Supplementary Information

Additional analyses: empirics

*Yearly country-level analyses*

**Table S1.** Ultimatum Game rejection rates, not offers, predict defaults

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| VARIABLES | Portfolios at risk |
|   |   |   |   |   |   |   |   |   |
| Offers | 0.112 | 0.206 | 0.130 | 0.114 | 0.120 | 0.0684 | -0.0668 | -0.164 |
|  | (0.217) | (0.158) | (0.133) | (0.259) | (0.142) | (0.173) | (0.357) | (0.278) |
| Rejections | 0.282\* | 0.215\* | 0.507\*\*\* | 0.432\*\* | 0.318\*\*\* | 0.0530 | 0.683\*\* | 0.426\*\* |
|  | (0.137) | (0.100) | (0.0841) | (0.165) | (0.0899) | (0.111) | (0.228) | (0.176) |
| Constant | -0.00650 | -0.0277 | -0.000869 | -0.00600 | -0.000738 | 0.0331 | 0.0422 | 0.106 |
|  | (0.0857) | (0.0624) | (0.0524) | (0.103) | (0.0560) | (0.0689) | (0.142) | (0.110) |
|  |  |  |  |  |  |  |  |  |
| Observations | 12 | 12 | 12 | 13 | 12 | 13 | 13 | 12 |
| R-squared | 34.8% | 44.2% | 81.4% | 42.3% | 61.2% | 4.1% | 47.3% | 39.9% |
| Standard errors in parentheses |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |

Table S1 above shows that in each year (except 2012), UG rejection rates are highly predictive of default rates while offers are not. When we excluded Papua New Guinea, rejection rates were still predictive, β = 0.238, SE = 0.092, *p* = 0.030, R2 = 43%, and offers remained unpredictive, β = 0.074, SE = 0.130, *p* = 0.605, R2 = 5%. Further, there is no World Values Survey trust index data for Papua New Guinea, which means that specifications 2-10 of Table S2 all exclude Papua New Guinea, yet still replicate the relationship between UG rejection rates and default rates. Further, for those concerned that including both offers and rejection rates in the same model is problematic, our results hold when we examine either independent variable on its own. In particular, collapsing across the 8-year period, we find no effect of UG offers on default rates, β = 0.128, SE = 0.210, *p* = 0.555, R2 = 3%, but a strong effect of UG rejection rates, β = 0.367, SE = 0.130, *p* = 0.080, R2 = 66%.

