Risk Attitudes and Well-Being in Latin America*

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In 1930, Irving Fisher made a bold claim that has often been taken as a matter of fact in the policy and academic literatures on economic development ever since. He claimed that, to paraphrase, people remain poor because their inherent preferences are incompatible with growth (1, 2). Since then discussions about attitudes towards risk (3, 4) have caused the conjecture to morph into a statement often associated with the "culture of poverty:" people remain poor because they are too impatient to save and too risk averse to take the sort of chances needed to accumulate wealth.

Despite early economic experiments that found no significant link between the risk preferences of poor farmers and wealth (5, 6, 7) and, that "poor" rats tended to actually have lower discount rates in an innovative animal study that exhibited the sort of internal validity not attainable in human studies (8), this conjecture continues to be the basis of economic models (9, 10, 11, 12) and policy (13, 14, 15, 16).

The importance of this claim about the characteristics of the poor has caused it to gather considerable empirical attention. In the economics literature, the empirical tests of the conjecture can be divided into three categories. In one category, researchers begin by inferring preferences from observed choices and

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then these preferences are correlated with wealth or other measures of well-being. The results of this literature are mixed: some researchers find the poor to be more impatient (17) and risk averse (18, 19) but others find no link between wealth and discount rates (20) and that the self-employed are actually more risk averse (21).

The first method has been criticized because wealth or its correlates enter both stages of the analysis and this might lead to spurious correlation (22). This, however, is not a problem for the second method which relies on direct measures of preferences from surveys. Researchers in this category report that people with higher incomes are less risk averse (23, 24) and more patient (25, 26).

While the second method does not suffer from the spurious correlation problem, the preference measures are based on hypothetical questions which might be more prone to various forms of measurement error (27). The third method of testing the conjecture suffers from neither of these issues. The third group of researchers conducts incentivized experiments to elicit preferences. In these experiments real money is at stake and participants have the incentive to truthfully reveal their preferences. Concerning impatience, some researchers in India and Canada find the poor to be more impatient (28, 29) but this does not appear to be true in Denmark (30). In Ethiopia, one study reports the poor to be more risk averse (31) but the opposite holds in Spain (32) and among poor farmers in Chile and Tanzania (33).

A related problem with measures of risk and time preferences is that it is no longer appropriate to gather just the "standard" measures. Instead of being risk averse, it might be, for example, that the variation in attitudes towards potential losses (34) or the aversion to ambiguous situations (35) matters. Concerning patience, some researchers are now convinced that people have time inconsistent preferences. The hyperbolic discounting model suggests that people appear to be much more impatient about decisions with immediate consequences than they are when they think about similar decisions scheduled to take place in the future (36).

Aside from the measurement problems with time and risk preferences already mentioned, there are other problems that make it difficult to say

anything definitive about the relationship between preferences and well-being. Although incentivized experiments may provide the best quality data on preferences, samples from the lab tend to be small and from convenience samples of college students which usually lack variation in the important socio-economic characteristics in which we are interested. Even if one is confident in the quality of the data and can gather enough to be credible, the relationship between preferences and well-being may also be complicated by other factors such as the availability of credit.

We report on field experiments designed to address many of the major problems confounding previous analyses of preferences and well-being. In this project we focus on the relationship of experimental risk attitudes, including aversions to losses and ambiguity, and a spectrum of well-being measures (home ownership, basic services, employment, overall economic status, perceived relative economic status, requiring government assistance, expenditures and having lost a business). Our participants faced real monetary incentives earning the equivalent of two days pay, on average, in 148 sessions. Our sample includes more than 3,000 participants who were drawn representatively from six Latin American cities (Bogota, Buenos Aries, Caracas, Lima, Montevideo, San Jose). In addition to the experiment, participants completed an extensive survey that provides a number of important controls for our analysis including demographics and their access to credit.

Experiments. Participants were asked to choose one of six binary lotteries to assess their attitudes towards risk. To operationalize the chosen lotteries, participants then picked blindly from an opaque bag containing ten balls of either high or low value. To keep things as simple as possible, in each case there were five low value balls and five high value balls. Figure 1 illustrates this task with dollar payoffs that roughly correspond to the stakes experienced in the field. Starting in the 1 o'clock position, a participant can guarantee herself a payoff of \$33 by choosing the first lottery because this circle represents a bag of ten balls all of which are worth \$33. Picking this lottery demonstrates extreme risk aversion. Compared to the first lottery, the second in the 3 o'clock position is more risky because participants have a 50-50 chance of end up with \$25 or \$47.

However, there is some incentive to take on this risk because the expected payoff, $(0.5\times25)+(0.5\times47)=\$36$, is larger.

In general, the riskiness and expected payoff of the lotteries increase as one moves clock-wise through Figure 1 until one gets to the sixth lottery. Here the expected payoff is the same, \$42.5, as the fifth lottery but the variance in the payoffs has increased. A person who chooses the sixth lottery over the fifth must be at least risk neutral and may actually be risk seeking. Using a simple constant relative risk aversion utility function of the form $u(x)=x^{1-r}/1-r$ to weigh the payoffs allows the experimenter to categorize the implied level of risk taking, r, from extremely risk averse (r=1.77) to risk neutral (r=0) and risk seeking ($r<0$) (37). What is important is that picking lotteries further clock-wise around the ring indicates more tolerance for risk. The supplementary material (SM) discusses other details of the protocol.

One advantage of our sample, other than size, is that we strove to make the city subsamples representative. Other studies have looked cross-culturally (38, 39) but we went to great lengths to stratify our sample based on economic position, education, gender and age. As detailed in the SM, (Table S1) our stratification was mostly successful except that we tended to attract slightly older and more educated participants compared to our recruitment efforts and household surveys that have been conducted in the target cities.

To reduce any idiosyncratic errors that might result from variation in the participants' ability to read, the post-experiment surveys were administered by a group of hired pollsters trained for this purpose. The measures of well-being that we collected were listed above and the control variables include gender, age, education, marital status, children, ethnicity, home size (bedrooms), the number of income earners in the household and whether the decision-maker had access to credit and the political process. Although summary statistics for our controls are presented in the SM (Table S2), overall our participants were 55% female, 31% were married, 2% revealed indigenous heritage, another 2% claimed African heritage, 23% said that they had access to credit, if needed but only 4% said they had access to the political process; in other words, most felt disenfranchised to some extent. On average, our participants are 37 years old, have spent 11.77

years in school, they have slightly more than one child and they live in homes with about two and a half bedrooms and two income earners.

