503 (0.332)      | 0.675 (0.355)   |
| Num. of acquaintances               | 1.436 (1.296)              | 3.847 (1.506)   | 3.468 (2.202)      | 3.202 (1.830)  | 3.492 (1.388)      | 3.306 (1.855)   |
| Mean GSS questions                  | 1.686 (1.002)              | 1.341 (0.868)   | 1.724 (1.029)      | 1.337 (0.813)  | 1.877 (0.903)      | 1.592 (0.952)   |
| (num. of positive replies out of 3) |                            |                 |                    |                |                    |                 |
| <i>Treatments</i>                   |                            |                 |                    |                |                    |                 |
| Fraction in self-select treatment   | 0.000 (0.000)              | 0.161 (0.368)   | 0.000 (0.000)      | 0.500 (0.501)  | 0.455 (0.499)      | 0.224 (0.417)   |
| Fraction in monitoring treatment    | 0.000 (0.000)              | 0.145 (0.353)   | 0.000 (0.000)      | 0.000 (0.000)  | 0.255 (0.436)      | 0.089 (0.285)   |
| Fraction of real MF borrower        | 0.000 (0.000)              | 0.000 (0.000)   | 0.529 (0.450)      | 0.000 (0.000)  | 0.11 (0.313)       | 0.166 (0.372)   |
| Num. of others same religion        | 3.487 <sup>1</sup> (1.505) | 3.459 (1.479)   | 3.457 (1.595)      | 4.21 (1.324)   | 3.852 (1.535)      | 3.68 (1.526)    |
| <i>Religious variables</i>          |                            |                 |                    |                |                    |                 |
| Religious frequency                 | 0.000                      | 2.3             | 2.171              | 1.854          | 1.5                | 1.785           |
| Fraction Catholic                   | 0.000                      | 0.618           | 0.000              | 0.000          | 0.624 <sup>2</sup> | 0.281           |
| Fraction Evangelicals               | 0.000                      | 0.366           | 0.257 <sup>2</sup> | 0.533          | 0.000              | 0.252           |
| Fraction Hindu                      | 0.000                      | 0.000           | 0.629              | 0.000          | 0.000              | 0.171           |
| Fraction Muslims                    | 0.000                      | 0.000           | 0.086              | 0.467          | 0.288              | 0.167           |

Means with standard deviations in parentheses.

Notes: <sup>1</sup>Of same pre- or post-Perestroika generation in Armenia.

<sup>2</sup>Data did not differentiate between Christian denominations in India and the Philippines, but Christian subjects in India were believed to be more than 90% Evangelical Protestant while in the Philippines more than 90% Catholic.

shocks are private information in the standard execution of the game, but the game can easily be adapted to allow for a peer monitoring treatment.

Our experimental setup consisted of a circle of chairs facing away from the center of the circle (except for the monitoring treatments, in which the chairs faced inward.) Each member of the group gave a clear statement of his or her religion<sup>3</sup> to the other five members of the borrowing group. The experimenter then read directions, answered clarifying questions, and carried out three pre-determined trial runs of the experiment, asking questions to the subjects after the trial runs to ascertain their knowledge of how the experiment would work.

In the experiment each of the six subjects is given a loan equal to approximately US\$0.50. For example, in India the initial loan to each subject was 20 rupees. This created a jointly liable loan for 120 rupees that must have been repaid at 20% interest for a total of 144 rupees. The experimenter then passes a black bag with six colored ping-pong balls to each subject, who draws one ball, notes the color of the ball with the experimenter, and then returns the ball to the bag. The color of the ball is then marked with ink on a card held by the subject. There are six balls in the bag, five green and one red. Except for the monitoring treatment, only the experimenter and the individual subject know the color of the ball he has randomly chosen. After all six subjects have drawn their balls, the experimenter makes another trip around the circle to record the contribution of each group member to the joint liability loan. If the subject draws a red ball, the subject receives a negative shock on her investment; she loses her principal and cannot repay her share of the group loan. If she receives a green ball, then she must choose whether or not to contribute to repayment of the loan by displaying a decision card privately to the experimenter. For example in India, the payoff to a successful investment was 48 rupees. With all six members contributing to a loan, each member would have to contribute 24 rupees to pay off the 144 due on the loan and could keep 24 rupees. However, if the number of contributors was smaller, as with real-world group lending, the contribution of the repaying members was larger.

Continuing with the India example, if the number of contributors ended up being four, each would have to contribute 36 rupees, while keeping only 12 rupees as a payoff from that round. Since it requires 144 rupees to pay off the group loan, full repayment is impossible if fewer than three borrowers contribute to repayment. Thus if three or more borrowers contribute, the group receives another loan in a subsequent round, but if less than three contribute, lending ceases and the experiment ends with subjects receiving their payoffs accrued from each round. Subsequent to each round, the experimenter informed players about the total number of contributors (but not their identities), and if repayment was sufficient

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<sup>3</sup>Religious introductions were performed in Guatemala, Kenya, India, and the Philippines.

to foster another loan.<sup>4</sup> After the experiment, subjects filled out a questionnaire with approximately 50 questions pertaining to demographic, social, religious variables, and societal trust.<sup>5</sup>

In Appendix 2 we present formally the strategic conditions under which it is optimal for a player to contribute to the group loan, taking into account the benefits from withholding contribution in the present round with the added risk this brings to loan termination. Carrying out a set of computer simulation exercises based on the formal model, we demonstrate that when three other players contribute,  $n=3$ , the expected whole-game payoff is higher playing the Withhold strategy than Contribute. With  $n=4$ , Contribute begins to pull marginally ahead of Withhold, and at  $n=5$ , the Contribute strategy yields an expected whole-game payoff about twice as high as Withhold. Trust between members is thus crucial to strategy, sustainability of the exercise, and, ultimately, payoffs.

