Bilinguals in the Lab: (Why) Does Randomising Language Affect Cooperation?

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Abstract

Most people speak at least two of the world's 7,000 living languages, permitting a causal answer to an old question: does your language influence your choices? We test this by randomising the language of a public goods game for bilingual subjects in Uganda. To avoid cherry-picking unrepresentative findings, we preregister a replication of a previous experiment. By design we exclude both grammar and proficiency as confounds. We find language causes a 30% difference in cooperation between languages, within 0.1% of the original study. Unlike previous work, we explore three possible mechanisms for this difference. First, language could change expectations, acting as a coordination device for conditional co-operators. Second, language could activate associated cultural norms. Third, language could directly affect preferences. We are able to exclude both norms and expectations as mechanisms. Norms do not vary by language, and expectations vary in the wrong direction. Rather, language seems to affect one's own social preferences. The effect is in line with anthropological work on relevant cultural values. Subjects are more selfish when speaking Lugishu than when speaking Luganda. This matches the autonomous cultural values of Lugishu's original speakers: the Gishu. Our results show language has profound, predictable and direct effects on preferences.

Keywords: Norms, expectations, language, cooperation, preferences
JEL Codes: C71, C92, O12, R10

For the Pre Analysis Plan, please see Clist, Paul and Joshua Hill. 2019. "Pre-Analysis Plan for A Public Goods Game in Urban Uganda." AEA RCT Registry. September 09. `https://doi.org/10.1257/rct.4616-1.0`

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1 Introduction

Whether your language affects your choices is an age old question. There are currently 7,105 known active languages across 200 nations (Lewis et al., 2013), demonstrating the relevance of language and its potential to explain global differences in preferences. Indicative evidence from cross-country and observational studies report that language explains a large fraction of cross-country differences in revealed preferences (Chen, 2013; Jakiela and Ozier, 2018; Galor et al., 2018; Roberts et al., 2015). Multilingualism is a global norm and daily necessity for the majority of the world (Crystal, 2012). Unlike cross-country studies, experiments using bilinguals allows us to causally show the impact of language on choice. Experimental studies show randomising the language for bilinguals causes differences of up to 30% (Clist and Verschoor, 2017; Li, 2017; Lambarraa and Riener, 2015). This method not only allows language effects to be distinguished from other cultural aspects, but also permits an investigation into the underlying mechanism driving observed differences in revealed preferences.

This paper investigates the mechanism driving observed differences in cooperation by language. We propose a model whereby an individual's choice is based on their intrinsic norm-free preference and sensitivity to both norms and expectations. We investigate each as a potential mechanism, measuring norms and expectations directly and inferring intrinsic preferences. Grammar and language proficiency are also potential mechanisms, but these are excluded by design. 'Neo-Whorfian' studies consider the extent to which linguistic relativity influences cognition, particularly concerning time, gendered nouns, and computation (Boroditsky and Gaby, 2010; Boroditsky et al., 2003; Frank et al., 2008). Similarly language proficiency and whether a language is native are both important factors (Boroditsky, 2001; Boroditsky et al., 2003; Athanasopoulos, 2006; Athanasopoulos and Kasai, 2008). As there is already a substantial literature in this area, we eliminate grammar and proficiency as potential mechanisms by using two native languages from the same family and ensure subjects are equally proficient in both.

Social identity research has highlighted that individuals can have multiple identities, each being associated with different social categories, which in turn have multiple sets of intrinsic preferences (Akerlof and Kranton, 2000). This model has been meaningfully applied to a range of topics, including gender, economic development, public good provisioning and in-group coordination (Akerlof and Kranton, 2000; Basu, 2006; Akerlof and Kranton, 2010; Chen and Chen, 2011). Previous studies have shown that changing the language of a bilingual produces significantly different behaviours (Clist and Verschoor, 2017; Li, 2017; Lambarraa and Riener, 2015), but have not directly test whether this can be attributed to multiple sets of intrinsic preferences, such as altruism. We argue that language can act as a frame or subtle prime affecting intrinsic preferences (Weber et al., 2004; Benjamin et al., 2010). Given the external relevance of language, such a finding would be an exciting development in terms of understanding real-world decision making. However, norms and coordination ('expectations') are also potential mechanisms.

Consistent with literature investigating norms, we define norms as a commonly held view about what is considered to be appropriate behaviour in a specific scenario and culture (Bicchieri, 2010). Experimental studies have shown that norms can explain behaviour in dictator games public goods, trust and ultimatum games and discriminatory behaviour (Krupka and Weber, 2013; Kimbrough and Vostroknutov, 2016; Barr et al., 2018; Fehr and Schurtenberger, 2018).

There is strong evidence that the use of frames in social dilemma games can affect behaviour (Liberman et al., 2004; Camerer, 2011), but little research which considers whether language has a similar impact on decision making. Each language may have a different set of norms, making certain behaviours more or less socially acceptable and affecting revealed preferences.