Results. The first step in our analysis is to replicate what others have done: does our measure of risk aversion correlate with wealth? In Figure 2 we introduce two of our well-being measures. In the top panel, we assess the likelihood of being in the top of three "economic classes" depending on the participant's lottery choice. Because incomes, wealth and instances of poverty differ by city, we normalized each participant's economic status into one of three economic classes: low status, middle status, high status. This categorization was based on the social stratification used by each city for classifying neighborhoods by income. These stratifications are used when assigning utility rates (e.g., electricity), for example. The goal is to charge higher rates to higher income neighborhoods thus subsidizing low income neighborhoods. However, some cities have more categories than others: Buenos Aires and San Jose have three categories, Caracas and Montevideo have four, Lima has five and Bogota has six. To make these comparable across cities, we grouped levels for cities that had more than three levels into the respective low, middle and high socio-economic classes. In the bottom panel of Figure 2 we create a similar graph using "relative wealth" instead of economic class. Our relative wealth measure is novel in that we asked each participant to imagine where she stood on an economic ladder with ten rungs. In other words, what was the participant's evaluation of her relative economic position in society? Combined, these two measures of well-being give us objective and subjective rankings.

According to the conjecture that motivates our work, the bar height in each panel of Figure 2 should increase from left to right because the gambles are arrayed from extremely risk averse (\$33|\$33) to risk neutral or risk seeking (\$0|\$95) and more risk tolerant people should be better off. Although the top panel of Figure 2, which uses economic class, appears to roughly conform to the conjecture in that the two higher risk gambles are associated with higher probabilities of being in the upper class, the error bars hint that not many of these differences are statistically significant. In addition, the bottom panel, in which subjective evaluations are used, demonstrates tighter error bars but the

differences in the means are also smaller so, again, there does not appear, based on simple tests, to be a significantly increasing relationship between one's tolerance for risk and well-being. In anything, the relationship appears more U-shaped.

Adding six more measures of well-being and using multiple regressions to control for other factors that might explain some of the variance in economic outcomes, allows our first step analysis to be more comprehensive. To economic class and relative wealth, we add a variety of measures that broaden the analysis from wealth to well-being, more generally. The inclusions are an indicator for home ownership (56% affirmative), an indicator for participants who report having all three basic services: electricity, piped water, trash collection (93% affirmative), an indicator for being employed (58% affirmative), the level of family expenditures measured as multiples (1-7) of the local minimum wage, an indicator for not receiving any government assistance (64% affirmative) and an indicator for never having lost a business to bankruptcy (94% affirmative). The last two measures were transformed to have the same, positive, frame as the others.

The regressions were slightly complicated by the fact that we can not measure one's risk attitude on a scale of 1-6 because moving from the first lottery to the second is not necessarily the same as moving from the third to fourth, for example. Our strategy was to be as agnostic as possible about our specification by creating indicator variables for each of the six lotteries. If the data conform to the conjecture we should see that the coefficients on the lottery indicators are increasing in magnitude as the lotteries represent more risk tolerance (just like the bar heights should have increased monotonically in Figure 2).

Table 1 summarizes the results of eight regressions and multiple coefficient comparisons (reported in more detail in the SM). The lottery choices are arrayed along the top and side of the table. The acronyms entered in the table indicate the domain for which the regression was run. NRA, for example, indicates the regression in which the indicator for not requiring government assistance was the dependent variable. All entries indicate that the coefficient on the row lottery was statistically significantly greater (at the 10% level or better) than the

coefficient on the column lottery. Thus, entries below the diagonal are consistent with more risk tolerance being associated with higher well-being. At the same time, entries above the diagonal are evidence of the opposite trend: greater risk tolerance being associated with lower well-being.

Overall, the evidence in Table 1 suggests that there is almost as much evidence that well-being decreases with risk tolerance as there is suggesting the opposite. There are three domains of well-being that seem to be most in line with the conjecture. When not receiving government assistance (NRA) is the dependent variable, three more risky lotteries (\$25|\$47, \$18|\$62, \$0|\$95) have higher coefficients that the baseline, safe \$33|\$33 lottery. While not all the coefficients are significantly different, after controlling for other factors, Table 1 indicates that there is some evidence that the well-being measures depicted in Figure 2 (EC and RW) increase with risk-taking. However, considering the entries for EC and RW above the diagonal, it might be that the relationship is not monotonic; a U-shape seems to be a better fit. Very risk averse people and risk-neutral people do the best economically, those with moderate risk aversion may do worse. Nevertheless, these results should not be overstated because there are many empty cells in Table 1 suggesting that the few significant differences are not terribly robust. In sum, with a very large sample we find only limited evidence for the conjecture that more risk tolerance corresponds to higher well-being.

As hinted at in the introduction, we can take another, more nuanced, second step in our analysis because we conducted additional treatments to identify several biases that now regularly appear in the empirical and theoretical decision-making literatures. Perhaps it is not simple risk aversion that correlates with well-being; maybe biases that arise as the decision environment gets closer to the sort of conditions encountered in real life will be more closely associated with well-being. Few real world decisions, apart from those encountered in the casino, involve pure risk. Instead of knowing all the possible outcomes and the probabilities associated with those outcomes, many decisions are made under uncertainty when the important parameters are ambiguous – you often do not know what the chances of an outcome occurring are for sure (40). In addition,

real world lotteries usually involve both gains and losses and it is now reasonable to expect that people treat losses differently from gains. Lastly, people in the real world occasionally make risky choices as part of a group instead of alone. Having groups set up insurance schemes by pooling their risky choices should cause individuals to reconsider their individual choices.

We conducted three additional treatments (using a within subjects design) to capture the possible effects of deviations from behavior in the simple risk task. Figure 3 illustrates how the protocol changed in two of these treatments. In the "ambiguity" treatment, the gambles were represented as in the left panel of Figure 3. Participants were told that instead of there being five high value balls and five low value balls for sure as in the baseline, there would be three high value balls and three low value balls but that they would not know for sure the value of the other four balls. In other words, the chances of pulling a high value ball were somewhere between 3/10 and 7/10. Additionally, they were not told the method used to fill in the four ambiguous balls. This was important because if we told them that the other four balls would be allocated randomly, for example, there would be no reason to expect any change in behavior. In expectation, the gambles would then be identical to those in Figure 1. To create a measure of "ambiguity aversion" we can order the lotteries one through six and take the difference in behavior between ambiguity treatment and each player's baseline lottery. If the difference (ambiguity-baseline) is negative the participant behaves more cautiously in ambiguous situations and if it is positive she is more risk seeking under uncertainty.