### 3. Results: does social capital matter?

We present here three basic sets of estimations: (i) On the duration of the experimental groups in terms of number of lending rounds, where higher contribution rates generally lead to more rounds of borrowing; (ii) On individual contributions by round given that a subject had a successful investment and had the opportunity to contribute, an estimation that allows us to incorporate round-level fixed effects; and (iii) On the total number of contributions by each subject divided by the number of opportunities to contribute. Each estimation offers distinct advantages in yielding insight into the effects of social capital variables and group interaction on group loan contributions. Table 2 shows regressions based on group longevity in the experiment. The advantage with these estimations is that in some sense they do capture the success of a group based on individual and social characteristics and treatments. However, because a random confluence of negative shocks may play a leading role in terminating lending in any particular round, the estimated effect of social capital variables on decision-making is less precise. The advantage of the pooled logit estimations on individual contributions by round in Table 3 is that they are able to incorporate situation-specific attributes in the experiment such as

<sup>4</sup>In cases where the experiment lasted more than ten rounds, to avoid the potential pitfalls of finitely repeated games, we announced to the subjects that we would artificially hastened the end of the experiment by flipping a coin to determine if another round would be played or by increasing the probability of a negative shock from 1/6 to 1/2. (See Appendix 2).

<sup>5</sup>We used the three standard GSS questions that included the question on *trust*, ‘‘Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?’’, the question on *fairness*, ‘‘Do you think most people would try to take advantage of you if they got the chance, or would they try to be fair?’’, and the question on *helpfulness*, ‘‘Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?’’. Because these questions are highly related, in our estimations we create a composite index equal to the number of answers reflective of a positive level of societal trust from the three questions.

Table 2 Borrowing group duration

|                            | (1)               | (2)               | (3)              | (4)             | (5)              | (6)                     | (7)                        |
|----------------------------|-------------------|-------------------|------------------|-----------------|------------------|-------------------------|----------------------------|
|                            | Armenia           | Guatemala         | India            | Kenya           | Philippines      | 5-Countries<br>FE: none | 5-Countries<br>FE: country |
| Total shocks in group      | -1.501*** (0.336) | -4.279*** (0.754) | -0.720 (1.028)   | -0.405 (0.308)  | -0.778 (0.935)   | -1.409*** (0.399)       | -1.381*** (0.380)          |
| Mean age                   | -0.043 (0.040)    | 0.109 (0.081)     | -0.078 (0.138)   | 0.147** (0.070) | 0.352** (0.143)  | 0.022 (0.034)           | 0.015 (0.032)              |
| Mean education             | 2.141 (4.564)     | 0.663 (0.920)     |                  | 1.470 (0.987)   | 1.575 (1.066)    |                         |                            |
| Mean own a business        | 3.549 (2.410)     | 0.038 (1.523)     | -2.601 (2.615)   | 0.130 (1.012)   | -1.101 (3.124)   | -1.657 (1.025)          | -1.013 (0.982)             |
| Mean past loan             | -3.354 (3.135)    | -1.476 (1.483)    | 3.545** (1.719)  | -0.747 (2.466)  | -3.443 (2.630)   | 1.934* (1.028)          | 0.293 (1.032)              |
| Mean fraction life in area | -2.526 (2.176)    | 2.315 (5.703)     | -1.402 (3.579)   | 3.021 (2.322)   | 3.326 (2.619)    | 4.213*** (1.045)        | 1.090 (1.516)              |
| Mean num. know. in group   | -0.054 (0.364)    | 0.400 (0.337)     | -0.589 (0.782)   | -0.392 (0.689)  | 0.136 (0.550)    | -0.466** (0.235)        | -0.226 (0.256)             |
| Mean GSS questions         | 0.299 (0.918)     | 1.993* (1.031)    | -1.070 (1.071)   | -0.493 (1.000)  | 1.693 (1.373)    | 0.751 (0.569)           | 0.313 (0.542)              |
| Religious homogeneity      | 1.011 (0.863)     | 0.534 (0.716)     | 0.990 (1.279)    | 0.953 (0.755)   | 0.742 (1.235)    | 0.240 (0.525)           | 0.473 (0.474)              |
| Proportion female          |                   | 4.870 (4.918)     | 0.000 (0.000)    | -0.562 (1.213)  | 0.881 (2.198)    | 2.329** (1.144)         | -0.052 (1.061)             |
| Mean wageworker            |                   | 0.757 (1.897)     | -7.029** (3.236) | 0.533 (0.938)   | -2.627 (1.579)   |                         |                            |
| Homogeneous gender         |                   | -0.203 (1.227)    |                  | -1.353 (0.845)  | -0.653 (1.489)   |                         | 0.155 (0.589)              |
| Self-selection treatment   |                   | 9.403 (7.808)     |                  | -3.887 (2.551)  | -7.767 (5.041)   | -9.463*** (1.973)       | -6.824*** (1.906)          |
| Self-selection *num know   |                   | -1.672 (1.702)    |                  | 0.862 (0.831)   | 2.226 (1.390)    | 1.789*** (0.515)        | 1.534*** (0.488)           |
| Monitoring treatment       |                   | 0.915 (0.797)     |                  |                 | -4.213** (2.057) | -0.604 (0.797)          | -1.258 (0.835)             |
| Microfinance borrower      |                   |                   | 3.043 (2.616)    |                 | -3.642 (3.788)   | 2.074 (1.380)           | 1.255 (1.418)              |
| Number of Evangelicals     |                   | 0.439** (0.206)   | -0.779 (1.101)   | 0.240 (0.152)   |                  | 0.507*** (0.144)        | 0.463 (0.407)              |
| Number of Muslims          |                   |                   | -0.735 (1.133)   | 0.000 (0.000)   |                  | 0.591*** (0.168)        | 0.501 (0.405)              |
| Number of Hindus           |                   |                   | -0.879 (1.067)   |                 |                  | 0.455* (0.233)          | 0.162 (0.471)              |
| Number of Catholics        |                   |                   |                  |                 |                  | 0.837*** (0.154)        | 0.124 (0.374)              |
| Armenia                    |                   |                   |                  |                 |                  |                         | -3.316 (2.115)             |
| Guatemala                  |                   |                   |                  |                 |                  |                         | 0.666 (1.191)              |
| Kenya                      |                   |                   |                  |                 |                  |                         | -7.489*** (0.864)          |
| India                      |                   |                   |                  |                 |                  |                         | -0.756 (1.462)             |
| Constant                   | 3.342 (9.239)     | -2.473 (7.318)    | 21.831** (8.273) | -4.933 (3.408)  | -10.290 (7.234)  | 0.452 (2.107)           | 7.716** (3.006)            |
| Observations               | 26                | 62                | 70               | 46              | 52               | 259                     | 259                        |
| R <sup>2</sup>             | 0.48              | 0.60              | 0.23             | 0.35            | 0.60             | 0.36                    | 0.49                       |

Dependent variable: rounds reached by group in microfinance game (OLS estimates).