*Bank-level analyses*

**Table S2.** Bank-level analysis predicting defaults using Ultimatum Game play

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| VARIABLES | Portfolios at risk |
|   |   |   |   |   |   |   |   |   |   |   |
| Offer | 0.0962 | 0.0517 | 0.0465 | 0.0801 | 0.0582 | 0.0296 | 0.0756 | -0.0343 | 0.0787 | 0.0593 |
|  | (0.104) | (0.0938) | (0.102) | (0.0941) | (0.0999) | (0.0972) | (0.0886) | (0.0949) | (0.0905) | (0.0365) |
| Rejections | 0.433\*\* | 0.232\*\* | 0.257\*\*\* | 0.236\*\* | 0.252\*\*\* | 0.228\*\*\* | 0.251\*\*\* | 0.321\*\*\*\* | 0.198\*\* | 0.233\*\*\*\* |
|  | (0.134) | (0.0870) | (0.0707) | (0.0816) | (0.0655) | (0.0651) | (0.0652) | (0.0759) | (0.0633) | (0.0280) |
| WVS trust |  | 0.0417 | 0.0327 | 0.0265 | 0.0205 | 0.0353 | 0.0317 | 0.0849\*\*\* | 0.00897 | -0.0351 |
|  |  | (0.0217) | (0.0222) | (0.0195) | (0.0236) | (0.0205) | (0.0212) | (0.0229) | (0.0316) | (0.0549) |
| % female |  |  | -0.0902\*\* | -0.0959\* | -0.0905\*\* | -0.0900\*\* | -0.0896\*\* | -0.0912\*\* | -0.0971\* | -0.0982\* |
|  |  |  | (0.0311) | (0.0399) | (0.0315) | (0.0308) | (0.0313) | (0.0282) | (0.0399) | (0.0390) |
| Yield |  |  |  | 0.0252 |  |  |  |  | 0.0274 | 0.0352 |
|  |  |  |  | (0.0405) |  |  |  |  | (0.0411) | (0.0565) |
| GDP (trillions) |  |  |  |  | 0.0163 |  |  |  | 0.0323 | 0.206\*\* |
|  |  |  |  |  | (0.0132) |  |  |  | (0.0231) | (0.0720) |
| GDP growth (%) |  |  |  |  |  | -0.00307\* |  |  | -0.00295\* | -0.00310\* |
|  |  |  |  |  |  | (0.00124) |  |  | (0.00125) | (0.00149) |
| GDP/cap (millions) |  |  |  |  |  |  | 1.369 |  | -0.176 | -1.692 |
|  |  |  |  |  |  |  | (2.247) |  | (1.619) | (1.935) |
| Gini |  |  |  |  |  |  |  | 0.000173 |  | 0.000636 |
|  |  |  |  |  |  |  |  | (0.00116) |  | (0.000996) |
| Constant | 0.00209 | 0.0212 | 0.0735 | 0.0582 | 0.0710 | 0.0983\* | 0.0571 | 0.0738 | 0.0797\* | 0.0529 |
|  | (0.0436) | (0.0343) | (0.0440) | (0.0406) | (0.0433) | (0.0427) | (0.0389) | (0.0622) | (0.0392) | (0.0515) |
|  |  |  |  |  |  |  |  |  |  |  |
| # of MFIs | 1,553 | 1,531 | 1,247 | 1,180 | 1,247 | 1,247 | 1,247 | 913 | 1,180 | 883 |
| # of Countries | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 10 | 12 | 10 |
| R-squared | 8.3% | 7.1% | 11.9% | 14.6% | 12.1% | 12.5% | 12.0% | 16.8% | 15.8% | 21.2% |
| Country-clustered robust standard errors in parentheses |
| \*\*\*\* p<0.0001, \*\*\* p<0.001, \*\* p<0.01, \* p<0.05 |

Table S2 above shows that UG rejection rates, at the country level, are robustly predictive of bank-level defaults rates. The fact that the UG rejection rate in each country is importantly predictive of default rates at the bank level suggests that it is the resident psychology of the borrowers, not administrative quirks of MFIs, that is driving defaults. This pattern of results hold if we omit UG offers, as was the case in the last set of regressions.

There are a few main results to note in this regression table. First, UG rejection rates are robustly predictive after controlling for economic development indicators (specifications 9 and 10). Second, by and large, the developmental indicators are not strong predictors of default, which suggests that there is something other than economic conditions that is driving defaults. Third, loan yield—a proxy for interest rates—is not predictive of default rates over and above the controls in specification 4. (Interestingly, loan yields are not predictive of defaults rates within a given MFI, β = -0.005, SE = 0.007, *p* = 0.419.) Fourth, the next best predictor of defaults after Ultimatum Game rejection rates is the percentage of borrowers that are female. This is a nice replication of one of the early studies done trying to understand default rates and how group dynamics promote or avoid defaults.

*Cross-cultural surveys, game play, defaults, and economic controls*

Using a separate meta-analysis of cross-cultural differences in Trust Game behavior, in addition to Ultimatum Game behavior we were able to look at the relationship between trust, trustworthiness, and default rates. In Table S3 below, we show the relationships between behavior in the Ultimatum Game, Trust Game, WVS trust, WVS civic cooperation, democracy, corruption, and rule of law after controlling for the economic development status of the country. The analysis in Table S3 reflects country-level outcomes and is restricted to 2007 to 2014.