In the second treatment both gains and losses were possible. To maintain the underlying riskiness of each gamble, participants were endowed with the equivalent of \$50 and then chose a gamble from the right panel of Figure 3. In other words, the only thing that really changed in the second treatment was the framing of the decision problem. For example, starting with \$50 and choosing the lottery at 1 o'clock resulted in a net gain of \$50-\$17=\$33 for sure. Similarly, adding \$50 to all the payoffs in the lower panel of Figure 3 gets us back to Figure 1. We create a measure of "loss aversion" by taking the difference between the second treatment and the baseline (loss-baseline). People are loss averse in the

sense that they shy away from certain losses and, in doing so, are willing to incur more risk when losses are possible.

The third treatment used exactly the same table of lotteries as in the baseline; however, participants were allowed to either pool their payoffs with the other joining participants or go it alone and simply replay the baseline. The size of the pooling group was announced after everyone decided to join or not. It should be clear that because the outcomes are uncorrelated, risk averse participants should adopt pooling. While the expected payoff of a group of poolers will not change compared to the same group had they not pooled, the variance and risk will be smaller. The harder question is how people should react once they have chosen to pool. Should they pick riskier or less risky lotteries? With some simplifying assumptions (symmetric risk attitudes, common knowledge of risk attitudes), the game theoretic outcome is not too hard to understand. Because they pool the group members will all receive the same payoff and this makes the "gamesman's" choice similar to the "social planner's" choice. Given our set of lotteries, a simple rule emerges: if you pool, everyone pick the next riskier lottery. If, for example, one picked \$25|\$47 in the baseline, pick \$18|\$62 in the pooling game. The logic is straightforward. Given the reduced risk associated with pooling, participants should compensate by increasing the expected value a little. They do this by picking the next lottery.

In Figure 4 we summarize the city-level differences in our three more nuanced measures of risk behavior. On average, people in all six cities tend to make different choices in the treatments. Ambiguity generates a relatively homogeneous response (blue circles). People tend to be more risk averse when the situation is ambiguous (ambiguity-baseline$<$0) and this tendency is similar in all the locations although the difference between our Colombian participants and our Costa Rican participants is significant (t=2.34, p=0.02). There also tends to be a behavioral difference when losses are at stake. In accordance with previous findings (41), people tend to be more risk seeking when losses are at stake (i.e., they shy away from certain losses). Compared to the ambiguity difference, people tend, in all locations, to be relatively more averse to losses and there seems to be more variation in this response by location. The Uruguayans appear to be

extremely loss averse compared to the Argentineans which is strange considering the proximity of the two experimental locations. Lastly, we also see that, on average, people react as expected to the risk pooling treatment. If they pool, they then tend to pick riskier lotteries. Interestingly, pooling tends to generate the most homogeneous response across cultures. This would happen if the modal difference is exactly one lottery as predicted by theory. However, the truth is that most people (around half) do not change and the distributions of differences are relatively symmetric in each location.

We have identified two demographics that are robustly associated with the behavioral differences driven by our treatments. The differences are highlighted in Figure 5. In the upper panel we see that there is a clear pattern to the way that men and women change their behavior in response to the treatments. For the sake of graphing simplicity, we re-characterize our measures of ambiguity aversion, loss aversion and the pooling difference into binary variables. One reacts either more conservatively (risk aversely) to the treatment or less conservatively (no change is lumped with being less conservative). In all three cases, women react more conservatively to the treatments than do men. In the face of ambiguity, losses or having joined a pooling group women are likelier to act more risk aversely in their lottery choices. In the bottom panel we see that having children is also associated with one's response to the treatments. In this case, participants with children acted more conservatively in each domain than those without children. Table 2 suggests that these two differences are robust when one controls for other possible factors. Females are between four and five percent more likely to act conservatively but the marginal effect of a standard deviation increase in the number of children is more modestly on the order of one or two percent.

Not only are the differences between men and women and those with and without children interesting on their own, they provoke discussion of the origins and stability of these preferences. Sex differences might be considered evidence of biological, stable, differences among our participants. Conversely, the effect of children is more indicative of an endogenous relationship between one's

environment and one's preferences. We return to the implications of the possibility of endogenous risk attitudes below.

If there is no clear relationship between simple, more traditional, measures of risk aversion and economic outcomes, do the more nuanced measures correlate better? In Table 3 we report the results of a conservative test of the extent to which these additional preference measures are associated with well-being. The results are conservative in that we control for a number of other factors, we cluster standard errors at the session level to account for the idiosyncrasies that may occur during individual sessions and, despite the resulting inflated standard errors due to possible multicolinearity, we force the three measures to compete "head-to-head" to explain the variation in well-being. We also allow for the relationship between preferences and outcomes to be "kinked" by using a spline specification (see the SM). Following (42) who argue that ambiguity aversion can only be understood in reference to one's risk aversion, we use the difference in behavior between the treatments and the risky baseline as our preference measures. Also, instead of assuming the relationship between preferences and outcomes will be the same regardless of whether people act more or less conservatively to the treatments, we allow the slope to change at the origin. Hence, there are six independent variables of interest reported in Table 3: accepting less or more risk in the treatment compared to the baseline for each of the three treatments.

As one can see, each of the domains of well-being appears to be associated with at least one of our preference measures. In this broad sense, the more nuanced protocols have already preformed better than the standard risk measure. Instead of focusing on the details of Table 3 and the subtleties of each domain, can we recognize any broad patterns in these results? When it matters (Basic services, Relative wealth, Not requiring government assistance, Not having lost a business), one's reaction to ambiguity tends to be associated concavely with well-being. This suggests that those people who react extremely, in either direction, to ambiguity are less well off. Specifically, people who reacted very conservatively in the ambiguity treatment compared to the baseline are less likely to have all the basic services and tend to have lower relative wealth. At the same time, those

who react in a risk seeking manner when the gamble is ambiguous tend to get more government assistance and are more likely to have lost a business.

