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Resolving Ambiguity as a Public Good: Experimental Evidence from Guyana[*]

Kaywana Raeburn[†], *Jim Engle-Warnick*[‡], *Sonia Laszlo*[§]

Abstract

We present a decision-making experiment, conducted in the field, that explores the extent to which reduction of ambiguity can be a public good. We find evidence that people with a preference to avoid ambiguity contribute to the public good. We find that risk averse people free-ride. Cheap talk erases the predictability of who free rides, but does not affect the overall public good provision, either in a positive or a negative direction. Finally, we find that people draw appropriate inference from the evidence that the public good provides. We relate our findings to the issue of new technology adoption.

Keywords: Ambiguity, Public Good, Technology Choice.

Codes JEL/JEL Codes: C90, O33, Q16.

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[†] McGill University. Corresponding author: kaywana.raeburn@mail.mcgill.ca.

[‡] McGill University and CIRANO.

[§] McGill University and CIRANO.

1 Introduction

In this paper we provide a new twist on the evidence of the determinates of technology adoption. We present a decision-making experiment, conducted in the field, that explores the extent to which reduction of ambiguity can be a public good. In the experiment, Guyanese farmers are given a choice between a risky and an ambiguous lottery. The risky lottery has known outcome probabilities, while the ambiguous lottery has unknown outcome probabilities. The chosen lotteries are publicly resolved, and then subjects choose again. The public resolution of the lotteries provides a public good because all subjects are able to learn about the unknown probability distribution whenever any subject chooses the ambiguous lottery. The final lottery choice reveals the extent to which the public good was received and properly utilized.[1] A public chat in the middle of the experiment provides an opportunity to coordinate on public good provision through cheap talk.

With our experiment we seek to provide evidence that the need for ambiguity reduction can be a source of public good provision, i.e., that ambiguity reduction as a public good is an aspect of technology adoption.[2] Understanding how individuals make real-world decisions when faced with risky or ambiguous outcomes can be difficult to do using conventional field data because of potentially confounding factors and difficulties measuring risk and ambiguity preferences. For this reason, we take our research question to an artefactual field experiment (Harrison and List, 2004) so that we can control for these confounding factors. We recruit farmers in Guyana, rather than from a convenience subject pool, because these farmers are regularly faced with the real-life analagous decision we wish to model. Indeed, partly in thanks to the existence of Guyana's National Agricultural Research Extension Institute

[1]The updating after the resolution of the lotteries is similar to the learning by doing literature which is primarily based on Jovanovic and Nyarko (1996) and demonstrated in Foster and Rosenzweig (1995). Conley and Udry (2010) take both this and information spillovers into account in their field study.

[2]There are other factors besides the public good aspect that may explain ambiguous choices. Tversky and Kahneman (1992) identify ambiguity effects as being based on the source of the uncertainty (see Abdellaoui et al., 2011 for a source-based elicitation procedure). Heath and Tversky (1991) suggested that self-perceived competence might explain why an entrepreneur, such as a farmer, might show a preference for ambiguity. Altruistic tendencies could be important as well; see Charness and Rabin (2002) and the references therein for experimental models of social preferences.

(NAREI), Guyanese farmers must regularly make decisions about the crops they plant and the varieties and other inputs they use.

In our experiment, the ambiguous lottery is a metaphor for a new technology (Engle-Warnick, Escobal and Laszlo, 2011), where unknown probabilities of outcomes are a better fit for unknown technologies than known probabilities. The new technology adoption as a public good is a model for a situation when, for example, a farmer plants a new seed and the entire community sees the resulting yield, which is common in many farming communities. Public good provision in general is an important aspect of the real-life decisions in these types of economies (Cardenas and Carpenter, 2008).[3]

Technology change is a major contributor to economic growth. For technology change to affect an economy, new technologies must first be generated, and then adopted and diffused throughout. In some economies, where importation can be the source of technology generation, adoption can be an issue. For example, in many developing countries, the adoption of new technologies tends to lag, particularly in the agriculture sector. Two prominant determinates of the individual decision to adopt a technology are risk aversion (Binswanger, 1980; Knight et al., 2003; Liu, 2013; Ghadim et al., 2005) and ambiguity aversion (Ross et al., 2012; Engle-Warnick, Escobal and Laszlo, 2011).[4]

We find evidence that people with a preference to avoid ambiguity contribute to the public good, precisely as they should. We find that risk averse people free-ride. Cheap talk erases the predictability of who free rides, but does not affect the overall public good provision, either in a positive or a negative direction. Finally, we find that people make appropriate decisions from the evidence that the public good provides.

[3]There is a rich and long experimental history exploring the provision of public goods. Standard long-known and robust findings include that public goods provision decays in a repeated framework (Isaac et al., 1984); that larger groups provide more of the public good (Isaac and Walker, 1994); that punishment and sanctions increase provision (Fehr and Gachter, 2000; Masclet et al., 2003) and that communication increases provision (Isaac et al, 1985).

[4]Examples of other determinants of technology choice have been found to be poverty (i.e. wealth), access to credit, learning by doing (Foster and Rosenzweig, 1995), comparative advantage (Suri, 2011), and social learning (Conley and Udry, 2010). See Feder et al. (1985) for a survey.

2 Experimental Design

Our experiment tests whether a public good motive can serve as a mechanism to resolve ambiguity in a social setting. The public good is public information regarding the probability distribution in an ambiguous gamble. The more information about the distribution, the greater the reduction in ambiguity, and the more people can benefit from it. In our experiment, an individual can provide this information by choosing to draw from the ambiguous distribution and making the outcome public. The social setting is important because it allows for information sharing, which in turn facilitates the social return to the public good. This information sharing can be direct (through discussion, advice, social exchange) or passive (mimicry).

We designed our experiment to be able to deconstruct this question into several components which may come into play in this mechanism. Specifically, we wish to distinguish the roles played by (1) knowledge of information as public good, (2) participation in information sharing, (3) the content of the information sharing and (4) the resolution of past ambiguity.

The experimental design consists of three tasks and four decisions, as illustrated in Figure 1. Following the instructions, the first task involves a single decision (Decision 1) in which subjects choose between a costly risky gamble and a costless but ambiguous gamble. The risky gamble is represented by a bag with two types of chips, with a specified number of each type chip inside (Figure 2, 'Black bag'). The ambiguous gamble is represented by a bag with an unknown number of chips of each type inside (Figure 2, 'Green bag'), which we describe more fully in the following paragraph. In the second task, subjects must choose among the same gambles, but are now explicitly given a public good motive: the result of their choices will (anonymously) be revealed to other participants (Decision 2). Each draw from the ambiguous bag will thus provide information about the distribution of outcomes in the bag. Before moving to the third and last task, subjects participate in an unstructured discussion, after which they are told they can revise their choice from the beginning of this second task (Decision 3). Thus task two involves two decisions, an initial choice whether or not to provide a public good by choosing the ambiguous gamble, and a second choice that allows for the decision to be influenced by the discussion. At the end of task two, the results of the revised decisions are revealed to the public. Finally, in task three, subjects make a final private decision (Decision 4) over the two gambles after seeing the revealed outcomes from the second task. Subjects earn the results from Decisions 1, 3, and 4 at the end of the session.

The analogy for our experimental design is learning from others about a new agricultural technology (see Foster and Rosenzweig (1995) for a seminal introduction to this question). A new technology is ambiguous to the farmer if its yield probability distribution function is unknown to them. Any uncertainty averse individual farmer may wish to observe others' experience with the technology before experimenting with it themselves. The economically important information is the realized yield from others' experience, providing a realization of a draw from the ambiguous option. In many rural communities around the developing world, where Guyana is no exception, farmers are indeed able to observe others' farming practices, and they also receive advice and information from peers or experts. The social setting has been shown to be an important factor in technology adoption (Bandiera and Rasul, 2006; Conley and Udry, 2010).[5]

2.1 Decision 1: Baseline Decision

Figure 2 presents the instrument for the the first decision, a choice between two gambles: a left gamble with two outcomes with known probabilities and a right gamble with the same two outcomes but with unknown probabilites. The gamble on the left is represented by the black bag with twelve chips inside, six chips representing a *HIGH* outcome and six chips representing a *LOW* outcome. This gamble costs GUY$50 to select i.e. GUY$50 is taken from the subject's earnings if s/he chooses the left gamble.[6] The gamble on the right is

[5]Our study is also related to recent work by Hanna et al. (2014) who show that farmers can 'learn through noticing' where simply making use of previously ignored available data can increase agricultural productivity.