Notes: Robust standard errors in parentheses. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

Table 3 Individual repayment decisions

| Variable              | (1)<br>Armenia | (2)<br>Guatemala | (3)<br>India      | (4)<br>Kenya    | (5)<br>Philippines | (6)<br>5-Country<br>FE: none | (7)<br>5-Country<br>FE: country | (8)<br>5-Country<br>FE: group |
|-----------------------|----------------|------------------|-------------------|-----------------|--------------------|------------------------------|---------------------------------|-------------------------------|
| Lag subject shock     | 0.079 (0.351)  | 0.092 (0.259)    | 0.369* (0.210)    | -0.670 (0.452)  | -0.330 (0.224)     | 0.058 (0.109)                | 0.032 (0.113)                   | -0.101 (0.115)                |
| Lag shocks others     | -0.130 (0.121) | -0.153 (0.127)   | -0.004 (0.103)    | -0.055 (0.320)  | -0.038 (0.091)     | 0.021 (0.052)                | -0.013 (0.052)                  | -0.149*** (0.056)             |
| Age                   | 0.011 (0.014)  | 0.002 (0.022)    | 0.001 (0.012)     | 0.065* (0.037)  | 0.006 (0.009)      | 0.010 (0.006)                | 0.010* (0.006)                  | 0.013*** (0.005)              |
| Education             | -0.133 (1.034) | -0.105 (0.218)   |                   | -0.004 (0.300)  | -0.210 (0.146)     |                              |                                 |                               |
| Female                |                | 0.432 (0.759)    |                   | -0.063 (0.413)  | 0.042 (0.185)      | 0.589*** (0.147)             | 0.099 (0.158)                   | 0.209 (0.147)                 |
| Wage worker           |                | -0.785* (0.450)  | -0.841*** (0.277) | 0.249 (0.453)   | -0.217 (0.183)     |                              |                                 |                               |
| Own business          | -0.169 (0.425) | 0.216 (0.358)    | -0.095 (0.245)    | -0.355 (0.623)  | 0.070 (0.231)      | -0.014 (0.125)               | 0.009 (0.140)                   | 0.091 (0.116)                 |
| Past loan             | -0.239 (0.609) | 0.428 (0.434)    | -0.040 (0.334)    | -0.578 (0.594)  | -0.450* (0.246)    | -0.046 (0.172)               | -0.041 (0.175)                  | 0.182 (0.125)                 |
| Frac. of life in area | 0.135 (0.375)  | -0.957 (1.221)   | -0.245 (0.371)    | 0.504 (0.940)   | 0.435* (0.236)     | 0.637*** (0.173)             | 0.054 (0.153)                   | -0.069 (0.158)                |
| Num know. in group    | -0.030 (0.099) | 0.305* (0.169)   | 0.034 (0.062)     | 0.107 (0.128)   | -0.124*** (0.046)  | 0.037 (0.039)                | 0.016 (0.039)                   | 0.026 (0.035)                 |
| GSS                   | 0.117 (0.143)  | 0.471* (0.250)   | 0.100 (0.135)     | 0.597** (0.249) | 0.141 (0.118)      | 0.127* (0.068)               | 0.184*** (0.070)                | 0.221*** (0.050)              |
| Relig. as self tmnt.  | 0.013 (0.107)  | 0.054 (0.150)    | 0.131 (0.087)     | 0.383 (0.334)   | -0.232*** (0.079)  | -0.034 (0.053)               | 0.024 (0.053)                   | 0.139*** (0.054)              |
| Town as self tmnt.    |                | 0.272 (0.194)    |                   |                 |                    |                              |                                 |                               |
| Self-selection tmnt.  |                | -1.744 (1.083)   |                   | -1.183 (1.087)  | -1.193* (0.632)    | -1.69*** (0.492)             | -1.46*** (0.432)                |                               |
| Self-sel* numknow     |                | -0.033 (0.243)   |                   | -0.040 (0.242)  | 0.348** (0.156)    | 0.214* (0.118)               | 0.191* (0.100)                  | 0.042 (0.086)                 |
| Monitoring tmnt.      |                | -0.426 (0.985)   |                   |                 | -0.373 (0.349)     | 0.060 (0.297)                | 0.186 (0.298)                   |                               |
| Microf. borrower      |                |                  | 1.044*** (0.383)  |                 | 0.791 (0.693)      | 0.794** (0.321)              | 0.977*** (0.320)                |                               |
| Evangelical           |                | -1.027* (0.540)  | 0.726*** (0.259)  | 0.653 (0.427)   |                    | 0.713*** (0.220)             | -0.939** (0.467)                |                               |
| Muslim                |                |                  | 0.985*** (0.378)  |                 | 0.317 (0.231)      | 0.748*** (0.218)             | -0.287 (0.420)                  |                               |
| Catholic              |                |                  |                   |                 |                    | 1.056*** (0.246)             | -0.349 (0.401)                  |                               |
| Hindu                 |                |                  |                   |                 |                    | 0.231 (0.276)                | -1.47*** (0.519)                |                               |
| Constant              | 0.762 (2.218)  | 1.300 (1.698)    | 0.961 (0.745)     | -4.374* (2.393) | 2.662*** (0.703)   | -0.280 (0.365)               | 0.927*** (0.447)                |                               |
| Observations          | 436            | 2,093            | 2,183             | 149             | 1,360              | 6,640                        | 6,640                           | 5,088                         |

Dependent variable: 1 = individual contributes in round  $x$ . Binary logit on pooled panel data, clustered standard errors at group level.

Notes: \*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. Clustered standard errors at the group level in parentheses.

responses to previous period shocks to self and others. Uncorrected, however, these estimations would overweight the contribution decisions of individuals in successful groups that were able to receive loans for more rounds resulting from the unbalanced panel. The OLS estimations on average individual contribution rates (given in Table 4) don't allow for a study of dynamic responses during the experiment, but offer something akin to a between estimator where the analysis is carried out at the individual level rather than the round level. In each of our five-country estimations we show results without fixed effects, with fixed effects at the country level, and fixed effects at the group level. We incorporate robust standard errors in our estimations on experimental group longevity, and clustered standard errors at the experimental group level in our estimations on individuals.