Reactions to losses are also significantly correlated with well-being in four domains (Home ownership, Basic services, Relative wealth, Expenditures) and, in contrast to the ambiguity results, the relationship tends to be convex. Now those at the extremes are better off. In particular, those participants who act more risk aversely when losses are at stake tend to have higher home ownership rates, more basic services and higher subjective assessments of their relative wealth.

One's behavioral difference in the risk pooling treatment is associated with well-being in all but one domain (Having lost a business). Like ambiguity, the general relationship between pooling and well-being tends to be concave. Again, those at the extremes do worse. In particular, those who react contrary to theory have lower well-being. Recall that theory suggests that even risk averse poolers should pick the next risky lottery.

Discussion. There is a long tradition in economics and public policy of assuming that people are poor because they have attitudes and preferences that keep them from saving and investing in projects that can improve their well-being. Our research takes aim at the assumed link between preferences and outcomes. Our first step is to use a large sample of incentivized participants and a broader set of well-being measures to replicate previous results that have used standard risk aversion instruments. We find little evidence of robust links between risk aversion and well-being. In our second step we analyze the results of three different treatments that add elements of reality to the decision problem to see if these, more subtle, instruments correlate better with well-being. Indeed they do, even after controlling for a variety of other important factors like access to credit. Not only are there significant links between responses to ambiguity, losses and pooling, the links array themselves in interesting patterns that should spark new areas of research. For example, we find that people with extreme relative reactions to ambiguity do worse. Of particular interest is that people who seek risk in ambiguous situations may tend to subject themselves and their families to too much risk in their daily lives because these people are more likely to need government assistance and are more likely to have lost a business.

Our loss and pooling results are equally interesting. Concerning behavioral responses to the possibility of losses, in studies conducted in labs on college campuses most people seek risk when losses are at stake. We replicate this in the field: 75% of our participants tolerated more or the same amount of risk in the loss treatment. However, while much of the focus of previous research has been on the majority of the population who seek risk, our findings suggest that it is the other participants, those that react very conservatively to losses, who are more interesting. These people are more likely to own their own homes, have a full set of basic services and perceive themselves to be of higher economic stature. Our risk pooling results are interesting because they suggest that those participants who reduce their risk tolerance instead of increasing it, in other words those that do not take advantage of the insurance aspect of pooling, do significantly worse in five of the eight domains. This result alone seems important in the development context because so much attention has been paid to risk pooling strategies in rural agriculture and by itself should be the impetus for new research.

While our results are impressive because of the quality of our risk measures, the size and representativeness of our sample and the amount of controls that we have gathered, there is still one important issue that cannot be resolved by our study and will need to be addressed in future research. We have been able to establish correlations between various measures of behavior in risky situations and a number of outcome variables, but we can not, with this sample, determine the direction of causality. Do preferences cause well-being as hypothesized by much of the existing literature or do the preferences of people change with their economic circumstances? To untangle these relationships will require econometric instruments that can be used to predict preferences but are only correlated with outcomes because of their causal effect on preferences. More basic research will be required to develop and test factors that might determine preferences but do not also directly affect outcomes.

References

1. Fisher, Irving, 1930. The Theory of Interest. Macmillan, New York.
2. Thaler, Richard, 1997. Irving Fisher: Modern Behavioral Economist. American Economic Review, 87(2), 439-441.
3. Pratt, J., 1964. Risk Aversion in the Small and in the Large. Econometrica, 32, 122-136.
4. Arrow, Kenneth, 1965, Aspects of the Theory of Risk Bearing. Yrjo Jahnssonin Saatio, Helsinki.
5. Binswanger, Hans, 1980. Attitudes Toward Risk: Experimental Measurement in Rural India. American Journal of Agricultural Economics, 62(August), 395-407.
6. Sillers, Donald, 1980. Measuring Risk Preferences of Rice Farmers in Nueva Ecija, Phillippines: An Experimental Approach, Ph.D. thesis, Yale, New Haven.
7. Walker, Thomas, 1980. Decision Making by Farmers and by the National Agricultural Research Program on the Adoption and Development of Maize Varieties in El Salvador, Ph.D. thesis Stanford, Palo Alto.
8. Kagel, John, Battalio, Raymond and Green, 1995, Intertemporal Choice. In: John Kagel (Ed.), Economic Choice Theory: An Experimental analysis of Animal Behavior. Cambridge University Press, New York, pp. 173-199.
9. Lipton, Michael, 1968. The Theory of the Optimizing Peasant. Journal of Development Studies, 4(3), 327-351.
10. Netting, Robert, 1993, Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture. Stanford University Press, Stanford.
11. Banerjee, Abhijit, 2000, The Two Poverties, MIT Department of Economics Working Paper 01-16, Cambridge.
12. Azariadis, Costas, Stachurski, John, Philippe, Aghion and Steven, N. Durlauf, 2005, Chapter 5 Poverty Traps, Handbook of Economic Growth. Elsevier, pp. 295-384.

13. Adubi, A., 1996. Impact of Socio-Economic Factors on Risk Behavior of Small Farmers: An Empirical Evidence from Oyo North Agricultural Development Project, Nigeria. African Development Review, 8(1), 115-126.
14. Holzmann, Robert and Jorgensen, Steen, 1999. Social Protection as Social Risk Management: Conceptual Underpinnings for the Social Protection Sector Strategy Paper. Journal of International Development, 11, 1005-1027.
15. Sinha, Saurabh and Lipton, Michael, 1999, Damaging Fluctuations, Risk and Poverty: A Review, Background Paper for the World Development Report 2000/2001.
16. Knight, John, Weir, Sharada and Woldehanna, Tassew, 2003. The Role of Education in Facilitating Risk-Taking and Innovation in Agriculture. Journal of Development Studies, 39(6), 1-22.
17. Lawrance, Emily, 1991. Poverty and the Rate of Time Preference: Evidence from Panel Data. Journal of Political Economy, 99(1), 54-77.
18. Moscardi, Edgardo and de Janvry, Alain, 1977. Attitudes toward Risk among Peasants: An Econometric Approach. American Journal of Agricultural Economics, 59(4), 710-716.
19. Rosenzweig, Mark and Wolpin, Kenneth, 1993. Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-Income Countries: Investments in Bullocks in India. Journal of Political Economy, 101(2), 223-244.
20. Ogaki, Masao and Atkeson, Andrew, 1997. Rate of Time Preference, Intertemporal Elasticity of Substitution, and Level of Wealth. Review of Economics and Statistics, 79(4), 564-572.
21. Halek, Martin and Eisenhauer, Joseph, 2001. Demography of Risk Aversion. The Journal of Risk and Insurance, 68(1), 1-24.
22. Lybbert, Travis and Just, David, 2007. Is Risk Aversion Really Correlated with Wealth? How Estimated Probabilities Introduce Spurious Correlation. American Journal of Agricultural Economics, 89(4), 964-979.
23. Donkers, Bas, Melenberg, Bertrand and Van Soest, Arthur, 2001. Estimating Risk Attitudes using Lotteries: A Large Sample Approach. Journal of Risk and Uncertainty, 22(2), 165-195.