[6]One US$ is approximately GUY$200 at the time of the study.

represented by the green bag with twelve chips inside, and contains the same outcomes as the gamble on the left, however, the number of $HIGH$ and LOW chips is unknown to the subject. The right gamble costs nothing to select. The instrument represents a single choice from a typical ambiguity preference elicitation instrument.[7] Decision 1 provides a benchmark decision in the absence of a public goods motive.

2.2 Decision 2: Public Good Motivation

After completing the first decision a script was read in which the choice between the two gambles was reframed to introduce a public good motive for choosing the unknown distribution. The subjects were told that, after repeating their choice in Decision 1, they would play their choice for pay. Once all subjects made their choices, they would then observe all of the draws from each bag and the associated value of each drawn chip (but not the identity of the subject who drew each chip for their own pay).

Thus choosing the ambiguous gamble in Decision 2 provides a public good in the sense that no one is excluded from the information revealed when the outcome of the gamble is realized. For this task, each subject chose one of the bags, knowing that the chip s/he eventually draws from the bag would be made public information. Since only the contents of the ambiguous bag are unknown, the more subjects choose from this bag, the more information is available to the public, and the more ambiguity is reduced for everyone.

Conjecture 1. *Willingness to provide a public good increases the proportion of subjects who choose the ambiguous gamble.*

2.3 Decision 3: Discussion as Coordination Device

After making their choice in Decision 2, we allowed subjects to either participate in or observe an unstructured discussion group (cheap talk). Our design allows subjects to socially

[7]The instrument is developed from the risk preference instrumet of Holt and Laury (2002), and the smooth model of ambiguity of Klibanoff et al. (2005), see Engle-Warnick, Escobal and Laszlo (2011).

exchange information. This gives subjects an opportunity to make the public goods motive salient to others. The discussion serves as a coordination device.[8] We built into the design a test for whether the effect of social exchange comes from active participation in the discussion or simply exposure to the information itself. To do so, we follow Engle, Engle-Warnick and Laszlo (2013) where we randomly assigned half of the subjects to participate in group discussions (treatment) and the other half to simply observe the discussions (control). Subjects assigned to the treatment groups were told they could discuss anything they wanted and the only restriction was that they could not identify themselves in any way other than by their participant identification number. Meanwhile, subjects assigned to the control groups did not participate in the discussion but were able to watch and listen to the discussion taking place in the corresponding treatment group. The duration of the discussion was 15 minutes. Upon completion of the discussion, subjects were allowed to revise their choice from Decision 2 if they wished to do so. They were told that they would be paid for the revised decision (Decision 3).

Conjecture 2. *The discussion provides a coordination device for the public good resulting in increased selection of the ambiguous gamble.*

After making their choice in Decision 3, each subject then privately pulled a chip from his/her chosen bag. The bags were pre-prepared with the chips corresponding to the gambles and the chips were chosen without replacement. The experimenter noted the outcome of the draw to be included in the earnings from the session. Participants' identification numbers, randomly assigned at registration, determined the order of selection from the bags.

2.4 Decision 4: Information Update from Public Draws

After all participants had chosen a chip, all the chosen outcomes from each bag were anonymously revealed to the participants by the experimenter. Participants thus saw how many

[8] A coordination device is anything that would allow "the belief formation process of all individuals, and, being commonly known, it coordinates among them" (Argenziano and Gilboa, 2012).

people chose each bag and the number of $HIGH$ and LOW outcomes chosen from each bag but they did not know who chose which bag or which outcome. Subjects then made a final choice between the two gambles, Decision 4. Ambiguity averse subjects should be more likely to choose from the ambiguous bag the more information she receives about its distribution. Furthermore, if the ratio of $HIGH$ to LOW draws begins to rise in the ambiguous gamble relative to the risky gamble, we would expect a higher probability of subjects choosing from the ambiguous bag.

Conjecture 3. *The selection of the ambiguous gamble in Decision 4 is correlated with the number of draws from the ambiguous bag in Decision 3. Specifically, the decision to select the ambiguous gamble should increase with the number of* $HIGH$ *outcomes revealed after Decision 3.*

Conversely, revealing Decision 3 draws from the risky bag should be inconsequential in the decision to choose from the ambiguous gamble in Decision 4, as they do not add any information about the distribution in either bag.

Conjecture 4. *The draws from the risky bag do not affect the choice of either bag in Decision 4.*

After the last decision was made, each participant completed the exit survey and then selected a chip from the bag corresponding to the bag they chose for Decision 1 and Decision 4, to determine their earnings from Task 1 (Decision 1) and Task 3 (Decision 4). These earnings were added to the earnings from Decision 3 to determine their total earnings from the experiment.

3 Experimental Procedures

3.1 Setting

We ran two sets of experimental sessions in farming areas of Guyana in November 2012 (Region 3) and August 2014 (Region 6). These experiments formed part of a larger project on food security in the CARICOM funded by Canada's International Development Research Center (IDRC) and the former Canadian International Development Agency (CIDA)'s Canadian International Food Security Research Fund (CIFSRF). Because of its importance for regional food supply, Guyana was specifically chosen for this study to give researchers and policy makers a better understanding of the behavioural determinants of technology adoption.

Two coastal and predominantly farming regions (Region 3 and Region 6) were selected by the CIFSRF project as target areas for agricultural interventions (improved irrigation, crop selection, and extension services) in partnership with Guyana's National Agricultural Research and Extension Institute (NAREI). The first set of six sessions were held in Parika Back Dam (Region 3) in November 2012, and the second set of five sessions in Black Bush Polder (Region 6) in August 2014.[9] Experimental procedures were identical in both regions. In both cases, we ran the sessions in locations that are central to the surrounding farming communities. All communities are rural where agriculture is the main livelihood. Though the communities do not specialize in any particular agricultural good, fruits and vegetables are the dominant crops.

3.2 Subject Pool

Recruitment of participants and organization of the locale for the experiment were conducted by our local field staff. Our field supervisors were NAREI employees based in the correspond-

[9]The sessions in Black Bush Polder were made possible thanks to additional funding received by the IDRC's International Doctoral Research Award.

ing region and our field assistants consisted of NAREI employees, community leaders and local farmers. Each community was visited several days in advance to recruit subjects based on the following criteria: they had to be farmers of legal age (18 or above), reside in one of the adjacent rural communities and have basic literacy and numeracy skills. If a recruited subject was unable to attend on the day he indicated, a replacement participant was chosen from a reserve list. To increase participation, we recruited at most two subjects from the same household.

3.3 Experimental Sessions

We ran our sessions as laboratory experiments in the field. Subjects were given a show-up fee of GUY$1500 upon arrival to cover their transportation and opportunity cost.[10] We paid the show-up fee immediately to facilitate trust in the incentivized part of the experiment. After obtaining consent, the instructions were read from a script by a single experimenter. The subjects were given separate decision sheet for Task 1 (Decision 1), Task 2 (Decisions 2 and 3) and Task 3 (Decision 4) at the appropriate times and different color pens in order to identify the decisions for the different tasks. The value of the $HIGH$ and LOW chips were randomly selected for each session to lessen cross-contamination between sessions. Table 1 shows the assigned $HIGH$ and LOW values for each session. The color of the bags for the two distributions was also changed between sessions for this reason.

To implement the discussions in Task 2, subjects were separated into two sets of two groups, each set containing one treatment and one control group. Each group contained between 4 and 6 subjects. One set remained in the primary location and the second set moved to a secondary location. The seats were arranged so that participants were sitting in two open and facing semi-circles. The treatment (participate) group sat in a semi-circle, and the control (observe) group sat in the facing semi-circle. This setup was replicated in each room. A digital voice recorder was set in the middle of the treatment group and the

[10]During the the field periods, US$1 was approximately GUY$200.

discussion was moderated by a field assistant. See Figure 3 for an example of the room configuration. A second experimenter read the instructions for the discussion and Task 3 for the second set.

The gambles were implemented by drawing chips out of a bag. For this we used two separate bags, one for risk and one for ambiguity. The first bag contained 12 numbered chips corresponding to the risky gamble (e.g. the 'Black Bag' illustrated in Figure 2). Six chips were numbered with the $HIGH$ amount (e.g. \$740 in the 'Black Bag' in Figure 2) and six chips were numbered with the LOW amount(e.g. \$240 in the 'Black Bag' in Figure 2).[11] This bag determined the outcome of a 50/50 gamble with known probabilities. This 'risky' bag was associated with a cost of \$50.