We refer to expectations as an individual's belief about the degree to which others obey a specific norm. Individuals may commonly acknowledge a norm exists, but may adhere to that norm to differing degrees (Bicchieri, 2010). Expectations about norm following act as a coordination device (Rabin, 1998; Fehr and Schmidt, 2006). There is evidence which suggests that frames act as coordination devices in a Prisoners' dilemma (Ellingsen et al., 2012) or that they directly affect intrinsic time and risk preferences (Benjamin et al., 2010). Language may act as a frame, signalling different sets of expectations about norm adherence and thus influencing revealed preferences.

To distinguish between these mechanisms, we pre-register our experimental design and empirical approach to enhance the validity of our findings and rule out publication bias. We then replicate and develop Clist and Verschoor (2017) (which has the largest effect size) by conducting a lab-in-the-field experiment in Uganda. We randomise the language of a Public Goods Game amongst bilinguals using the extensively adopted one-shot version to measure cooperation (Zelmer, 2003; Cardenas and Carpenter, 2008; Levitt and List, 2007). We ensure all subjects are bilingual and that the expectations of partner identity were kept as consistent as possible. We then extend the original design in three key ways. Firstly, we measure norms using the Krupka and Weber (2013) four-point norms elicitation method. The method is a pure coordination game (Mehta et al., 1994), thus making it incentive compatible to reveal shared norms. This approach has since been widely adopted and/or adapted (Kimbrough and Vostroknutov, 2016; Gächter et al., 2017; Barr et al., 2018; Chang et al., 2019). Secondly, we measure expectations on in-session choice behaviour in the PGG (see Fischbacher and Gachter (2010) for overview). Lastly, we depart from the original study by using university students in Kampala rather than a rural farming community near Mbale. This urban setting allows for an insight into how widespread language-level differences in cooperation are, as well as to test the robustness of any effect.

We have three main results. First, we show that subjects contribute 28.9% more in the national language (Luganda) than in the local language (Lugisu). This effect size is within 0.1% of the original Clist and Verschoor (2017) study, who report a difference of 28.8% and is in line with with anthropological literature (Heald, 1989). As we replicate in an urban setting and pre-register this demonstrates a consistent and robust effect.

Second, we can rule out norms as a mechanism. Elicited norms are 'hump-shaped' and are almost identical in both languages across all contribution levels.

Third, expectations are slightly different, but do not explain contribution behaviour. Subjects wrongly expect greater cooperation when they play the game in the tribal language (De Oliveira et al., 2015; Fischbacher and Gachter, 2010; Fischbacher et al., 2001). Rather than conditional cooperation, they appear to display wishful thinking.

This leaves intrinsic preferences as the mechanism. In Lugishu people do not contribute less because they expect others to give less (conditional cooperation) nor because of general social norms, but rather because they prefer to give less (Benjamin et al., 2010; Ellingsen et al., 2012).

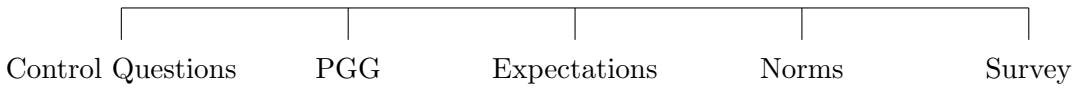
Language affects one's choices by directly affecting one's preferences.

The paper proceeds as follows. Section 2 presents the research design, section 3 the model and empirical considerations, section 4 the results and section 5 concludes.

2 Research design

In this section we outline our experiment, as summarised in figure 1. Once subjects enter the room, they hear an explanation in the randomly allocated language of that session.

Figure 1: Experimental Design



2.1 Location, sample and screening

We follow the work of Clist and Verschoor (2017) by limiting the sample to those that speak Lugishu and Luganda. We depart by conducting the experiment in Uganda's capital Kampala, as opposed to rural areas in Bugishu (the homelands of the Bagishu). We run our experiment across 14 sessions, with an average size of 25.7 subjects. Each session is randomly assigned one of the two languages (Luganda or Lugisu) and there is an equal number of sessions for each language. Our sample of 360 comprises 200 over 8 sessions from Makerere University and 160 over 6 sessions from Kyambogo University. Both have a sizeable Bagishu population.

A constant set of facilitators deliver a script that has been carefully translated and backtranslated to ensure consistency. All facilitator roles are maintained across both session languages to ensure comparability, though all are proficient in both languages. The assigned session language is used in *all* communication of that session (between facilitators, and from the first interaction to the last). Subjects are pre-screened before the experiment to gauge their ability to partake in the experiment (in either language).

The experiment is conducted by the Field Lab (https://thefieldlabuganda.com), which is based in Mbale (a city in the Bugishu region), naturally aligning with our target population. Facilitators explain this when delivering the script and highlight that the experiment is interested in how people that are Bagishu, or from the Bugishu region, make decisions. Though English is the national language of Uganda, Luganda is the primary language spoken in the Buganda region, which includes Kampala. Local informants suggest that if a subject in Kampala speaks Lugishu, they will also be fluent in Luganda. This was confirmed during the pilot. Lugishu is the language spoken at home by 84% of our sample though all reside in Kampala. As such, we undertake all recruitment activities in Lugishu.