24. Hartog, Joop, Ferrer-i-Carbonell, Ada and Jonker, Nicole, 2002. Linking Measured Risk Aversion to Individual Characteristics. Kyklos, 55, 3-26.
25. Ashraf, Nava, Karlan, Dean and Yin, Wesley, 2006. Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines. Quarterly Journal of Economics, 121(2), 635-672.
26. Holden, Stein, Shiferraw, Bekele and Wik, Mette, 1998. Poverty, Market Imperfections and Time Preferences: of Relevance for Environmental Policy? Environment and Development Economics, 3, 105-130.
27. Bertrand, Marianne and Mullainathan, Sendhil, 2001. Do People Mean What They Say? implications for subjective survey data. American Economic Review, 91(2), 67-72.
28. Pender, John L., 1996. Discount Rates and Credit Markets: Theory and Evidence from Rural India. Journal of Development Economics, 50(2), 257-296.
29. Eckel, Catherine, Johnson, Cathleen and Montmarquette, Claude, 2005, Saving Decisions of the Working Poor: Short- and Long-Term Horizons. In: Jeffrey Carpenter, Glenn Harrison and John List (Eds.), Field Experiments in Economics. JAI/Elsevier, Amsterdam, pp. 219-260.
30. Harrison, Glenn W., Lau, Morten I. and Williams, Melonie B., 2002. Estimating Individual Discount Rates in Denmark: A Field Experiment. American Economic Review, 92(5), 1606-1617.
31. Yesuf, Mahmud and Bluffstone, Randy, 2007, Risk Aversion in Low Income Countries, IFPRI Discussion Paper 00715.
32. Bosch-Domenech, Antoni and Silvestre, Joaquim, 2006, Do the Wealthy Risk More money? An Experimental Comparison. In: Charalambos Aliprantis and Nicholas Yannelis (Eds.), Institutions, Equilibria and Efficiency. Springer, Berlin, pp. 95-115.
33. Henrich, Joseph and McElreath, Richard, 2002. Are Peasants Risk-Averse Decision Makers? Current Anthropology, 43(1), 172-181.
34. Kahneman, D. and Tversky, A., 1979. Prospect Theory: An analysis of choice under risk. Econometrica, 47, 263-291.

35. Ellsberg, Daniel, 1961. Risk, Ambiguity, and the Savage Axioms. Quarterly Journal of Economics, 75(4), 643-669.
36. Angeletos, Geroge-Marios, Laibson, David, Repetto, Andrea, Tobacman, Jeremy and Weinberg, Stephen, 2001. The Hyperbolic Consumption Model: Calibration, Simulation and Empirical Evaluation. Journal of Economic Perspectives, 13(3), 47-68.
37. Holt, Charles and Laury, Susan, 2002. Risk Aversion and Incentive Effects. American Economic Review, 92(5), 1644-1655.
38. Henrich, Joseph, Boyd, Robert, Bowles, Samuel, Camerer, Colin, Fehr, Ernst et al., 2001. In Search of Homo Economics: Behavioral Experiments in 15 Small-Scale Societies. American Economic Review, 91(2), 73-78.
39. Henrich, Joseph, McElreath, Richard, Barr, Abigail, Ensminger, Jean, Barrett, Clark et al., 2006. Costly Punishment Across Human Societies. Science, 312(23 June 2006), 1767-1770.
40. Engle-Warnick, Jim, Escobal, Javier and Laszlo, Sonia, 2008, Ambiguity Aversion and Portfolio Choice in Small-Scale Peruvian Farming, Department of Economics, McGill University Working Paper.
41. Tversky, Amos and Kahneman, Daniel, 1981. The Framing of Decisions and the Psychology of Choice. Science, 211, 453-458.
42. Klibanoff, Peter, Marinacci, Massimo and Mukerji, Sujoy, 2005. A Smooth Model of Decision-Making Under Ambiguity. Econometrica, 73(6), 1849-1892.