The second bag, corresponding the ambiguous gamble, was of a different colour (e.g. the 'Green Bag' illustrated in Figure 2 and contained 12 chips numbered $HIGH$ or LOW. Because the exact number of $HIGH$ and LOW chips was unknown to the participant, they were represented on the instrument sheet as a question mark ("?"). This 'ambiguous' bag was explicitly costless (\$0).

The number of $HIGH$ chips was determined randomly before the experiment by drawing from a uniform distribution from 0 to 12 before the session. For Task 2, each subject drew a chip from the bag according to their choice in Decision 3 to determine their earnings for that task. In order to anonymously convey the information about the drawn chips in the risky and ambiguous bags, we required additional props: (a) a poster containing the image from the instrument (similar to Figure 2) but with the values on the chips kept blank, and (b) two opaque boxes. Since each participant drew a chip from their chosen bag in Decision 3, the outcome was private, and noted by the experimenter to ensure payment for that task at the end of the experiment, and the participant placed the chip in the corresponding box. The experimenter ensured that no-one but the experimenter and the participant would see which box in which the chip was placed to protect the privacy of each participant's decision.

[11] Actual amounts used in the session are those in Table 1.

Once all subjects completed their draw in Task 2, the results were revealed to all participants in each treatment-control pair. The box corresponding to the risky (ambiguous) gamble was opened and each chip was shown to all participants. The values of all chips drawn from the 'risky' box were written by the experimenter on the 'risky' bag on the poster, and the values of all chips drawn from the 'ambiguous' box were written by the experimenter on the 'ambiguous' bag on the poster. In this way, all subjects could see the drawn chips from each bag. In other words, while subjects could not learn anything about the true distribution in the risky bag (they were told and shown that there were a total of 6 $HIGH$ and 6 LOW), subjects should learn about the distribution of $HIGH$ and LOW chips in the ambiguous bag. Specifically, the more subjects chose from the ambiguous bag in Decision 3, the more information about the distribution of chips in that bag, and the more ambiguity is resolved.

Once all tasks were completed, our field workers individually and privately administered a short exit survey, which collected information on demographics, farming practices, irrigation practices and views about climate change impact. We also measured their risk and ambiguity preferences using hypothetical (non-incentivized) choice instruments adapted from Engle-Warnick et al. (2009 and 2011).[12] Upon completion of the survey, subjects proceeded individually and privately to sit with the experimenter to determine their session earnings. Specifically, subjects pulled a chip from the bag (with replacement) according to their choices in Decision 1 (Task 1) and Decision 4 (Task 3) to determine their earnings from these two tasks. Total payment was calculated by summing these two amounts and the amount from the choice in Decision 3 (Task 2). Subjects were permitted to see the composition of the chips in the ambiguous bag after the draw if they desired. No subject ever asked to do so.

In Region 3, the experiments were held is a school room and village meeting hall which were adjacent to each other and in Region 6, they were held in an outbuilding at a NAREI

[12]The risk preference instrument requires subjects to choose among several pairs of gambles that vary in their level of risk. The more they choose from the relatively risky gamble, the more risk averse they are assumed to be. Similarly, the ambiguity instrument involves a series of decisions between risky and ambiguous gambles, similar to the instrument in Figure 2 but with different values. The more often subjects chose to pay to avoid the ambiguous gamble, the more ambiguity averse they are deemed to be.

nursery facility. Only the subjects, the experimenters and field staff were in the room at the time of the experiments and outside distractions were minimized. In total 187 subjects participated in the experiment with session sizes of 11 to 12 participants in Region 6 and 20 to 24 participants in Region 3. Subjects earned an average of GUY$1500 in addition to the show-up fee. The experiment lasted approximately one hour and the entire time spent on the experiment and survey was on average two and a half hours per session.

4 Experimental Results

4.1 Exit Survey Descriptive Statistics

Table 2 presents the descriptive statistics of the farmer and household characteristics. The average participant in the experiment was 40 years old, most likely to be of East Indian descent and married with over forty percent of individuals being female. The highest level of education received was primary school (51%), followed by secondary school (43%) and the remainder split equally between post-secondary schooling (3%) and less than primary (3%). Participants came from households with an average size of 4 individuals.

Participants had an average of 19 years farming and had farmlands that were relatively small on average (6.43 acres). Forty two percent of respondents owned their farm land while the majority (58%) rented or leased. To get a measure of access to credit, we asked the farmers how easily they could obtain a loan or credit to make improvements on their farm on a scale of 1 (never) to 5 (always). The median farmer chose 2 on the scale and the mean was 2.71, which suggests that on average farmer felt s/he had limited access to credit. Fifty six percent of respondents went to official sources such as the Ministry of Agriculture or NAREI for advice on farming, 22% went to a friend, relative or neighbour and 12% went to a household member. Fifty seven percent of participants also said that they observe the farming practices of other farmers with 91% of those responding yes indicating that this influenced their own farming practices. This demonstrates that our design is appropriate for settings in which information exchange in farming is common practice.

The main crops planted by the farmers in our sample were fruits and vegetables. Table 3 provides a breakdown of the main crops reported to be cultivated. The 5 most common crops were bora (yardlong bean), cabbage, cucumber, ochro (okra) and pepper, all cash crops with short growing cycles.

Figures 4 and 5 present histograms for responses to the hypothetical risk and ambiguity preference measures in the exit survey. The risk preference measure is the number of times the subject chose the safer of two gambles in four decisions and the ambiguity preference measure is the number of times the subject chose to pay to avoid the ambiguous gamble (selecting a costly known gamble with the same payoffs) in five decisions.[13] The risk measure is thus increasing in risk aversion and the ambiguity preference measure is increasing in ambiguity aversion. For both measures there is heterogeneity in responses, with modes of never choosing the relatively safe gamble and never choosing to pay to avoid ambiguity respectively. The measures are also positively and significantly correlated (r = 0.6891) so that relatively risk averse subjects also tend to be relatively ambiguity averse.

4.2 Decision 1: Baseline Decision

We begin by exploring whether the subjects' decision in Task 1 is correlated with observable socio-economic characteristics and the behavioural preference measures. Specifically we estimate:

$$Y_i = X_i'\beta_1 + Z_i'\beta_2 + P_i'\gamma + \epsilon_i, \tag{1}$$

where Y_i is a dichotomous variable equal to 1 if individual i chose the ambiguous gamble and equal to 0 if the subject chose the risky gamble, X_i is a vector of respondent characteristics (demographics, education and marital status), Z_i is a vector of household and farm characteristics, P_i is a vector of preference parameters (risk and ambiguity aversion) and ϵ_i is a stochastic error term.

[13] See Engle-Warnick, Escobal and Laszlo (2011) for details on how these measures are constructed.

Probit marginal effects from estimating equation (1) are presented in Table 4. All regressions include controls for sessions and region and report robust standard errors. Due to considerations of possible collinearity problems, we consider various specifications: Column (1) includes only behavioural measures (our proxies from risk and ambiguity aversion), column (2) demographics only, column (3) farming controls only and column (4) all controls. The regressions show a relatively poor fit: none are statistically significant. The only variable which has predictive power is the gender of the participant: women were more likely to choose the ambiguous gamble in Decision 1. This result is robust to specification method (e.g. logit, linear probability model, including session controls or not). Since there is no theory to suggest that demographic or farming controls would have any predictive power, we are not concerned about the estimated values of these coefficients or the poor fit. The only theoretical prediction in these regressions is that more ambiguity averse subjects are less likely to choose the ambiguous gamble. While the coefficient on this variable is indeed negative, it is statistically insignificantly different from zero.

4.3 Conjecture 1: Ambiguity Aversion Predicts Public Good Provision and Risk Aversion Predicts Free Riding

We test this conjecture by considering subjects' choices in Decision 2. Recall that for this decision, subjects were told that the outcome would be made public. In this sense, any draw from the ambiguous bag provides a public good as it renders public information about the distribution of that bag. Panel A of Table 5 shows the proportion of subjects choosing the ambiguous gamble in Task 1 (Decision 1) and Task 2 (Decision 2) and the difference between the two. The proportion decreased statistically significantly by 9% from Task 1 to Task 2 when knowledge that the choice of the ambiguous gamble provides public good information. Surprisingly rather than provide a public good, these results are more consistent with free-riding behaviour.