### 3.1 Hypothesis 1: homogeneity and trust

While in Cassar *et al.* (2007) we found that clan homogeneity in South Africa displayed a significant effect on group loan repayment, here we find only mild evidence that group homogeneity fosters either higher contribution rates or group longevity. Our treatments for homogeneity are oriented around what were perceived as the greatest social divisions in each particular country context. In Armenia our treatments incorporated the significant societal tensions between the pre- and post-Perestroika generations. In Guatemala one of our treatments incorporated residency between one of two rival towns, San Pedro Atitlan and San Juan Atitlan, where serious conflict has emerged over problems associated with tourism, drug trafficking, and the ownership of coffee plantations. We also created groups that were homogeneously Catholic, homogeneously Evangelical, and mixed groups with three of each. We carried out similar homogeneous and heterogeneous borrowing group treatments among Muslims, Hindus, and Christians in India, Muslims and Christians in Kenya, and Muslims and Christians in the Philippines.

While we find hints of a mild importance of homogeneity on contribution rates and group longevity, we cannot find any consistent pattern of significance across countries for groups homogeneous by religion or residence for individual contribution rates. In Table 2 point estimates are positive for group homogeneity in every country, yet all coefficients are statistically insignificant. In Table 3 we find homogeneity to have a positive coefficient in four of five countries, but significantly negative in the Philippines. In our five-country estimation using fixed effects at the group level, we find that subjects increase their contributions the greater the number of other subjects with the same religion as themselves, a significant effect at the 1% level, but our estimations on individual contribution rates in Table 4 reveal no statistical significance or consistency of sign. Consequently, while we find hints that homogeneity matters to group performance, the evidence across our five countries indicates that homogeneity may not be as important to group performance as other factors.

Three of our control variables attempted to capture other aspects of social capital amongst our subjects: fraction of a subject's life lived in the region of the

Table 4 Individual repayment decisions

| Variable              | (1)<br>Armenia | (2)<br>Guatemala  | (3)<br>India      | (4)<br>Kenya     | (5)<br>Philippines | (6)<br>5-Country<br>FE: none | (7)<br>5-Country<br>FE: country | (8)<br>5-Country<br>FE: group |
|-----------------------|----------------|-------------------|-------------------|------------------|--------------------|------------------------------|---------------------------------|-------------------------------|
| Avg subject shock     | 0.286 (0.179)  | 0.080 (0.100)     | 0.194** (0.103)   | -0.108 (0.243)   | 0.069 (0.156)      | 0.245*** (0.067)             | 0.167*** (0.062)                | 0.040 (0.738)                 |
| Avg shocks others     | -0.033 (0.036) | -0.143*** (0.050) | -0.008 (0.036)    | 0.063 (0.040)    | 0.040 (0.051)      | -0.008 (0.020)               | -0.006 (0.019)                  | -0.003 (0.732)                |
| Age                   | 0.001 (0.002)  | 0.002 (0.002)     | -0.001 (0.001)    | 0.015*** (0.003) | 0.002 (0.002)      | 0.003*** (0.001)             | 0.002** (0.001)                 | 0.002** (0.001)               |
| Education             | -0.084 (0.186) | 0.004 (0.018)     |                   | 0.043 (0.038)    | -0.018 (0.021)     |                              |                                 |                               |
| Female                |                | 0.033 (0.053)     |                   | 0.076 (0.078)    | 0.030 (0.032)      | 0.122*** (0.033)             | 0.026 (0.030)                   | 0.001 (0.045)                 |
| Wage worker           |                | -0.032 (0.038)    | -0.130*** (0.045) | 0.054 (0.062)    | -0.023 (0.041)     |                              |                                 |                               |
| Own business          | -0.044 (0.090) | 0.036 (0.022)     | 0.029 (0.035)     | -0.013 (0.072)   | 0.022 (0.049)      | -0.011 (0.021)               | 0.007 (0.020)                   | 0.016 (0.027)                 |
| Past loan             | 0.047 (0.125)  | 0.046 (0.028)     | -0.0680 (0.067)   | -0.010 (0.120)   | -0.138*** (0.049)  | 0.018 (0.023)                | -0.005 (0.022)                  | 0.005 (0.029)                 |
| Frac. of life in area | 0.060 (0.066)  | 0.005 (0.094)     | -0.052 (0.039)    | -0.004 (0.098)   | 0.102 (0.063)      | 0.113*** (0.030)             | 0.009 (0.031)                   | 0.013 (0.039)                 |
| Num. know. in group   | 0.004 (0.016)  | 0.030** (0.012)   | -0.022*** (0.008) | 0.001 (0.029)    | -0.016 (0.011)     | -0.005 (0.006)               | -0.002 (0.006)                  | 0.004 (0.008)                 |
| GSS                   | 0.031 (0.026)  | 0.042** (0.016)   | 0.016 (0.014)     | 0.044 (0.043)    | 0.023 (0.020)      | 0.026*** (0.010)             | 0.027*** (0.009)                | 0.028** (0.012)               |
| Relig. as self tmnt.  | -0.003 (0.017) | -0.002 (0.014)    | 0.009 (0.009)     | 0.023 (0.022)    | -0.016 (0.016)     | -0.001 (0.007)               | 0.008 (0.006)                   | 0.003 (0.013)                 |
| Town as self tmnt.    |                | 0.006 (0.015)     |                   |                  |                    |                              |                                 |                               |
| Self-selection tmnt.  |                | 0.052 (0.101)     |                   |                  | -0.216 (0.134)     | -0.247** (0.118)             | -0.350*** (0.081)               | -0.207*** (0.076)             |
| Self-sel*numknow      |                | -0.024 (0.022)    |                   |                  | 0.017 (0.036)      | 0.049 (0.031)                | 0.036* (0.019)                  | 0.026 (0.017)                 |
| Monitoring tmnt.      |                | 0.014 (0.030)     |                   |                  |                    | -0.107* (0.062)              | -0.004 (0.037)                  | -0.045 (0.039)                |
| Microf. borrower      |                |                   | 0.092** (0.042)   |                  |                    | 0.025 (0.104)                | 0.089** (0.041)                 | 0.060 (0.041)                 |
| Funded borrower       |                |                   | 0.143** (0.071)   |                  |                    |                              |                                 |                               |
| Evangelical           |                | -0.019 (0.038)    | 0.077** (0.032)   |                  |                    |                              | 0.029 (0.033)                   | -0.053 (0.073)                |
| Muslim                |                |                   | 0.093** (0.046)   |                  | 0.107 (0.081)      | 0.031 (0.049)                | -0.038 (0.043)                  | -0.060 (0.073)                |
| Catholic              |                |                   |                   |                  |                    |                              | 0.133*** (0.034)                | -0.059 (0.067)                |
| Hindu                 |                |                   |                   |                  |                    |                              | -0.008 (0.040)                  | -0.138* (0.078)               |
| Constant              | 0.798* (0.420) | 0.731*** (0.139)  | 0.707*** (0.080)  | -0.361** (0.145) | 0.752*** (0.147)   | 0.431*** (0.064)             | 0.662*** (0.086)                | 0.579 (0.732)                 |
| Observations          | 152            | 302               | 378               | 207              | 244                | 1,354                        | 1,354                           | 1,354                         |
| R <sup>2</sup>        | 0.05           | 0.16              | 0.10              | 0.12             | 0.16               | 0.20                         | 0.27                            | 0.01                          |