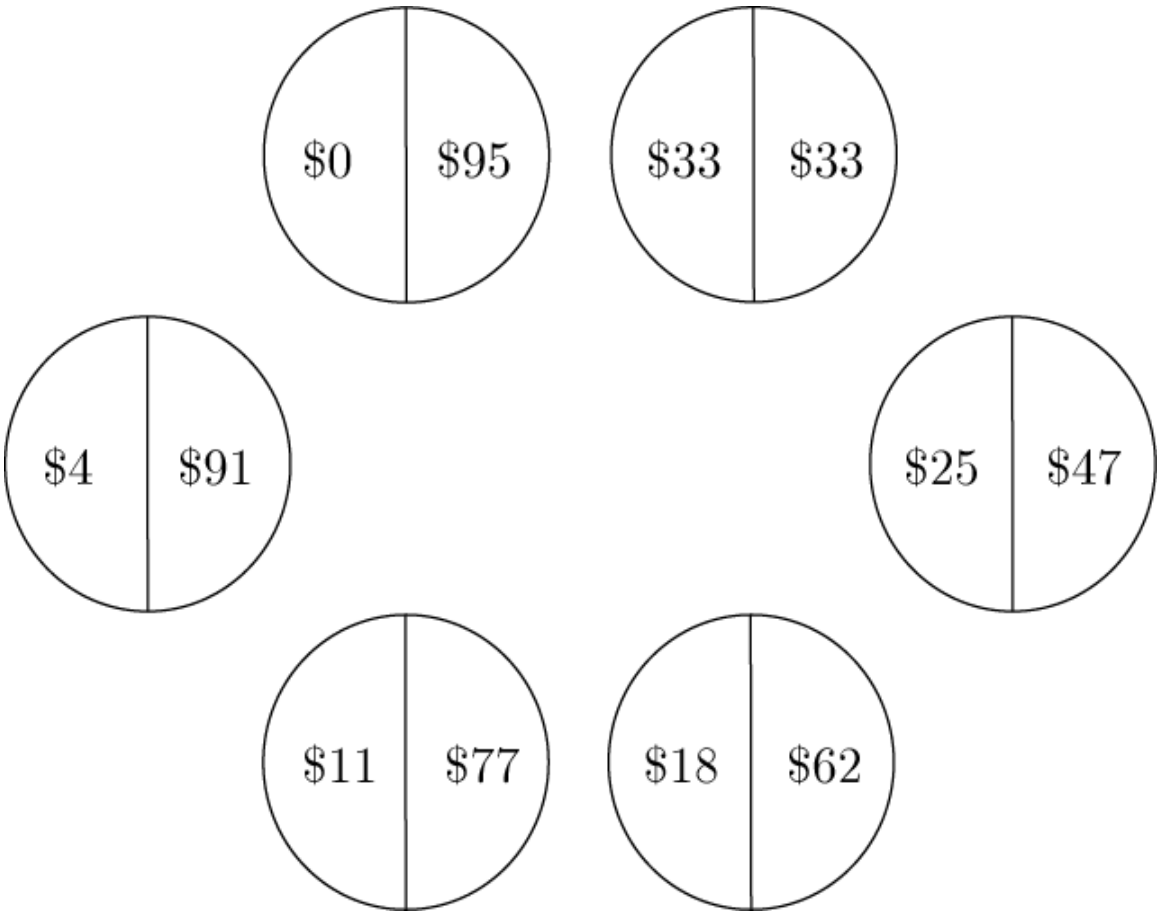

Figure 1. The decision task (with representative U.S. dollar payoffs) used to assess attitudes towards risk. Participants are asked to choose one of six 50-50 lotteries in which the odds of a high payment are the same as the odds of a low payment. As one moves clock-wise around the ring, the lotteries increase in risk and expected payoff except for the last lottery which has the same expected payoff as the fifth but is riskier. The participant's risk attitude can be bound by the chosen lottery. To determine payoffs for the task, the experimenter uses a bag of five low value balls and five high value balls where the ball values are determined by the chosen lottery and the participant blindly picks a ball from the bag.

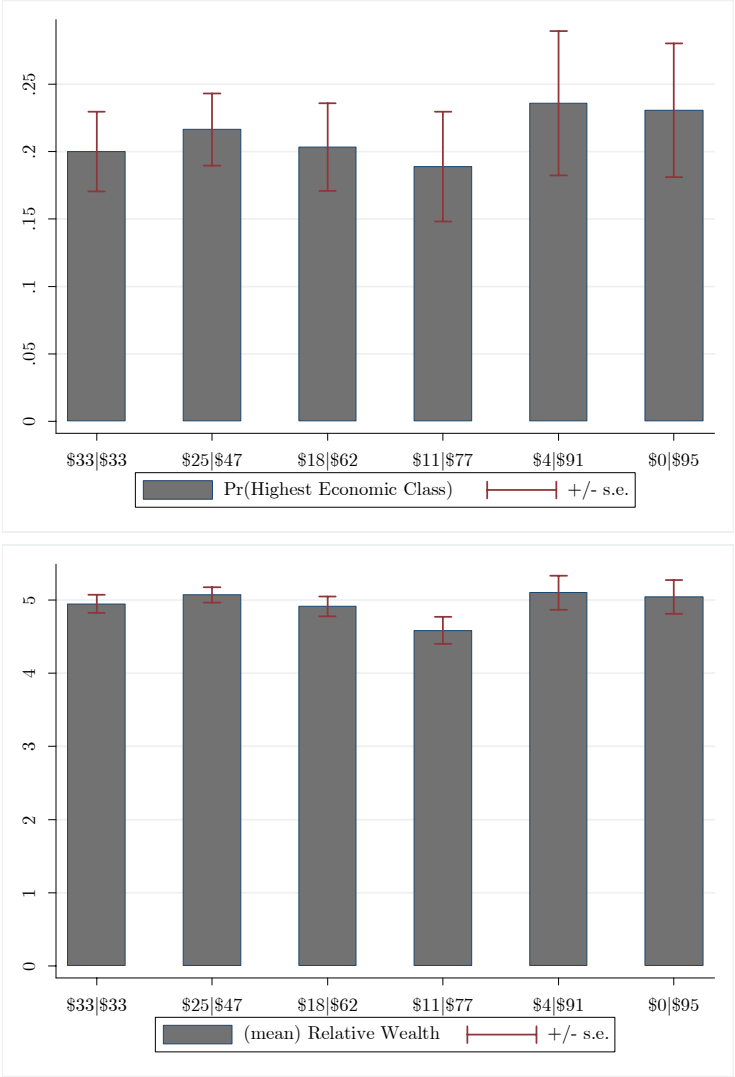

Figure 2. Simple measures of risk tolerance and well-being. Both panels represent the relationship between lottery choices and well-being. In the upper panel well-being is measured by the objective criteria of neighborhood wealth (probability of being in the top of three classes). In the lower panel well-being is measured by participant subjective evaluations of their relative wealth compared to others in their city (on a scale from 1 to 10).

	\$33|\$33	\$25|\$47	\$18|\$62	\$11|\$77	\$4|\$91	\$0|\$95
\$33|\$33	-		EM,EC	RW		
\$25|\$47	NRA, EX	-	EM,EC, EX	RW	BS	EX, BS
\$18|\$62	NRA		-	RW		
\$11|\$77				-	NLB	
\$4|\$91			EC	EC,RW	-	
\$0|\$95	NRA		EM,EC	RW	NLB	-

Table 1. Does well-being increase with risk tolerance? The different lotteries are represented on the columns and rows. All entries indicate that the row lottery has a significantly larger coefficient at the 10% level than the column lottery. Entries below the diagonal therefore suggest that being more tolerant of risk is associated with higher well-being in the relevant domain. Entries above the diagonal indicate that being less tolerant of risk (i.e., more risk aversion) is associated with higher well-being. The coefficients come from regressions that control for gender, age, college education, married, ethnicity, home size, number of children, number of income earners, access to credit and access to the political process. The key for the well-being domains is: HO = Home ownership, BS = Basic services, EM = Employed, EC = Economic class, RW = Relative wealth, NRA = Not require assistance, EX = Expenditures and NLB = Never lost a business.