Cross tabulations of the decisions in Task 1 and Task 2 are shown in panel B of Table

5. The upper right cell shows the individuals who switched from the known distribution in Task 1 to the unknown distribution in Task 2 and the lower left cell shows the individuals who switched from the unknown distribution to the known distribution. Over 75% of the subjects stayed with their decision from Task 1 and more people switched from the ambiguous bag to the risky bag than from the risky bag to the ambiguous bag when the choice became a contribution to the public good. This counter-intuitive free-riding result suggests some subjects avoided contributing information about the ambiguous gamble to others while expecting to obtain that information from others. Free-riding behaviour has been repeatedly found in standard public goods contribution games (e.g. Isaac et al., 1984).

We also explore the effect of knowledge of the provision of public good information by looking at whether there is a difference in the participant characteristics that are significant determinants of the choice of the ambiguous gamble between Task 1 and Task 2. We thus estimate equation 1 with the dependent variable being the choice for Task 2 (Decision 2): equal to 1 if the individual chose the unknown distribution in Task 2 and equal to 0 if the subject chose the known distribution. The results are shown in Table 6 with the same participant characteristics as independent variables and also including the choice in Task 1 (Decision 1) as a control in the behavioral measures.

Much like in Decision 1, the demographic and farming controls have little predictive power. The most interesting results pertain to the behavioural measures. Not surprisingly, behaviour in Decision 1 most strongly predicts behaviour in Decision 2. Confirming the descriptive results from Table 5, subjects who chose the ambiguous bag in Decision 1 were most likely to choose from the ambiguous bag in Decision 2. More strikingly, the measures for risk and ambiguity aversion are now also statistically significant.

More risk averse subjects were less likely to choose from the ambiguous bag but more ambiguity averse subjects were more likely to choose from the ambiguous bag. This result is interesting because it suggests that the more ambiguity averse subjects were most willing to provide the public good information about the distribution of the outcomes, whereas the free-riding behaviour came more from the risk averse subjects.

4.4 Conjecture 2: Participation in Group Discussion Solidifies Decision-Making

We now test for the possibility that subjects took advantage of the discussion to make the public goods motive more salient. A group discussion provided subjects an opportunity to engage in a conversation about strategies. Since ambiguity averse subjects should wish to have more information about the distribution of chips in the ambiguous bag, then we should see more subjects choose from the ambiguous bag. If communication affects contributions in public-goods games (Isaac et al., 1985), and information here is the public good, then we should see an increase in ambiguous choices post-discussion (Decision 2) compared to pre-discussion (Decision 3).

Table 7 reports the difference-in-differences in the proportion of subjects choosing the ambiguous gamble between those who participated (treatment) in the discussion and those that simply observed (control) the discussion. Although the proportion of subjects choosing the ambiguous gamble rose in both groups, the differences between them and after the discussion are not statistically different from zero.

To assess whether participation in the discussion had a treatment effect on individuals' decision, we include a dummy variable on the right hand side of equation (1) which is equal to 1 if the individual participated in the discussion and equal to 0 if they observed the discussion but did not participate. A significant coefficient on this variable would indicate that participation the discussion was able to increase the likelihood of choosing the ambiguous gamble. Additionally, given the significant gender effects found for Task 1 (Decision 1), we include a group gender composition variable which sums the total number of women in the group. We do so because we observed gender based dynamics during the discussions and because several literatures have isolated important differences among men and women in group interactions (e.g. Smith-Lovin and Brody, 1989). For completeness, we also include the number of subjects in each of the treatment and control groups.

Results from this analysis are found in Table 8, where we report the probit marginal fixed effect estimates of the probability that the subject chose the ambiguous gamble in Decision 3. Again, due to considerations of possible collinearity problems, we consider various specifications: Column (1) includes only behavioural measures (our proxies from risk and ambiguity aversion, and the choice in Decision 1), column (2) demographics only, column (3) farming controls only, column (4) discussion group characteristics only and column (5) all controls.

In no case do we find that participation relative to observation influenced the choice of the ambiguous gamble after the discussion, however, the decision to choose the ambiguous gamble post-discussion (Decision 3) was different than the decision to choose that gamble pre-discussion (Decision 2, Table 6). Indeed, our measures of risk and ambiguity aversion are not longer statistically significant, though the influence of the choice in Decision 1 remains statistically significant and positive and of the same magnitude. None of the other controls are statistically significant either individually or jointly.

The fact that these results are different than those in Table 6 suggests that while treatment assignment to participate rather than observe did not have a measurable effect on decision-making, the discussion itself did have an impact on subjects' behaviour as it removed the significance of the behavioral measures in predicting who freerides.

We ran the same regression on the probability that subjects changed their decision after the discussion. The results are shown in Table 9. The results show that subjects who chose the ambiguous gamble in Decision 1 were less likely to change their decision between Decision 2 and Decision 3 after the discussion. The coefficient on the participation dummy is negative in all columns, but only significant in the spefication with full controls. This suggests that participation solidified decision-making rather than effecting change. The results also suggest that group characteristics also predicted whether subjects changed their choice in this task: the more women in the group, the more likely they changed their choice.

4.5 Conjectures 3 and 4: Subjects Learn Appropriately about both Ambiguous and Risky Distributions

Recall that in Decision 4, subjects were instructed to make the decision between the two gambles once the draws from Task 2 were made and revealed public. Before making this last decision, therefore, subjects saw the outcomes of all the draws from Task 2, whether they were from the risky or the ambiguous bag. Conjecture 3 posits that subjects should increase their selection of the ambiguous gamble the more draws from that bag, and that the effect should be especially strong for the number of $HIGH$ outcomes revealed at the end of that task.

We test this conjecture by estimating equation (1) augmented with first the number of subjects who chose the ambiguous bag and second with the number of $HIGH$ outcomes in the ambiguous bag revealed after Task 2. We also include a control for the number of participants in the group. This is found in Table 10, columns (1) and (2) (no controls) and columns (4) and (5) (with demographic and farming controls).[14] Our results are supportive of this conjecture. Not only does the number of draws from the ambiguous bag in Task 2 favour subjects choosing the ambiguous gamble in Task 3, but this effect is measurably stronger for the number of high draw from this bag.

Conjecture 4, meanwhile, posits that subjects should not respond to draws from the risky bag, as this information should not provide any update as they are told there is a 50% chance of $HIGH$ and a 50% chance of LOW. We test this conjecture by running a similar regression as for Conjecture 3 but instead we consider the number of $HIGH$ outcomes from the risky bag. The hypothesis that the revelation of outcomes from the risky bag should not affect selection from the ambiguous bag is not rejected (columns (3) and (6) in Table 10). The coefficient on the number of $HIGH$ draws from the risky bag is insignificant. Thus participants correctly updated on the revealed information from the unknown distribution and correctly did not update on revealed information from the known distribution.

[14] Because of multicollinearity concerns we do not include both measures simultaneously.

5 Conclusions

We report an artefactual field experiment in which the personal act of resolving ambiguity provides a public good. Our experiment mimics the choice of a new technology, where the outcome of the technology choice is publicly observable. Our subject pool of farmers in Guyana sheds light on decision making by people who make these choices routinely in real-life.

Our experiment made public the outcome from lottery choices that modeled new and existing technologies. We found evidence that people with a preference to avoid ambiguity contribute to the public good, precisely as they should. We found that risk averse people free-ride. Cheap talk erased the predictability of who free rides, but does not affect the overall public good provision, either in a positive or a negative direction. Finally, we found that people make appropriate decisions from the evidence that the public good provides.

Future work can build from these basic results in this new framework for exploring public goods provision. Perhaps the most obvious question concerns the institutional details that hinder or assist the provision of the public good of ambiguity reduction. While we took a first step exploring the effect of cheap talk, repetition has generally been found to decrease provision (Isaac et al, 1984), but it is not clear that in this more complicated framework that this would hold. Furthermore, mechanisms to increase provision can now be tested for robustness to this environment (Fehr and Gachter, 2000; Masclet et al. 2003). Further work can be explored with regard to correlating the real-life decisions people make with their behavior in this experiment. While our approach was to use a carefully chosen subject pool, futher validation that this type of public good is at work in technlogoy adoption could be provided.

Our new framework for new technology adoption suggests that it is not only important to resolve individual ambiguity to stimulate new technology adoption, it is also important to address the social dilemma that leads to free riding that, in this case, leads to lagging technology adoption.