Dependent variable: fraction of times repaid divided by opportunities to repay.

Notes: Clustered standard errors at group level in parentheses.

\*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

experiment, number of acquaintances within the experimental borrowing group, and general societal trust as measured by responses to three standard questions from the General Social Survey (GSS). Results from the estimations yield no identifiable pattern across countries for the first two variables.

We do, however, find positive responses to the GSS social trust questions to have a consistently positive effect on contribution rates across all countries. The variable we create is a simple index of the number of affirmative answers to the three GSS questions that concern whether they generally believe that others in society are (i) trustworthy, (ii) fair, and (iii) helpful. The GSS coefficients have the expected positive sign for every country in every estimation, and are statistically significant on the individual round estimations (Table 3) and contribution rates (Table 4) in all three five-country estimation specifications. This result holds despite the fact that country fixed effects almost certainly absorb some of the measures of trust captured by the GSS questions.

General trust is important to cooperative play because across our five experiment sites, subjects were somewhat acquainted with about 2/3 of the other subjects. Even if a subject were to believe every subject whom she knows to be a contributor, a subject must possess some degree of trust in the contributions of the unknown remaining 1/3 to rationalize her own decision to play Contribute.

The GSS variable is significant even when we carry out contribution estimations using group-level fixed effects. This is significant because to avoid issues of framing, our survey necessarily took place after our experiment. Thus without corroborating our estimations using fixed effects at the group level, we could not be certain that statements of trust resulted from a subject's experience with her borrowing group in the experiment. By using group-level fixed effects in column 8 in Tables 3 and 4, we control for the experience of the group, and obtain the effects of differences in trust within borrowing groups in individual contribution rates. In fact in Table 3 our point estimates are highest and results most highly significant when using group-level fixed effects, and in Table 4 our point estimates are virtually identical in the absence of fixed effects (column 6), using country-level fixed effects (column 7), and using group-level fixed effects (column 8).

Trust seems to be one reason that women have dramatically higher rates of contribution than men. The Kruskal-Wallis test in Table 6 show overall mean contribution rates of women in the study to be dramatically higher, twice as high in fact, than men, 83.1% to 42.4%, a finding entirely consistent with the established wisdom that women repay microfinance loans at higher rates than men. Interestingly, however, the coefficient on gender has an insignificant sign in virtually every estimation, because the trust measures absorb much of the higher repayment performance of women.

As seen in the country duration rates in Fig. 1 and the average country contribution rates in Table 1, there are substantial country differences in outcomes between our country sites. Contribution rates were 90.3% in Guatemala, 75.4% in Armenia, 85.4% in India, 74.0% in the Philippines, but only 38.7% in Kenya. These differences seem to be consistent with the expectations that group members took into the

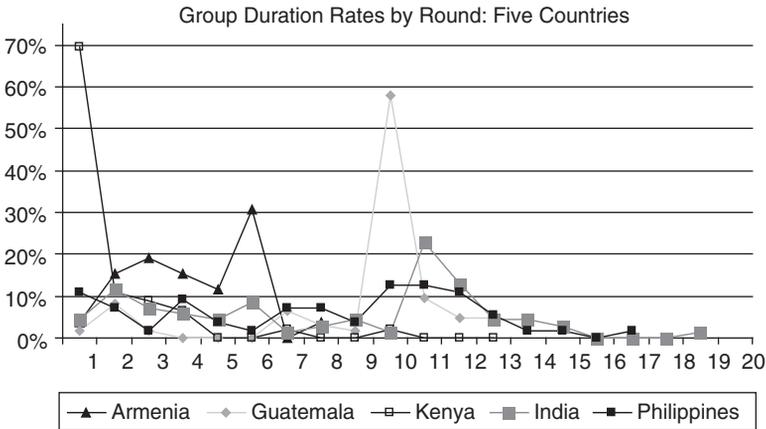


Fig. 1 Group duration rates by round and country

experiment about the behavior of other members. Based on our simulation detailed in Appendix 2, group members should contribute to the loan if they believe at least four of the other five members will contribute to the loan when they draw a green ball. In four of the five countries, this generally appeared to be the case, although at any point in the experiment, a confluence of red balls drawn in one round may have caused those expectations to be revised downward. However, in each country we randomly carried out exit interviews with subjects asking them to tell us to explain their repayment strategy for the game.

It was clear from these exit interviews in the Nairobi sites that subjects frequently played the Withhold strategy from the onset of the game because they believed other group members would do likewise. Our experiment in Kenya was carried out at two experimental sites: Kibera, an inner-city slum of Nairobi and Ongata Rongai, located outside the city. The population inflow from outlying areas in Kenya and even from other countries has caused considerable civil unrest in the area. Kibera itself was an epicenter of much of the violence that took place in Kenya as a result of the disputed December 2007 elections. The lack of trust by subjects in their counterparts coming into the group lending game appeared to create a set of self-fulfilling prophecies that resulted in 32 of the 46 groups terminating after the first round.