**Table S3.** Game play and survey variables predicting default rates with economic controls

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| VARIABLES | Portfolios at risk |
|   |   |   |   |   |   |   |   |   |   |
| UG rejection rate | 0.4610\*\* |  |  |  |  |  |  |  |  |
|  | (0.0958) |  |  |  |  |  |  |  |  |
| UG offers |  | 0.1660 |  |  |  |  |  |  |  |
|  |  | (0.3753) |  |  |  |  |  |  |  |
| TG % sent |  |  | 0.1189 |  |  |  |  |  |  |
|  |  |  | (0.0629) |  |  |  |  |  |  |
| TG % returned |  |  |  | 0.1195 |  |  |  |  |  |
|  |  |  |  | (0.0552) |  |  |  |  |  |
| WVS trust |  |  |  |  | -0.0328 |  |  |  |  |
|  |  |  |  |  | (0.0442) |  |  |  |  |
| WVS civic cooperation |  |  |  |  |  | 0.0059 |  |  |  |
|  |  |  |  |  |  | (0.0083) |  |  |  |
| Democracy rank |  |  |  |  |  |  | -0.0000 |  |  |
|  |  |  |  |  |  |  | (0.0003) |  |  |
| Corruption rank |  |  |  |  |  |  |  | 0.0004 |  |
|  |  |  |  |  |  |  |  | (0.0003) |  |
| Rule of law |  |  |  |  |  |  |  |  | -0.0192 |
|  |  |  |  |  |  |  |  |  | (0.0166) |
| GDP growth (%) | 0.0058 | -0.0021 | -0.0048 | -0.0125 | -0.0019 | -0.0013 | -0.0084\* | -0.0078 | -0.0059 |
|  | (0.0061) | (0.0140) | (0.0071) | (0.0057) | (0.0050) | (0.0057) | (0.0042) | (0.0042) | (0.0039) |
| GDP (trillions) | 0.0282 | -0.0132 | 0.0049 | 0.0004 | -0.0007 | -0.0065 | -0.0124 | -0.0148 | -0.0120 |
|  | (0.0495) | (0.1200) | (0.0120) | (0.0116) | (0.0225) | (0.0229) | (0.0244) | (0.0242) | (0.0239) |
| GDP per capita (millions) | 4.6645 | 1.5217 | -2.5720 | -4.2209 | 4.8308 | 5.1265 | 0.1022 | 2.4505 | 2.5760 |
|  | (3.2669) | (8.4529) | (2.1887) | (2.0655) | (2.6649) | (2.8815) | (2.9732) | (3.0689) | (2.9128) |
| Gini | 0.0011 | -0.0016 | 0.0001 | 0.0008 | -0.0010 | -0.0009 | 0.0013 | 0.0014 | 0.0013 |
|  | (0.0014) | (0.0030) | (0.0010) | (0.0010) | (0.0011) | (0.0011) | (0.0009) | (0.0009) | (0.0009) |
| Constant | -0.0760 | 0.0981 | 0.0448 | 0.0771 | 0.1063 | 0.0737 | 0.0660 | 0.0182 | 0.0340 |
|  | (0.0946) | (0.2499) | (0.0748) | (0.0624) | (0.0548) | (0.0489) | (0.0548) | (0.0566) | (0.0431) |
|  |  |  |  |  |  |  |  |  |  |
| Observations | 11 | 11 | 15 | 15 | 45 | 42 | 71 | 71 | 76 |
| R-squared | 83.4% | 10.0% | 49.0% | 53.2% | 14.6% | 14.9% | 9.5% | 11.7% | 8.6% |
| Standard errors in parentheses |  |  |  |  |  |  |  |  |
| \*\*\* p<0.001, \*\* p<0.01, \* p<0.05 |  |  |  |  |  |  |  |  |

The only variable that is robustly predictive of defaults rates after controlling for economic development status are Ultimatum Game rejection rates, which is positively related to defaults. On the social capital account of repayment, trustworthiness should be negatively related to default rates. Note that GDP is in trillions for ease of interpreting coefficients, but using the raw GDP does not change the result.