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Figures and Tables

Figure 1: Timeline

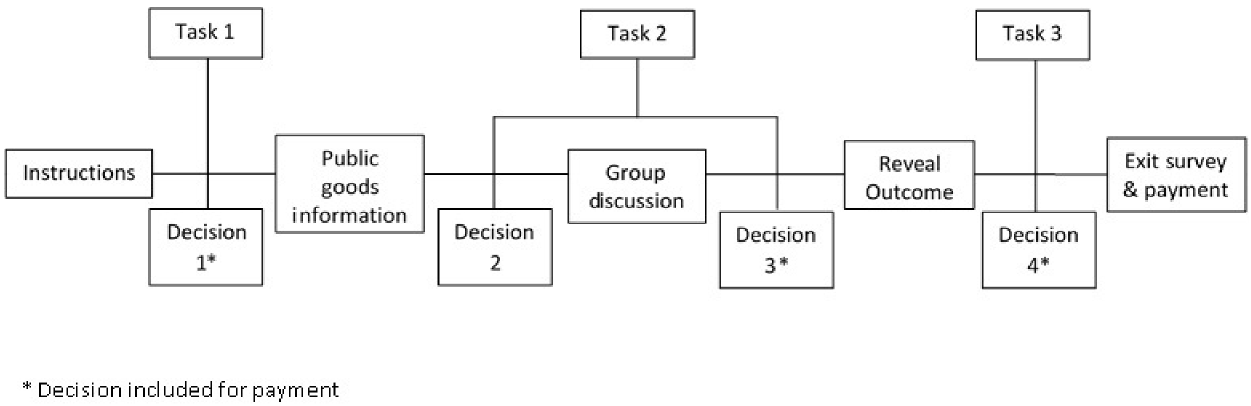

Figure 2: Ambiguity Instrument

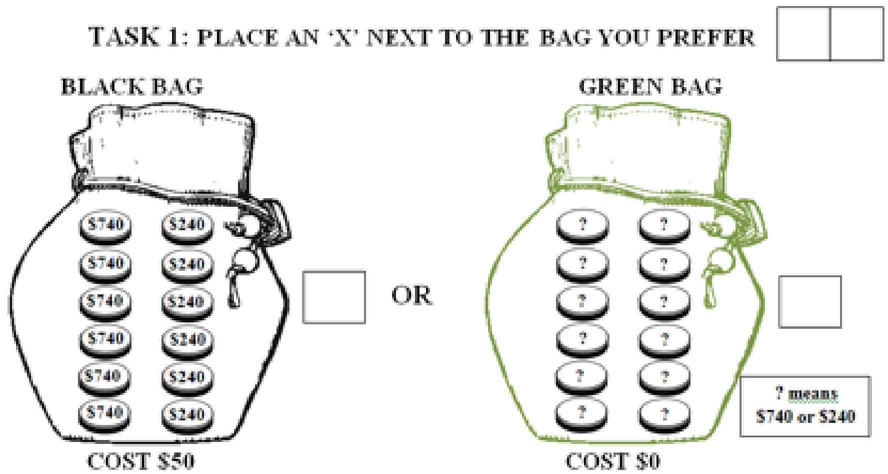

Figure 3: Room configuration for group discussions

Figure 4: Number of Safe Choices

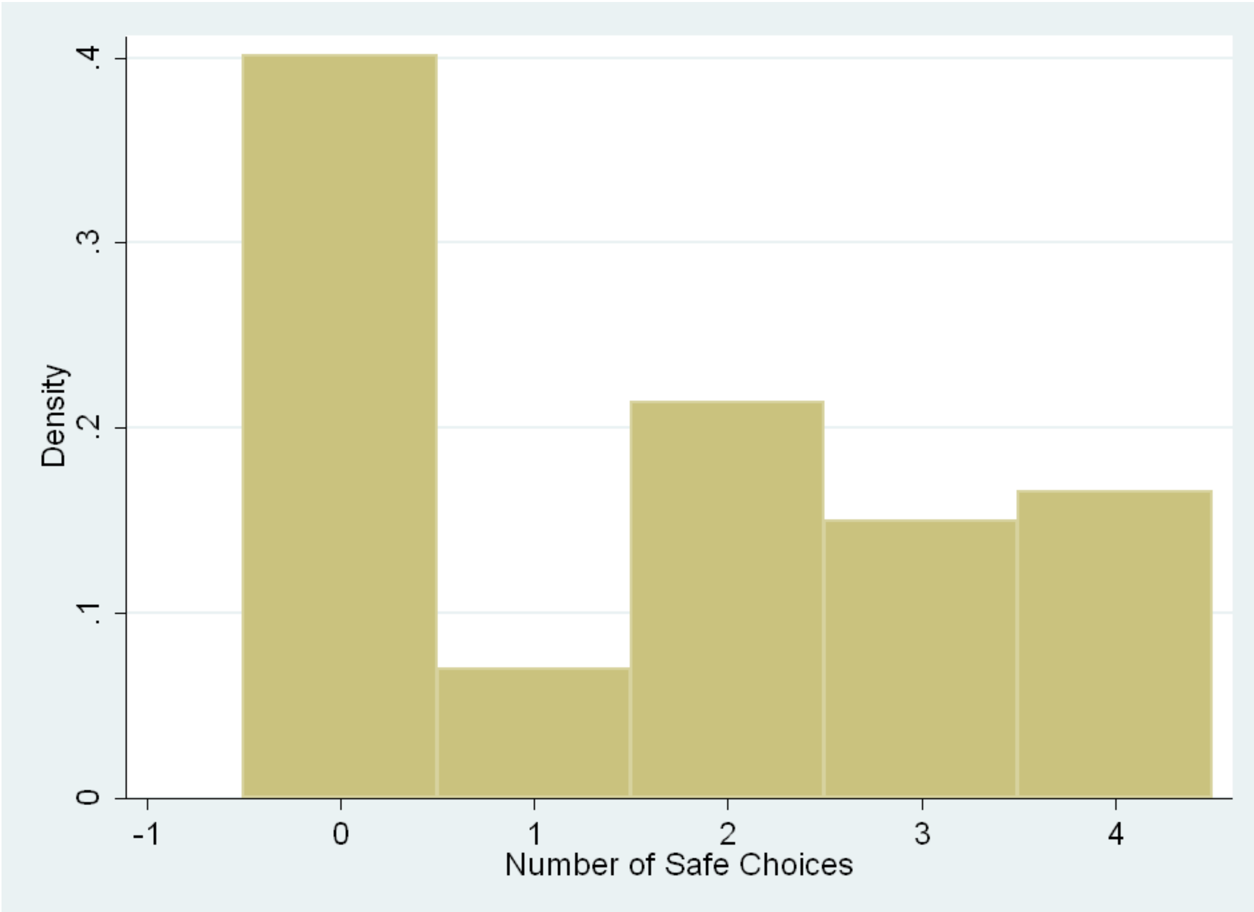

Figure 5: Number of Times Chose to Pay to Avoid Ambiguity

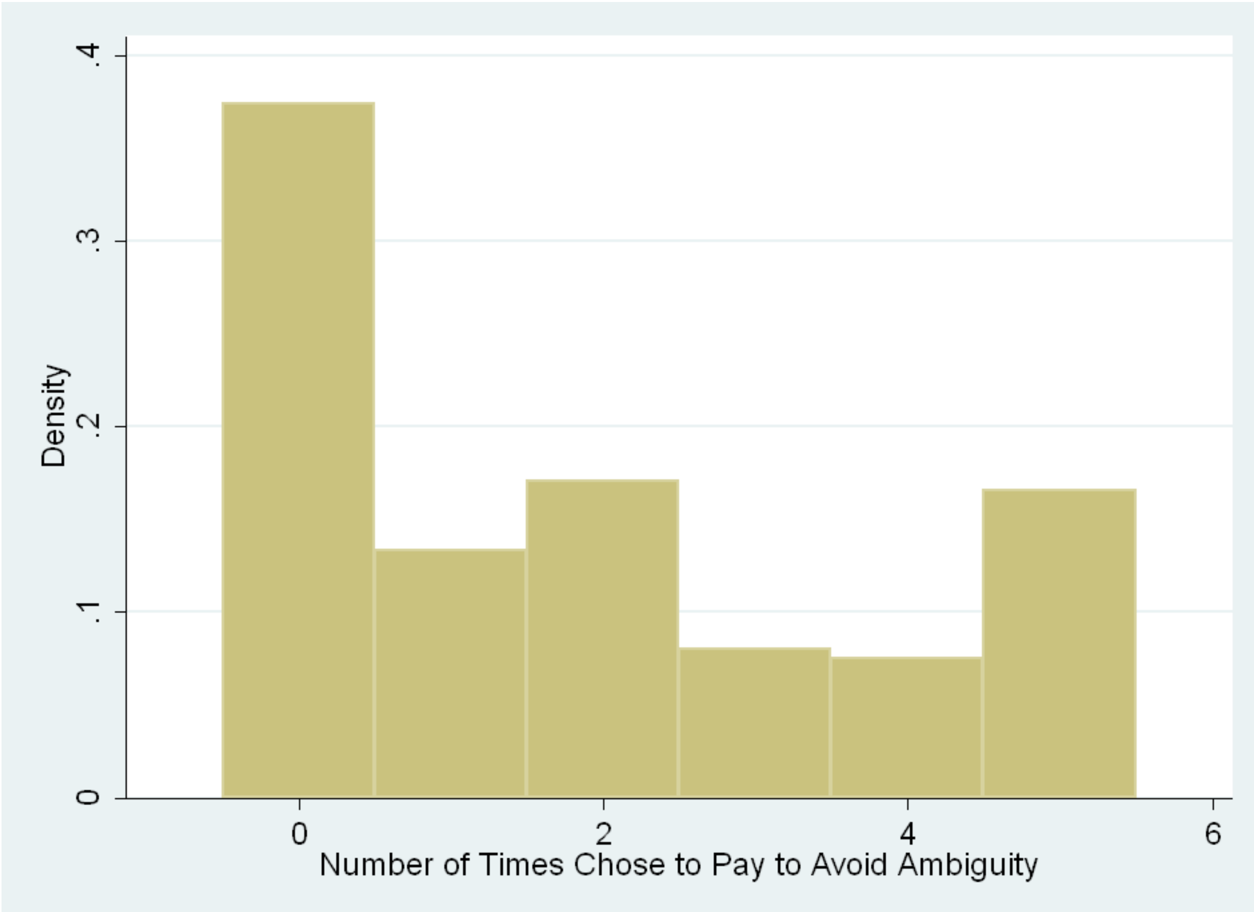

Table 1: Gamble Values by Session

Session	HIGH Value	LOW Value
1	GUY$ 675	GUY$ 300
2	GUY$ 825	GUY$ 200
3	GUY$ 600	GUY$ 350
4	GUY$ 525	GUY$ 400
5	GUY$ 750	GUY$ 250
6	GUY$ 525	GUY$ 400
7	GUY$ 525	GUY$ 400
8	GUY$ 675	GUY$ 300
9	GUY$ 825	GUY$ 320
10	GUY$ 600	GUY$ 350
11	GUY$ 750	GUY$ 250

Table 2: Descriptive Statistics from Exit Survey

Variable	Mean	Std. Dev
Participant Characteristics		
Age	40.40	14.07
Gender (Female=1)	0.42	–
Ethnicity		
East Indian	0.81	–
African	0.05	–
Other	0.13	–
Marital Status		
Married	0.78	–
Single	0.15	–
Separated	0.03	–
Widowed	0.05	–
Highest Education Level		
Less than Primary	0.03	–
Primary	0.51	–
Secondary	0.43	–
Post Secondary	0.03	–
Household Size	3.97	1.70
Farming Characteristics		
Years Farming	18.91	12.76
Farm Size (Acres)	6.43	6.27
Land Ownership	0.42	–
Source of Farming Advice		
Household Member	0.12	–
Friends and Family	0.28	–
Official Source	0.54	–
Observe Other Farmers Practices	0.57	0.50
Access to Credit (1-5 Scale)	2.71	1.45
Behavioral Measures		
Number of Safe Choices	1.61	1.53
Number of Times Chose to Pay to Avoid Ambiguity	1.84	1.87

N=187

Table 3: Top 5 Crops Cultivated

Crop Name	Frequency	Percent
Pepper	97	16.52
Bora (Yardlong Beans)	86	14.65
Cabbage	47	8.01
Ochro (Okra)	43	7.33
Cucumber	34	5.79

Table 4: Probability of Choosing the Ambiguous Gamble in Decision 1

	(1)	(2)	(3)	(4)
Behavioral Measures				
Number of Safe Choices	0.0195			-0.0004
	(0.034)			(0.036)
Number of Times Chose to Pay to Avoid Ambiguity	-0.0251			-0.0318
	(0.028)			(0.030)
Demographics				
Age		-0.0013		-0.0024
		(0.015)		(0.015)
Age Squared / 1000		0.0080		-0.0268
		(0.168)		(0.167)
Gender (Female = 1)		0.2187***		0.2346***
		(0.072)		(0.075)
Secondary School or Higher		0.0143		0.0167
		(0.080)		(0.083)
Married		0.1251		0.1159
		(0.095)		(0.100)
East Indian Ethnicity		0.1185		0.1183
		(0.113)		(0.136)
Household Size		-0.0045		-0.0091
		(0.022)		(0.023)
Farming Controls				
Years Farming			-0.0007	0.0041