### 3.2 Hypothesis 2: social capital creation in group borrowing

To see if social capital trust increases with group borrowing experience, we carried out a portion of our experiments with actual microfinance borrowing groups in India and the Philippines. These borrowers were affiliated with Panao Multi-Purpose Cooperative and Growing Opportunity Finance, respectively, two well-established microfinance institutions in their respective countries. Our estimations

across countries yield positive point effects in all instances. In estimations on contribution rates, we find the coefficient on a subject being an actual microfinance borrower to be positive in both countries and significant at the 5% level and 1% level in our five-country estimation in Table 3, and significant at the 5% in our specification in column (6) of Table 4. We then ask the question whether this positive effect appear to come from some type of self-selection of trustworthy people into microfinance or from the cumulative experience of repaying actual microfinance loans together in a borrowing group, i.e. does group borrowing activity harness existing social capital or perhaps create social capital?

In India we purposely selected some of our subjects from microfinance borrowing groups that were newly formed, but in various stages of their eight-week orientation course. They had not yet received actual loans. Other groups of real microfinance borrowers were veteran microfinance borrowing groups with between one and five six-month loans under their belts. Contribution rates were higher among the funded borrowers, 93.5% to 81.7% although the Mann-Whitney test in Table 6 for differences in contribution rates cannot reject the null of equal repayment rates. In Table 4, we include a separate term for funded borrower, where we separate out borrowers from experienced groups that had actually borrowed together from those who were merely in training. This estimation in column (3) shows that while the contribution rates of microfinance borrowers in general were 9.2 percentage points higher in India, the contribution rate of funded borrowers was an additional 14.3 percentage points higher.

One possible explanation for this result could have been that nascent borrowing groups include those that have not yet failed due to non-repayment, while veteran groups survive because they have been able to repay, and moreover have been purged of bad borrowers. However, borrowing groups in the particular branch we worked with in Chennai had exhibited virtually perfect repayment rates and extremely low levels of attrition, essentially ruling out a difference caused by borrowing group failure or dropout. The more likely explanation is that group borrowing builds trust and positive habits in group cooperation.

The results of our experiments are consistent, for example, with those of Charness *et al.* (2007), who demonstrate in a series of experiments that group membership and group identity have powerful effects on economic behavior, especially when play is manifest to the relevant group, leading subjects to select options that favor the group. Much previous microfinance literature has emphasized the role of group lending in harnessing existing social capital (Zeller, 1998; Wydick, 1999; Karlan 2005). But it indeed may be the case that group lending creates as much social capital as it harnesses, or perhaps more. There are important implications for microfinance if this is so, because it suggests that not all of the benefits of microfinance may be found simply through impact studies on individual household consumption and welfare, but that there are significant externalities from group lending in the creation of social capital that spill over into the larger community.

### 3.3 Hypothesis 3: reciprocity and repayment

As seen in Table 2, negative shocks to investment (random drawings of red balls) have a strong and significant effect on the longevity of groups. Especially when a random cluster of red balls are drawn in a single round it can either terminate the game on its own accord (especially when combined with one or more group members playing Withhold), or result in a downward revision of priors about the rate of contribution among other members. Based on the latter phenomenon, we would expect the propensity to contribute to decline based on the number of shocks to others in previous rounds when there is imperfect information.

Consistent with the theory of reciprocity put forth by Scott (1976) and others, we find evidence of reciprocity in our experimental data. It appears that the more negative shocks a subject receives, the more likely she is to contribute to the group loan when she has an opportunity to contribute. In Table 4 the coefficient on Average Subject Shocks is positive in every country (except Kenya), and significant at the 1% level in two of the three five-country estimations. We were surprised, however, at the rationale some subjects used to justify their decisions in exit interviews. One subject in India maintained that she played Withhold subsequent to receiving a negative investment shock to make up for the lost income from the previous round.

### 3.4 Hypothesis 4: self-selection

In Guatemala, Kenya, and the Philippines, we allowed subjects to form their own self-selected experimental borrowing groups. These are distinct from the actual borrowing groups that took part in the experiment in India and the Philippines. Our desire was to test whether self-selection would be likely to increase contribution rates (Ghatak, 1999; Van Tassel, 1999), and whether acquaintanceship is important in the self-selection process. An original implementation of the group lending game, among a population of university students, showed that self-selected groups displayed greater volatility in outcomes, higher contribution rates in early rounds, but with contribution rates falling (and groups collapsing) more rapidly in later rounds (Abbink *et al.*, 2006).

What we find in our self-selection treatments is that self-selection alone does not yield an improvement in contribution rates or group performance, and in fact by itself seems to have a significantly negative effect ( $p < 0.01$  in all five-country estimations). However, when we interact the self-selection treatment with acquaintance between individuals, we find a strongly significant and positive association with contribution rates and group performance: when subjects select others whom they know to become their fellow group members, rather than randomly selecting strangers off the street, it matters.

One might ask why borrowers would form a borrowing group with others whom they do not know well. However, as group lending is carried out in many parts of the world, borrowing groups comprised of members with relatively weak ties are

more common than one might imagine. Because microfinance institutions often compel borrowers to form solidarity groups in order to receive loans, those with a dire need for credit will sometimes hastily create a borrowing group of members with relatively weak social ties. Our results seem to provide some evidence that in contexts where people are well-acquainted with one another, self-selection is helpful to mitigating adverse selection issues and improving group lending repayment rates.

### 3.5 Hypothesis 5: peer monitoring

Early theoretical work on group lending (Stiglitz, 1990; Banerjee *et al.*, 1994) suggested that the high flow of information characteristic of socially cohesive societies may play an important role in generating the strong repayment rates observed under group lending. We sought to test these theories in our group borrowing experiment with a monitoring treatment. About 15% of our groups in Guatemala and 25% of our groups in the Philippines were given a monitoring treatment, in which the chairs of the subjects were re-directed inward so that information about investment shocks (the color of balls drawn by subjects) and contribution choices were observable to all. After the subjects took turns drawing balls, the experimenter elicited contributions simultaneously from group members by having them flip their cards to Contribute or Withhold. Subjects were allowed to change their cards in response to the decisions of others until the group converged to a Nash equilibrium, a process that usually took less than one minute. Our prior before implementing the monitoring treatment was that the shame effect would be sufficiently strong that no-one would dare to play Withhold after publicly drawing a green ball. Our prior was incorrect.