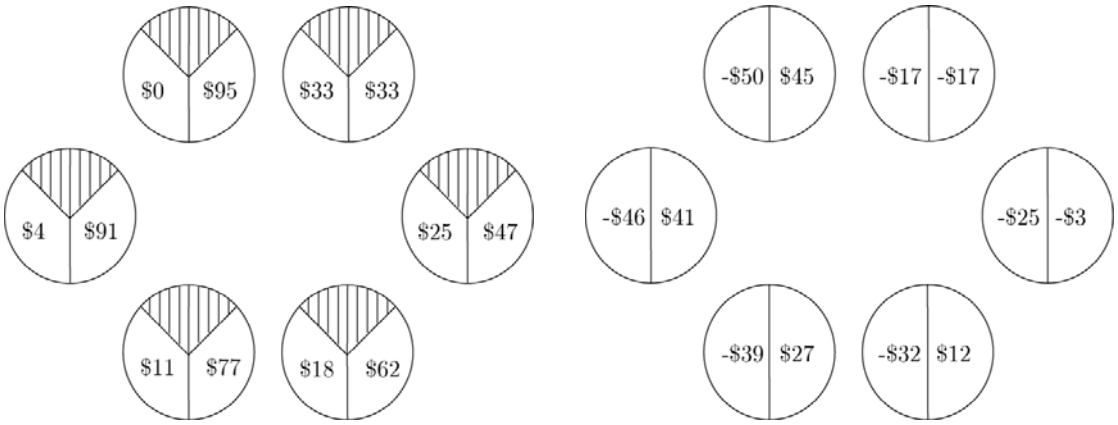

Figure 3. Two treatments. The left ring was used to transform the baseline choice into one in which the probabilities of earning low or high payoffs were ambiguous. Participants knew for sure that three of the ten balls were of low value and another three were of high value. Other than knowing they had to be one of the two stated amounts, they did not know the value of the remaining four balls nor did they know the process that decided the value of those balls. The right ring was used to re-frame the baseline into a situation in which losses were possible. Participants were endowed with $50 at the beginning of this choice and adding $50 to all the payoff in the right ring gets one back to the original payoffs.

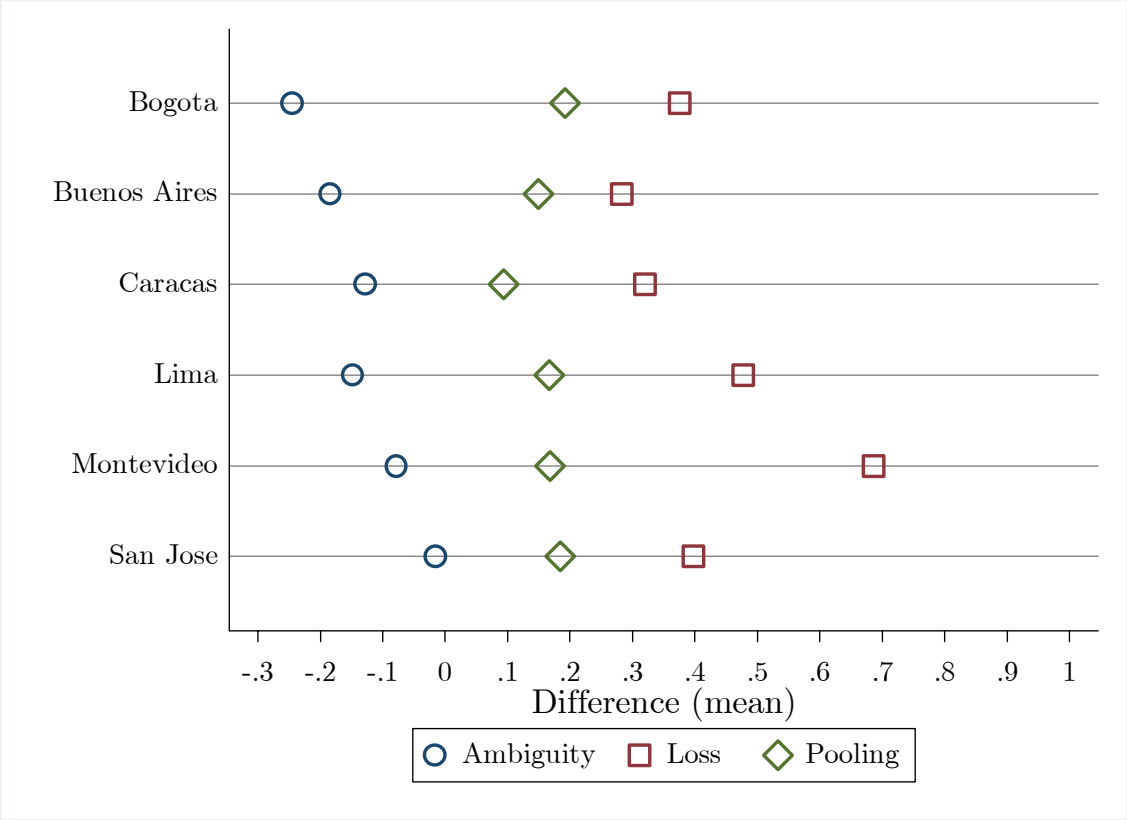

Figure 4. City level differences in treatment responses. Circles represent the city-level mean difference in ambiguous lottery choice from the risky baseline. Squares represent mean differences when losses are possible and diamonds represent mean differences of poolers when risk could be pooled. The figure groups the data by city.