			(0.003)	(0.005)
Farm Size (Acres)			0.0059	0.0061
			(0.006)	(0.006)
Land Ownership (Own = 1)			-0.0579	-0.0225
			(0.106)	(0.118)
Loan/Credit Access			-0.0008	0.0025
			(0.027)	(0.026)
Advice from Official Source			0.0932	0.1167
			(0.083)	(0.086)
Observe Other Farmers Practices			-0.0253	-0.0285
			(0.096)	(0.100)
Wald χ^2 test	4.93	14.13	8.16	22.72
χ^2-test (Behavioural measures)	0.82			2.22
χ^2-test (Demographics)		10.60		11.13
χ^2-test (Farming)			3.34	4.23
Pseudo R-squared	0.0199	0.0631	0.0303	0.0854

N=187. Probit marginal effects with robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Knowledge of Public Good Provision (Decision 2)

Panel A	Decision 1	Decision 2	Difference	Wilcoxon
Proportion of participants	0.6524	0.5615	0.0909	2.534
choosing ambiguous gamble	(0.035)	(0.036)	(0.035)**	[0.0113]**

Panel B	Decision 2		
Decision 1	Risky Gamble	Ambiguous Gamble	Total
Risky Gamble	51	14	65
Ambiguous Gamble	31	91	122
Total	82	105	187

Table 6: Probability of Choosing the Ambiguous Gamble in Decision 2

	(1)	(2)	(3)	(4)
Behavioral Measures				
Number of Safe Choices	-0.0706*			-0.0859**
	(0.039)			(0.042)
Number of Times Chose to Pay to Avoid Ambiguity	0.0551*			0.0733**
	(0.032)			(0.034)
Chose Ambiguous Gamble in Decision 1	0.5533***			0.5607***
	(0.034)			(0.067)
Demographics				
Age		0.0115		0.0178
		(0.015)		(0.018)
Age Squared / 1000		-0.1200		-0.2742
		(0.172)		(0.202)
Gender (Female = 1)		0.1451*		0.1080
		(0.080)		(0.088)
Secondary School or Higher		0.0110		-0.0043
		(0.084)		(0.091)
Married		0.0340		-0.0649
		(0.094)		(0.098)
East Indian Ethnicity		0.1034		0.0228
		(0.115)		(0.158)
Household Size		0.0102		0.0109
		(0.024)		(0.026)
Farming controls				
Years Farming			0.0021	0.0083
			(0.003)	(0.006)
Farm Size (Acres)			0.009	0.0106
			(0.006)	(0.008)
Land Ownership (Own = 1)			-0.0529	-0.0470
			(0.112)	(0.126)
Loan/Credit Access			-0.0387	-0.0582*
			(0.029)	(0.031)
Advice from Official Source			0.0415	-0.0027
			(0.092)	(0.101)
Observe Other Farmers Practices			0.0363	0.0792
			(0.105)	(0.114)
Wald χ^2 test	62.71***	13.49	14.59	74.65***
χ^2-test (Behavioural Measures)	51.12***			46.82***
χ^2-test (Demographics)		4.82		5.27
χ^2-test (Farming)			5.90	9.39
Pseudo R-squared	0.2393	0.0556	0.0542	0.0854

N=187. Probit marginal effects with robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Effect of Group Discussion (Task 2)