First, we observed numerous instances of defections, even with public monitoring. As Table 6 shows, the contribution rate of 72.9% with the monitoring treatment was significantly lower than the 84.6% rate of the standard non-monitoring treatment in Mann-Whitney tests ( $p = 0.05$ ). Indeed we observed two general types of behavioral responses to perfect monitoring. In Guatemala, the contributing subjects more often took a grin-and-bear-it approach toward a non-contributor, faithfully maintaining their contributions to the group loan in the face of defection. This behavior was maintained in several cases as non-contributors doggedly played Withhold throughout experiments lasting seven rounds or more.

The other clear pattern both in the data and observed during the experiment was that a Withhold decision by a group member would induce a retaliation effect where others would flip signs to Withhold. This phenomenon was more common among subjects in the Philippines. It is somewhat unclear whether either the initial reactions or subsequent reactions to a Withhold play were retaliatory or strategic in nature.

The estimations in Tables 2, 3, and 4 on the monitoring treatment dummy are mostly insignificant, with a positive sign in Guatemala and a negative sign in the Philippines. However, the overall effect in estimations on the five-country data

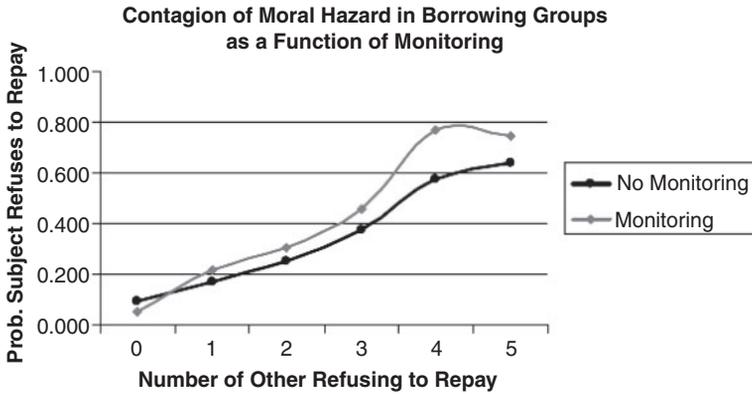


Fig. 2 Contagion of moral hazard

reveals a modestly negative relationship ( $p < 0.10$ ) between monitoring and group longevity. Interestingly, other recent experimental work has hinted at similar phenomena. Giné *et al.* (2010) carry out microfinance games among 491 subjects in Peru, finding, in a treatment allowing for communication between members of experimental borrowing groups, that the rate of risky (but potentially high yielding) investment behavior increased strikingly, from 47% to 58%.

Figure 2 and Table 5 illustrate what we call the ‘perilous paradox of peer monitoring’. On the vertical axis of Fig. 2 is the probability in a given round that a subject refuses to repay when she has drawn a green ball. On the horizontal axis is the number of other group members who refused to repay when they drew a green ball in that same round. The rate of refusal to repay is lower with monitoring only when there are no other members refusing to repay. With a solitary other member refusing to repay, repayment refusal becomes higher under peer monitoring with the difference between the two treatments accelerating as the number of others refusing to repay increases.

Table 5 shows OLS estimations on by-round subject contributions similar to Table 3, but includes the number of others refusing to repay as an additional independent variable. The estimations show the volatility of peer monitoring and its vulnerability to moral hazard contagion. The first two columns give estimates on the effect of the number of others refusing to repay in a given round on subject contributions. As seen in column (1), in the absence of direct information about defections, each additional refusal to repay by a fellow group member decreases a subject’s contribution rate by 5.6 percentage points, whereas under monitoring (column 2), the response is to decrease it by 9.6 points, both significant at the 1% level.

We see in columns (3) and (4) of Table 5 that even when four or more other players have shown to be contributing (in the previous round) and it is rational to repay based on our simulation results, players’ own contributions are still far more sensitive to willful non-contributions by their peers. Again both results are

Table 5 Effects of peer monitoring on repayment volatility

|                          | (1)<br>No<br>monitoring | (2)<br>Monitoring | (3)<br>No monitor<br>≥ 4 lagcont | (4)<br>Monitoring<br>≥ 4 lagcont | (5)<br>No monitor<br>≥ 4 contrib | (6)<br>Monitor<br>≥ 4 contrib |
|--------------------------|-------------------------|-------------------|----------------------------------|----------------------------------|----------------------------------|-------------------------------|
| Lag contributions others | 0.013* (0.007)          | 0.009 (0.011)     | 0.009 (0.013)                    | 0.020 (0.033)                    | 0.017* (0.009)                   | 0.006 (0.018)                 |
| Others refuse            | -0.056*** (0.013)       | -0.096*** (0.029) | -0.058*** (0.019)                | -0.130*** (0.028)                | -0.065 (0.043)                   | -0.129 (0.116)                |
| Shocks other             | -0.004 (0.006)          | -0.004 (0.011)    | -0.001 (0.007)                   | -0.006 (0.012)                   | -0.018 (0.018)                   | 0.008 (0.039)                 |
| Observations             | 2,937                   | 517               | 1,910                            | 313                              | 1,785                            | 293                           |
| R <sup>2</sup>           | 0.07                    | 0.24              | 0.09                             | 0.30                             | 0.09                             | 0.25                          |

Dependent variable: 1 = subject contributed in round  $j > 1$ . OLS estimates, clustered standard errors.

Notes: Clustered standard errors (at group level) in parentheses with fixed effects for country, round, and religion, and controls for subject characteristics, social variables, and treatments.

\*Significant at 10%; \*\* significant at 5%; \*\*\*significant at 1%.

Table 6 Tests for differences in means (equality of populations rank test)