**Experiment**

***Recruiting and Ultimatum Game***

**Participants for the experiment were recruited through Amazon’s Mechanical Turk. We recruited only participants from the US. Participants first learned about the Ultimatum Game from the instructions below:**

In this interaction you are matched with one other person.

One of you will be person A, one of you will be person B.

Person A starts with 200 units and person B starts with 0. For this interaction, and those that follow, units will be converted at the end of the study to real dollars. Specifically, for every 10 units you earn you will receive 1 cent.

*First person A makes a choice, then person B responds.*

1) Person A will make an offer on how to split the 200 units with person B.

2) Person B will either *accept* or *reject* this offer.

*If*person B *accepts,* then B will get the offered amount and A will keep the rest.

*If B rejects the offer then both individuals will get 0 units.*

Participants then answered a set of comprehension questions about the Ultimatum Game while they still had access to the instructions. The comprehension questions are below:

1. What choice by Player A will result in Player A earning the most money?

[Player A offering Player B nothing, Player A offering Player B everything, It depends on what the receiver is willing to accept]

2. Which choice by Player B will result in Player B earning the most money?

[Player B deciding to accept the offer, Player B deciding to reject the offer]

3. If Player B decides to accept Player A's offer, what happens?

[Each Player's bonus is determined by Player A's offer, Each Player gets a random bonus, Both Players get no bonus]

4. If Player B decides to reject Player A's offer, what happens?

[Each Player's bonus is determined by Player A's offer, Each Player gets a random bonus, Both Players get no bonus]

**Once participants had passed the comprehension test, we elicited their MAO. They could choose in 10-unit increments between 0 and 200. After they had reported their MAO, they reported what they would offer, using the same increments as the MAO.**

***Baseline and Social Dilemma Interactions***

After the Ultimatum Game, participants moved onto the main portion of the experiment. They were randomly assigned to a group with 2 other people and each group was randomly assigned to either the Baseline condition or the Social Dilemma condition.

Below are the instructions and comprehension questions for the Baseline condition:

You have been assigned to a group with 2 other people. You each will have the opportunity to earn units over a series of rounds of play, which will be converted to real money at a rate of 10 units per cent.

Each of you will be assigned an identifier, but these identifiers are randomly shuffled each round. Thus you will not be able to track the behavior of the other people from round to round.

Each round works as follows:

1) Each of you receives a randomly determined number of units, between 0 and 500. Each of you may receive a different amount. You do not know the amounts received by the other group members, and they do not know the amount you receive.

2) You each choose how many of these units to keep toward your bonus, and how many to contribute to the group. In order to continue to the next round, each person must contribute 200 units to the group. Otherwise, the game ends and none of you have a chance to earn additional money, unless a group member ‘pitches in’ in stage 3.

3) If anyone in your group contributes *less* than 200 units, the group is told how many additional units are needed to meet the 200-unit-per-person threshold. Then each of you in turn can choose whether (or to what extent) to ‘pitch in’ and make up the difference by contributing more than 200 units yourself.

4) If the threshold is met, your group will continue to the next round. Your group will play at least 8 rounds. After the 8th round, there is a 50% probability that there will be another round, and another, and so on. If the threshold is not met, the game ends immediately and none of you have a chance to earn any further bonus money.

Participants then answered the following comprehension questions and if they failed one or more (in either condition) they were excluded from the remained of the study.

1. Might you receive a different amount of starting money in each round than other people in your group? [Yes / No]
2. How many units are you responsible for contributing each round? [100, 200, 300, 400, 500, 600]
3. If you or someone in your group does not make their full contribution, what happens? [the game ends immediately; nothing happens and the game continues to the next round; other group members can ‘pitch in’ and make up the difference in that player’s contribution]
4. After the ‘pitching in’ phase is over, if you or someone in your group has failed to contribute enough units to get over the 200 unit threshold, what happens? [the game ends immediately; nothing happens and the game continues to the next round; everyone gets a bonus unit]

**Below are the instructions and comprehension questions for the Social Dilemma condition:**

You have been assigned to a group with 2 other people. You each will have the opportunity to earn units over a series of rounds of play, which will be converted to real money at a rate of 10 units per cent.