	Pre-Discussion Decision 2	Post-Discussion Decision 3	Difference	Wilcoxon
Control (N=92)	0.5761	0.5870	-0.0109	-0.302
	(0.052)	(0.052)	(0.036)	[0.763]
Treatment (N=95)	0.5474	0.5684	-0.0211	-0.707
	(0.051)	(0.051)	(0.030)	[0.479]
Difference	0.0287	0.0185	0.0102	
	(0.073)	(0.073)	(0.047)	
Kruskal-Wallis (χ^2)	0.156	0.065	0.045	
	[0.693]	[0.798]	[0.833]	

Table 8: Probability of Choosing the Ambiguous Gamble in Decision 3

	(1)	(2)	(3)	(4)	(5)
Participated in the Discussion	-0.0390	0.0031	-0.0024	-0.0082	-0.0047
	(0.081)	(0.076)	(0.076)	(0.080)	(0.094)
Behavioral Measures					
Number of Safe Choices	-0.0199				-0.0171
	(0.040)				(0.045)
Number of Times Chose to Pay to Avoid Ambiguity	0.0169				0.0135
	(0.033)				(0.037)
Chose Ambiguous Gamble in Decision 1	0.5490***				0.5740***
	(0.066)				(0.066)
Demographics					
Age		0.0112			0.0186
		(0.156)			(0.018)
Age Squared / 1000		-0.1643			-0.2525
		(0.177)			(0.202)
Gender (Female = 1)		-0.0918			0.0062
		(0.081)			(0.100)
Secondary School or Higher		-0.0507			-0.0847
		(0.084)			(0.093)
Married		0.1610			0.1312
		(0.096)			(0.107)
East Indian Ethnicity		0.1784			0.2494
		(0.114)			(0.147)
Household size		-0.0088			-0.0017
		(0.024)			(0.026)
Farming controls					
Years Farming			-0.0030		-0.0017
			(0.003)		(0.006)
Farm Size (Acres)			0.0066		0.0045
			(0.006)		(0.007)
Land Ownership (Own = 1)			-0.0177		0.1506
			(0.110)		(0.128)
Loan/Credit Access			-0.0116		-0.0188
			(0.029)		(0.030)
Advice from Official Source			0.0718		0.0158
			(0.092)		(0.099)
Observe Other Farmers Practices			0.0152		0.0440
			(0.102)		(0.117)
Group Characteristics					
Number of Women in Group				0.0245	-0.0429
				(0.036)	(0.046)
Number of Participants in Group				-0.0694	-0.0876
				(0.118)	(0.140)
Wald χ^2 test	57.09***	18.08	11.82	10.71	74.89***
χ^2-test (Behavioural Measures)	46.61***				48.51***
χ^2-test (Demographics)		10.09			8.00
χ^2-test (Farming)			2.59		2.21
χ^2-test (Group Characteristics)				0.76	1.41
Pseudo R-squared	0.2401	0.0825	0.0517	0.0517	0.2815

N=187. Probit marginal effects with robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Probability of Changing Decisions in Task 2 Following the Discussion

	(1)	(2)	(3)	(4)	(5)
Participated in the Discussion	-0.0284	-0.0484	-0.0454	-0.0552	-0.0685**
	(0.041)	(0.043)	(0.042)	(0.043)	(0.032)
Behavioral Measures					
Number of Safe Choices	0.0201				0.0210*
	(0.022)				(0.013)
Number of Times Chose to Pay to Avoid Ambiguity	-0.0080				-0.0134
	(0.0.18)				(0.010)
Chose Ambiguous Gamble in Decision 1	-0.1068**				-0.0984***
	(0.050)				(0.042)
Demographics					
Age		0.0012			-0.0008
		(0.007)			(0.005)
Age Squared / 1000		0.0069			0.0668
		(0.074)			(0.054)
Gender (Female = 1)		0.0161			-0.0160
		(0.040)			(0.023)
Secondary School or Higher		0.0150			0.0089
		(0.044)			(0.025)
Married		-0.0948*			-0.0290
		(0.065)			(0.047)
East Indian Ethnicity		0.0611			0.0460
		(0.040)			(0.022)
Household Size		0.0081			0.0073
		(0.011)			(0.008)
Farming Controls					
Years Farming			-0.0001		-0.0043**
			(0.002)		(0.002)
Farm Size (Acres)			-0.0076**		-0.0041
			(0.004)		(0.003)
Land Ownership (Own = 1)			0.0476		0.0680
			(0.057)		(0.051)
Loan/Credit Access			0.0113		0.0091
			(0.016)		(0.010)
Advice from Official Source			-0.0339		-0.0375
			(0.051)		(0.035)
Observe Other Farmers Practices			0.0474		0.0124
			(0.046)		(0.033)
Group Characteristics					
Number of Women in Group				0.0376**	0.0387***
				(0.017)	(0.013)
Number of Participants in Group				0.0017	0.0100
				(0.043)	(0.027)
Wald χ^2 test	8.85	7.2	10.06	6.43	34.10**
χ^2-test (Behavioural Measures)	6.56*				13.02**
χ^2-test (Demographics)		10.09			13.00*
χ^2-test (Farming)			8.95		13.94**
χ^2-test (Group Characteristics)				5.06*	11.30***
Pseudo R-squared	0.0570	0.0503	0.0517	0.0424	0.2477

N=187. Probit marginal effects with robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Probability of Choosing the Ambiguous Gamble in Decision 4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
# who Chose the Ambiguous Bag	0.1142***				0.0876**			
	(0.037)				(0.042)			
# of High Ambiguous Draws		0.1676***				0.1394**		
		(0.049)				(0.058)		
# who Chose the Risky Bag			-0.1070***				-0.0797**	
			(0.035)				(0.039)	
# of High Risky Draws				-0.0608				-0.0378
				(0.041)				(0.042)
Number of Safe Choices	0.0121	0.0096	0.0145	0.0201	-0.0128	-0.0168	-0.0115	-0.0101
	(0.034)	(0.034)	(0.034)	(0.034)	(0.037)	(0.037)		
Number of Times Chose to Pay to Avoid Ambiguity	-0.0546*	-0.0518*	-0.0523*	-0.0427	-0.0556*	-0.0523*	-0.0532*	-0.0458
	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)	(0.030)
Demographic Controls	N	N	N	N	Y	Y	Y	Y
Farm Controls	N	N	N	N	Y	Y	Y	Y
Wald χ^2	33.61***	35.52***	33.64***	24.60**	41.72**	42.71**	41.89**	38.16*
Pseudo R-squared	0.1333	0.1394	0.1294	0.0987	0.1825	0.1888	0.1801	0.1644

N=187. Probit marginal effects with robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

6 Appendix: Experiment Instructions

TOOLS WE WILL BE USING

First let me show you some of the tools that we will be using today. In front of me there are two bags: one is COLOUR_1 and one is COLOUR_2.

Inside the COLOUR_1 bag there are 12 chips that look like this [PULL ONE OUT]. Whenever we use this bag you will pull one chip from the bag without looking inside. It works like this [WALK AROUND THE ROOM WITH BAG & PULL AND SHOW]

Inside the COLOUR_2 bag there are also 12 chips. Whenever we use this bag you will pull one chip from the bag without looking inside.

[ASK] ARE THERE ANY QUESTIONS?

TASKS AND PAYMENT

Today you will be doing three main tasks. You will be paid for your decision in each task. I will first explain the decision you will make in your first task. Once you are done making this decision, I will explain the remaining tasks.

TASK 1

[DISTRIBUTE DECISION SHEET FOR TASK 1]

We have distributed a decision sheet which looks like this [SHOW POSTER]. You are asked to make one decision.

On the sheet there are two bags [SHOW ON POSTER], one COLOUR_1 and one COLOUR_2. Let me explain to you how these bags work so that you can better understand.

Inside the COLOUR_1 bag there are 12 chips. Each chip is worth a certain dollar amount, either $HIGH or $LOW. In this bag, 6 of the chips are each worth $HIGH and the other 6 are each worth

$LOW. Since there is an equal number of chips worth $HIGH or $LOW, there is a 50-50 chance of earning $HIGH or $LOW. The cost of this bag is $50. I will now place the chips on the table.

[ASK] Can 2 participants come up to look at them to verify that 6 chips are $HIGH and 6 chips are $LOW?

Inside the COLOUR_2 bag there are 12 chips. Each chip worth is a certain dollar amount, either $HIGH or $LOW. In this bag you do not know how many chips are worth $HIGH or how many chips are worth $LOW. There could be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 chips worth $HIGH or $LOW. Since you do not know how many chips are worth $HIGH or how many chips are worth $LOW, you do not know the chances of earning $HIGH or $LOW. There is no cost for this bag. I will not show you the chips in the bag but you can see them at the end of the session if you request. Your task is to choose which bag to pick a chip from.