| Treatment       | Countries                     | No. of obs. | Mean (std. dev.) | Mann-Whitney/Kruskal-Wallis test |
|-----------------|-------------------------------|-------------|------------------|----------------------------------|
| Female          | Guatemala, Kenya, Philippines | 57          | 0.831 (0.193)    | Kruskal-Wallis                   |
| Mixed           |                               | 99          | 0.645 (0.268)    | chi-squared = 25.063 (2 d.f.)    |
| Male            |                               | 7           | 0.424 (0.314)    | probability = 0.000              |
| Evangelical     | Guatemala, India, Kenya       | 29          | 0.611 (0.259)    | Kruskal-Wallis                   |
| Mixed           |                               | 86          | 0.794 (0.243)    | chi-squared = 11.469 (2 d.f.)    |
| Non-Evangelical |                               | 63          | 0.750 (0.278)    | probability = 0.003              |
| Catholic        | Guatemala, Philippines        | 33          | 0.776 (0.188)    | Kruskal-Wallis                   |
| Mixed           |                               | 66          | 0.846 (0.181)    | chi-squared = 3.900 (2 d.f.)     |
| Non-Catholic    |                               | 18          | 0.823 (0.114)    | probability = 0.1423             |
| Muslim          | India, Kenya, Philippines     | 29          | 0.598 (0.300)    | Kruskal-Wallis                   |
| Mixed           |                               | 35          | 0.622 (0.281)    | chi-squared = 7.408 (2 d.f.)     |
| Non-Muslim      |                               | 107         | 0.736 (0.222)    | probability = 0.0245             |
| Hindu           | India                         | 20          | 0.822 (0.178)    | Kruskal-Wallis                   |
| Mixed           |                               | 40          | 0.852 (0.150)    | chi-squared = 0.485 (2 d.f.)     |
| Non-Hindu       |                               | 10          | 0.897 (0.079)    | probability = 0.784              |
| Borrower        | India, Philippines            | 43          | 0.858 (0.181)    | Mann-Whitney: $z = -3.695$       |
| Non-borrower    |                               | 82          | 0.769 (0.161)    | Prob $>  z  = 0.000$             |
| Selfselect      | Guatemala, Kenya, Philippines | 58          | 0.577 (0.282)    | Mann-Whitney: $z = 4.121$        |
| Non-selfselect  |                               | 105         | 0.769 (0.232)    | Prob $>  z  = 0.000$             |
| Monitor         | Guatemala, Philippines        | 23          | 0.729 (0.245)    | Mann-Whitney: $z = 1.955$        |
| Non-monitor     |                               | 94          | 0.846 (0.148)    | Prob $>  z  = 0.0506$            |
| Experienced     | India                         | 5           | 0.935 (0.076)    | Mann-Whitney: $z = -0.912$       |
| Non-experienced |                               | 22          | 0.817 (0.184)    | Prob $>  z  = 0.3618$            |

H<sub>0</sub>: Avg. Contrib. Rate (treatment=0) = Avg. contrib. rate (treatment=1). = Avg. contrib. rate (treatment=2 if applicable).

significant at the 1% level, the point estimate actually increasing in column (4) to 13.0 percentage points. Although statistically insignificant, columns (5) and (6) yield an essentially identical pair of point estimates with four or more other players contributing in the current round. Because we demonstrate that subjects have an incentive to contribute when four or more others have contributed, what we appear to observe is an emotionally based retaliation effect rather than a calculated strategic response to non-contribution. In short what we find is that peer monitoring seems to outperform no peer monitoring only until any type of malfeasance emerges within a borrowing group. When malfeasance does begin to occur, co-operation unravels more quickly under peer monitoring.

These experimental results on our monitoring treatment contrast with the theoretical literature on microfinance, which has often underscored the importance of peer monitoring for reducing risky borrower behavior (Stiglitz, 1990; Banerjee *et al.*, 1994). But with imperfect information about true contribution decisions, a negative decision by one member may fail to trigger a downward spiral of defections because other players may attribute non-repayment to unavoidable mishap. In the context of group lending, coordination on the non-repayment equilibrium may ultimately yield the greatest disadvantage to the lender, a point originally made by Besley and Coate (1995) about group lending in a full information context. Imperfect information may thus serve some (ironic) purpose as a buffer against the contagion of malfeasance within groups.

#### 4. Summary and conclusions

Does social capital matter? Results from our five-country group lending experiment suggest that it does, though occasionally in unexpected ways. We present international results from an experiment in which subjects have an incentive to contribute to a joint-liability loan to improve the likelihood that their group continues to receive additional loans. However, any member can fair better individually in a given round by withholding contribution. The stakes were high in our game relative to the income earned in our five countries; subjects could earn up to two days' wages in less than two hours depending on their own performance and their group performance in the experiment. We demonstrate formally that trust is important in the group lending game: a subject has an incentive to contribute if she believes a critical number of other group members will also contribute, at least four out of five other members in a group of six. We believe that there are five central findings from our five-country group lending experiment:

- (i) Trust matters. Individuals with greater trust in their society (as revealed by their responses to GSS questions) displayed higher contribution rates, yielding benefits that spilled over to other members of their group. We found differences in societal trust both across groups and within groups to foster significantly higher contribution rates.

- (ii) When people lack confidence in the behavior of others, bad outcomes for all are likely to result. This we observed in Kenya, where the average contribution rate was only 38.7%, and where lending was terminated with borrowing groups after only 1.8 rounds. Low contribution rates were explained by low expectations about the behavior of others. Tragic events that took place in Kenya have brought to light the dearth of social trust that we observe in our experimental data, obtained less than 12 months prior to the outbreak of violence in Nairobi.
- (iii) The effects of social and religious homogeneity on group loan repayment, even where societal tensions exist between rival groups, are not as strong as we expected, are difficult to generalize, and are context-specific. We find mild evidence that religious homogeneity fosters better borrowing group performance, but overall the evidence is underwhelming. General expectations and trust regarding cooperation matter more.
- (iv) Social capital does not just exist innately in developing countries, but can be created through repetitive and cooperative group effort. Contribution rates were higher among those with experience taking and repaying loans as part of real-world microfinance borrowing groups compared to borrowing groups that had already been formed by the MFI and were in orientation, but had not yet been funded. Those who were members of experienced borrowing groups had higher levels of social trust than new borrowers from as yet unfunded groups or the general population of subjects.
- (v) The ability of people to monitor one other in group lending environments, and possibly in other situations such as work in teams, can yield negative as well as positive effects on behavior. When information is imperfect, moral hazard is not as contagious within a group because others may attribute poor performance to unavoidable shocks. However, with perfect monitoring in our experiment, willful non-contribution may trigger either retaliation or optimal defections by other agents, quickly unraveling group trust and performance.

In addition the results of our five-country experiment often reveal large and significant differences between the five countries in economic behavior and the effect of identical treatments on economic behavior. This cannot help but re-emphasize the caveats regarding the external validity of experiments and from drawing general inferences from experimental and non-experimental results about economic behavior drawn from a single cultural context, especially in research devoted to understanding the relationship between social variables and economic outcomes.

## Supplementary material

Supplementary material (Appendices 1 and 2) is available online at the OUP website.

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