Each of you will be assigned an identified, but these identifiers are randomly shuffled each round. Thus you will not be able to track the behavior of the other people from round to round.

Each round works as follows:

1) Each of you receives a randomly determined number of units, between 0 and 500. Each of you may receive a different amount. You do not know the amounts received by the other group members, and they do not know the amount you receive.

2) You each choose how many of these units to keep toward your bonus, and how many to contribute to the group. In order to continue to the next round, a total of at least 600 units must be contributed to the group. Otherwise, the game ends and none of you have a chance to earn additional money.

3) If less than 600 units are contributed, the group is told how many additional units are needed to meet the 600-unit threshold. Then each of you in turn can choose whether to ‘pitch in’ and make up the difference by contributing more, unless a group member ‘pitches in’ in stage 3.

4) If the threshold is met, your group will continue to the next round. Your group will play at least 8 rounds. After the 8th round, there is a 50% probability that there will be another round, and another, and so on. If the threshold is not met, the game ends immediately and none of you have a chance to earn any further bonus money.

After reading the instructions, participants in the threshold condition answered the following comprehension questions.

1. Might you receive a different amount of starting money in each round than other people in your group? [Yes / No]
2. How many units is your group responsible for contributing each round? [100, 200, 300, 400, 500, 600]
3. If your group does not make its full contribution, what happens? [the game ends immediately; nothing happens and the game continues to the next round; the group members can ‘pitch in’ and make up the difference]
4. After the ‘pitching in’ is done, if your group failed to contribute enough units to get over the 600 unit threshold, what happens? [the game ends immediately; nothing happens and the game continues to the next round; everyone gets a bonus unit]

*Regression table*

Below is a regression table that shows the regression results from the three sets of statistical models we fit. Specifications 1-4 are fit using logistic regression, while specifications 5 and 6 are fit using OLS regression. For each specification, we use the lowest MAO in the group in order to capture the how inequity averse the group’s least inequity averse member was. Groups with lower minimum MAOs have at least one member who will be more willing to pitch in, while groups with high minimum MAOs are less likely to have a member who will be willing to pitch in.

**Table S4.** Regression results from the experimental data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|   | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | Defaulted at any point | Defaulted in first round | Fraction of rounds foregone |
|   |   |   |   |   |   |   |
| Group minimum MAO | 4.719\*\*\* | 4.655\*\* | 3.952\*\*\* | 3.713\* | 0.636\*\* | 0.747\*\* |
|  | (1.766) | (2.057) | (1.451) | (2.219) | (0.286) | (0.361) |
| Condition (Social dilemma=1) | 1.590\*\*\* | 1.554\*\* | 1.305\*\*\* | 1.194 | 0.276\*\*\* | 0.327\*\* |
|  | (0.484) | (0.763) | (0.437) | (0.898) | (0.074) | (0.132) |
| Group minimum MAO x Condition |  | 0.245 |  | -0.412 |  | 0.264 |
|  |  | (4.017) |  | (2.929) |  | (0.558) |
| Constant | 0.553 | 0.539 | 2.261\*\*\* | 2.186\*\*\* | 0.665\*\*\* | 0.690\*\*\* |
|  | (0.462) | (0.512) | (0.551) | (0.759) | (0.081) | (0.0972) |
|  |  |  |  |  |  |  |
| Observations | 120 | 120 | 120 | 120 | 120 | 120 |
| R-squared/Pseudo R-squared | 11.8% | 11.9% | 9.2% | 9.2% | 12.2% | 12.4% |
| Standard errors in parentheses |  |  |  |  |  |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |  |  |  |  |  |