If you prefer to pick a chip from the COLOUR_1 bag, put an "X" next to it like this [DEMONSTRATE] and at the end of the experiment you will select a chip from the COLOUR_1 bag [LIFT COLOUR_1 BAG] to determine your earnings for this task. Remember the COLOUR_1 bag has 12 chips, 6 chips are worth $HIGH and 6 chips are worth $LOW so if you choose this bag there is a 50/50 chance of earning $HIGH or $LOW. If you pick a chip worth $HIGH you will earn $HIGH for this task. If you pick a chip worth $LOW you will earn $LOW for this task. This bag cost $50. If you choose this bag you will have to pay $50 from your earnings.

If you prefer to pick a chip from the COLOUR_2 bag, put an "X" next to it like this [DEMONSTRATE] and at the end of the experiment you will select a chip from the COLOUR_2 bag [LIFT COLOUR_2 BAG] to determine your earnings for this task. Remember the COLOUR_2 bag has 12 chips but you do not know how many chips are worth $HIGH or how many chips are worth $LOW so if you choose this bag you do not know the chances of earning $HIGH or $LOW. If you pick a chip worth $HIGH you will earn $HIGH for this task. If you pick a chip worth $LOW you will earn $LOW for this task. If you choose this bag you don't have to pay anything. Remember, your task is to choose which bag to pick a chip from: the COLOUR_1 bag or the COLOUR_2 bag.

[ASK] ARE THERE ANY QUESTIONS?

[DISTRIBUTE BLACK INK PENS]

You can go ahead and make your decision.

[SUBJECTS COMPLETE TASK 1]

Once you have finished making your decision, please turn your sheet upside down, raise your hand and we will collect your decision sheet.

[COLLECT DECISION SHEETS FOR TASK 1]

[ASK] Has everyone made their decision and handed in their decision sheet?

I will now explain the decisions you will make in Tasks 2 and 3. Once you are done making these decisions, you will be directed to one of our field assistants to complete a short survey.

TASK 2

For task 2, we will distribute a decision sheet which looks like this [SHOW POSTER] that requires that you make one choice between two bags. The bags are the same as in Task 1.

SEEING THE PULLED CHIPS IN TASK 2

After everyone has made their decision for Task 2, each of you will privately pick a chip from the bag you chose to determine your earnings for task 2. When you pull a chip from a bag, it will be noted by me and placed into a closed box for that bag. Your ID number, which was randomly assigned, will determine the order in which you pick.

After everyone has picked a chip from a bag, we will open the boxes and show you the chips. You will know which bag each chip came from but not the identity of the person who pulled it. The results will be shown on this poster [INDICATE TO POSTER]. You will see the number of chips worth $HIGH and $LOW picked from each bag, but not the person who picked the chips.

If you choose the COLOUR_1 bag, everyone will get to see one of the chips in the COLOUR_1 bag, and everyone will still know that there are 6 $HIGH and 6 $LOW chips in the COLOUR_1 bag.

If you choose the COLOUR_2 bag, everyone will get to see one of the chips in the COLOUR_2 bag, and everyone will know more about how many $HIGH and how many $LOW chips are in the COLOUR_2 bag.

This might help you in task 3.

[ASK] ARE THERE ANY QUESTIONS?

After every one has made their decision for Task 2, picked from a bag and seen everybody's results from both bags, you will then choose between the two bags for one last time. At the end of the experiment you will select a chip from the bag you chose to determine your earnings for this final choice.

[ASK] ARE THERE ANY QUESTIONS?

We will now distribute the decision sheets.

[DISTRIBUTE DECISION SHEET FOR TASKS 2 & 3]

You can go ahead and make your decision for Task 2 on the first sheet. Remember when you are done you will each pull a chip and then everyone will see which chips were pulled out of which bag.

[SUBJECTS COMPLETE TASK 2]

[COLLECT BLACK INK PENS]

[ASK] Has everyone finished making your decision for task 2?

DISCUSSION

Before you pick from the COLOUR_1 or COLOUR_2 bag for Task 2, you will participate in a discussion and then have the opportunity to revise your decisions. You can keep your decision from before or change it.

You will be separated into 2 large groups. The first group will stay in this room, and the second group will go to __________ (ROOM). Participants with IDs that start with the letters A and B are in the first group and will stay in this room and participants with IDs that start with the letters C and D are in the second group and will move to _________ (ROOM).

In each group half of the participants will be randomly chosen to discuss, and the other half will watch the discussion but not participate. If you are chosen for the discussion, you may say anything you like, as long as you respect the other participants But this is a chance to talk about the decision you are about to make. The discussion participants will sit together. If you are chosen to view the discussion, you will sit quietly and not participate in the discussion. The viewing participants will sit together.

HOW DISCUSSION WORKS

The way the discussion works is like this: If you wish to say something, raise your hand. The moderator will record your identification number, and call on you to speak when it is your turn. The discussion will be audio (but not video) recorded, and later written down. Only your identification number will be recorded. You will not be identified by anything you say. The discussion will last about 15 minutes.

You can now separate into your groups and ________ and ________ will show you where to sit.

[SEPARATE PARTICIPANTS INTO GROUPS]

Participants with IDs starting with A/C will be participating in the discussion while participants with IDs starting with B/D will be viewing the discussion but not participating.

[SETUP DISCUSSION SEATING]

You can now begin the discussion. If you would like to speak, please raise your hand and wait until the moderator calls on you to speak. He/she will refer to you by your ID number only. Remember that when you are finished you will be making another decision.

[SUBJECTS COMPLETE DISCUSSION]

Now that the discussion is complete, you can change your decision in Task 2 if you wish to do so. Place an X next to the bag you prefer on the same sheet, even if you even if you prefer the same bag.

[DISTRIBUTE BLUE INK PENS]

[SUBJECTS COMPLETE TASK 2 - REVISED]

[COLLECT BLUE INK PENS]

[ASK] Has everyone made their final decision for task 2?

You will now privately pick a chip from a bag based on your final decision for Task 2. You will pick in the order of your ID number. You will pick a chip from the bag you chose, observe it and hand it to me. I will take a note of it then place it into the closed box next to the bag. You will be paid this amount at the end of the session. After you have finished pulling from the bag, please return to your seat. Remember not to talk or communicate with the other participants.

We will start with participants with IDs starting with A/C followed by participants with IDs starting with B/D.

[SUBJECTS INDIVIDUALLY PICK FROM BAGS AND HAND IN DECISION SHEET]

Now that you have all pulled a chip from your chosen bag, we will reveal the chips that were pulled in each bag. The results will be shown on this poster.

[REVEAL RESULTS: FOR EACH BAG, PULL A CHIP FROM THE BOX, SAY THE VALUE OF THE CHIP OUT LOUD AND WRITE THE VALUE OF THE CHIP ON THE POSTER].

TASK 3

Now that you have seen the results of task 2, you will make one final decision. You have been given a decision sheet for this choice. You are asked to choose which bag to pick a chip from.

[DISTRIBUTE GREEN INK PENS]

Go ahead and complete this task.

[SUBJECTS COMPLETE TASK 3]

Has everyone finished making their final decision? We will now collect your decision.

[COLLECT DECISION SHEET FOR TASKS 2 & 3]

[COLLECT GREEN INK PENS]

SURVEY AND PAYMENT

Now that you have completed all tasks, you will be directed to one of the assistants to complete a short survey. Once you have completed the survey, you will go to ___________ (TABLE/ROOM) where you will be paid privately.

Remember you are being paid for all three decisions. For tasks 1 and 3, you will pull a chip from a bag based on your decision to determine how much you will earn for these tasks. We already know what you earned for task 2. We will add up your earnings for all three tasks and this will be your total earnings for your decisions. After you are paid you are free to leave.

[ASK] ARE THERE ANY QUESTIONS?

Thank you for participating in our study. You can now proceed to answer the survey.

[DIRECT SUBJECTS TO COMPLETE SURVEY]

[DIRECT SUBJECTS TO PAYMENT AREA]

1130, rue Sherbrooke Ouest, bureau 1400, Montréal (Québec) H3A 2M8
Tél. : 514-985-4000 • Téléc. : 514-985-4039
www.cirano.qc.ca • info@cirano.qc.ca

Centre interuniversitaire de recherche en analyse des organisations
Center for Interuniversity Research and Analysis on Organizations