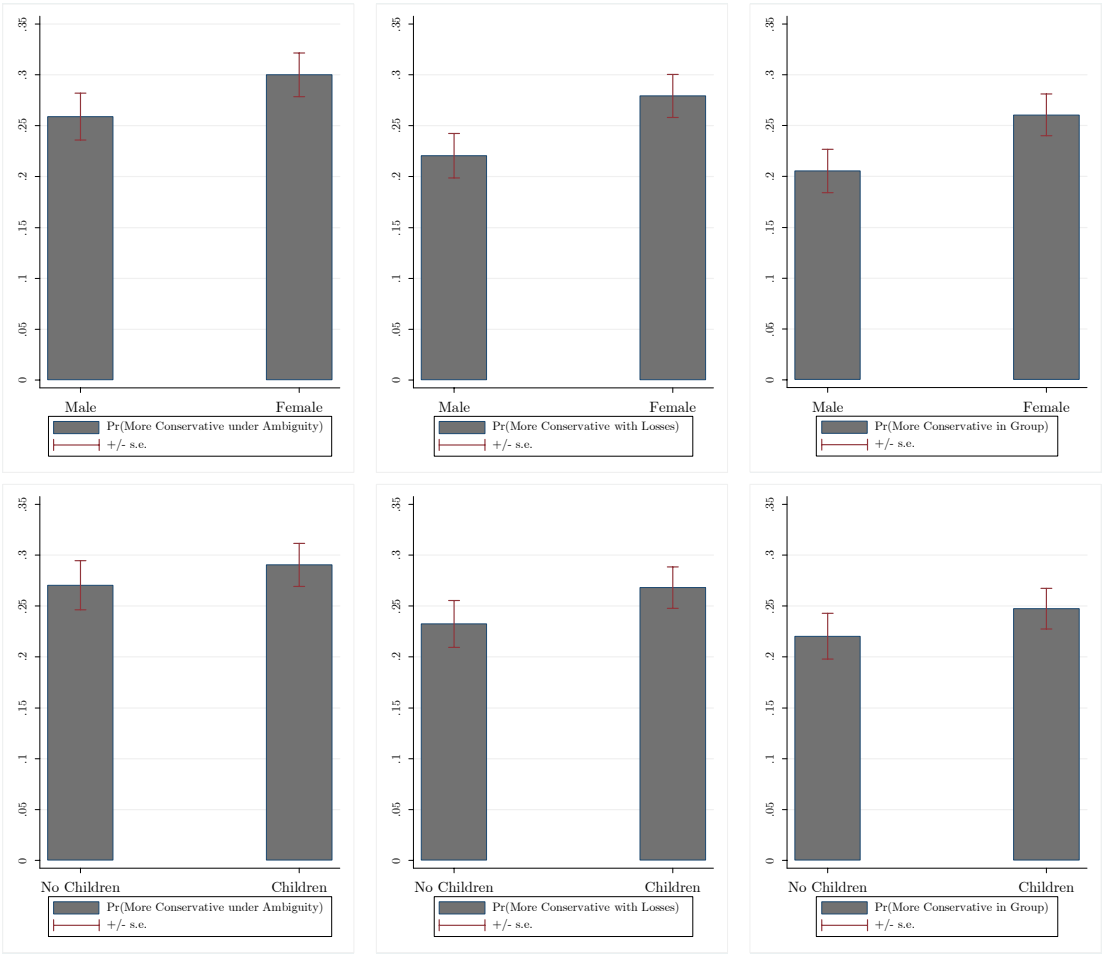

Figure 5. Demographic correlates of responses to ambiguity, losses and pooling. Treatment responses were transformed into binary responses. Participants responded either more conservatively (risk aversely) to a treatment or less conservatively (risk seeking). Non-responses are categorized and being less conservative.

	More Conservative under Ambiguity [indicator]	More Conservative with Losses [indicator]	More Conservative in Group [indicator]
Female	0.038***	0.048***	0.045***
	(0.015)	(0.017)	(0.015)
Children (number)	0.013*	0.012*	0.012*
	(0.008)	(0.007)	(0.007)
pseudo R^2	0.01	0.01	0.01
p-value from Chi^2 test	0.03	0.01	0.01
Observations	3090	3090	3090

Table 2. Key correlates of risk attitudes. Each column refers to a different treatment difference. The dependent variables are indicators and, therefore, the regressions are calculated using the Probit estimator. The standard errors (in parentheses) are clustered at the session level. Marginal effects are reported instead of coefficients. The specification for each characteristic includes controls for pooling in the shared risk task, age, college education, married, ethnicity, home size, number of income earners, access to credit and access to the political process. ***, **, * indicate significant at the 1%, 5% and 10% levels.

	Home Ownership [indicator]	Basic Services [Pr(all 3)]	Employment [indicator]	Economic Class [Pr(high)]	Relative Wealth [unit interval]	Not Require Assistance [indicator]	Expenditures [# min wages]	Not Lost a Business [indicator]
Accept Less Risk under Ambiguity	0.007	0.040***	-0.009	-0.001	0.069*	-0.007	0.009	0.001
	(0.007)	(0.016)	(0.015)	(0.010)	(0.038)	(0.010)	(0.031)	(0.002)
Accept More Risk under Ambiguity	-0.002	-0.012	0.018	-0.001	0.045	-0.022*	-0.021	-0.004*
	(0.009)	(0.018)	(0.016)	(0.011)	(0.046)	(0.012)	(0.029)	(0.002)
Accept Less Risk with Losses	-0.029***	-0.032**	-0.012	0.012	-0.072**	0.007	0.011	-0.001
	(0.011)	(0.016)	(0.017)	(0.011)	(0.035)	(0.012)	(0.032)	(0.002)
Accept More Risk with Losses	-0.004	-0.014	0.001	-0.003	-0.063**	-0.007	-0.036*	-0.001
	(0.005)	(0.012)	(0.010)	(0.008)	(0.026)	(0.009)	(0.022)	(0.001)
Accept Less Risk in Group	0.014*	0.032*	0.019	0.018*	0.104***	0.028**	0.072**	0.001
	(0.007)	(0.017)	(0.017)	(0.010)	(0.036)	(0.013)	(0.032)	(0.002)
Accept More Risk in Group	0.001	-0.022	-0.027**	-0.014*	0.007	0.002	0.014	0.001
	(0.007)	(0.016)	(0.014)	(0.009)	(0.034)	(0.010)	(0.025)	(0.001)
R^2 or pseudo R^2	0.07	0.11	0.07	0.05	0.04	0.06	0.04	0.05
p-value from Chi^2 or F test	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Observations	3087	3087	2169	3082	3086	2418	2810	3087

Table 3. Risk Attitudes and Well-Being. Each column refers to a different aspect of well-being. The regressions are splines to allow reactions to differ depending on whether or not one reacts more or less conservatively to the treatments. The splines are estimated with OLS, Probit, Ordered Probit or Tobit depending on the restrictions on the dependent variable. The standard errors (in parentheses) are clustered at the session level. Marginal effects are reported instead of coefficients. The specification for each characteristic includes controls for pooling in the shared risk task, gender, age, married, ethnicity, home size, number of children, number of income earners, access to credit and access to the political process. ***, **, * indicate significant at the 1%, 5% and 10% levels.