To recruit ethnically Gishu subjects (or subjects who have a strong link to the area) we initially use the semi-formal tribal social groups. These groups maintain membership lists which represent the most accurate data of the local ethnic Gishu population for each campus. Willing subjects register in advance and are randomly allocated to a session/language. From our survey

data, 96% of subjects were born in the Bugishu region (111 from urban Mbale and 236 from rural areas). The remaining 4% (13) identify as being ethnically Bagishu.

2.2 Controls and Public goods game (PGG)

We employ a standard linear one-shot two player PGG, which captures each participant's preference for cooperation. Subjects must trade off their own payoff and the social benefit, which is explained to subjects as a choice of how much to allocate to the 'common basket' and 'private envelope'. Both individuals in the pair are endowed with 12,000 Ugandan Shillings. At the time of the experiment this is equivalent to around £2.70 or $3.25, about two days income for an average Ugandan. The experiment lasts approximately an hour. Player 1's payoff (V_1) is calculated as:

$$V_1 = 12,000 - C_1 + 0.75(C_1 + C_2) \tag{1}$$

where C_1 is their contribution to the joint fund and C_2 is the contribution from player 2. Each player can earn between 9,000 and 21,000 Ugandan Shillings, with the minimum and maximum pay out per pair totalling 24,000 and 36,000 Ugandan Shillings respectively. The 'common basket' represents the group fund, (C_1 + C_2) multiplied by 1.5. 'Private envelopes' represent the amount of the initial endowment retained (12,000 — C_1).

In order to ensure subjects have fully understood instructions, the three corner solutions are used as the basis for control questions (C_1/C_2: 12,000/12,000, nil/nil and 12,000/nil). The first two control questions are solved jointly to aid understanding, and the third individually. Eleven subjects (3%) answered less than 30% of the third control question steps correctly, and are excluded from the analysis (as outlined in the pre-analysis plan). On completion of the control questions, subjects make their contribution decision: splitting 12,000 between their private envelope and a common basket (in an increment of 3,000).

2.3 Expectations, norms and survey

After the contribution selection, the expectations and norms for each contribution level are measured. Subjects are incentivised in both instances, being able to earn a bonus 4,000 Ugandan Shillings if their answer is correct. Before answering the survey, a random question from the expectation/norm sections is selected to determine which question is used for payment.

For the expectation question, subjects are asked to guess the percentage of people in their session that gave the various amounts (0 to 12,000 in 3,000 increments) to the common basket. Subjects earn the bonus if that question was selected and their guess was within 10% of the actual answer. For norms, subjects are asked to rank how socially acceptable each of the contributions are, using the now standard Krupka and Weber (2013) method. We employ a four-point scale; very socially unacceptable (- -), somewhat socially unacceptable (-), somewhat socially acceptable (+) and very socially acceptable (++). We use the whole distribution of possible choices. Subjects earn the bonus if they choose the most popular option. Note that while Krupka and Weber (2013) uses distinct samples, we follow d'Adda et al. (2016) and Erkut et al. (2015) in using the same sample for norms and contribution decisions. Subjects are only

eligible for this bonus if they only select one option for each scenario.

While payoffs are being calculated towards the end of the experiment, subjects are asked to complete an exit survey. Each question is read aloud, giving time for subjects to write their answers. Payment is made to subjects after completion of the survey and marks the end of the experiment. Table 1 reports summary statistics, including variables from the survey data. A full English script, answer sheet and survey questions, including encoding, are included in the appendix.

Table 1: Summary Statistics

	Language			
	Luganda	Lugisu	Total	p-value
Female	0.38	0.37	0.37	0.001***
	(0.49)	(0.48)	(0.48)	
Age	22.28	22.27	22.28	
	(2.08)	(2.32)	(2.20)	
Years in Kampala	0.90	1.130	1.01	
	(0.76)	(0.76)	(0.77)	
# people known in session	3.48	3.11	3.30	
	(3.84)	(3.02)	(3.45)	
N	172	177	349	

Note: Mean values and standard deviations are shown. P-value are for a omnibus balance test. This test was not pre-registered. *** p<.01, ** p<.05, * p<.1. Age is capped at 30.

3 Model and empirical considerations

Research that looks at norms often has some variant on the following standard model of norm-dependent preferences:

$$U_i(a_c) = V_i(a_c) - \gamma_i N(|a_c - a_c^*|) \tag{2}$$

where individual i must decide upon some action a_c, balancing direct ('norm-free') utility $V_i(a_c)$ against disutility that comes from deviating from some norm a_c^*. N is a strictly convex increasing function and γ captures norm sensitivity. This framework comes from a focus (though not exclusive) on dictator games, where expectations do not play a role as one's utility is not determined by the other player's actions (Krupka and Weber, 2013; Kimbrough and Vostroknutov, 2016; Akerlof and Kranton, 2000; Benjamin et al., 2010; Cappelen et al., 2007; Chang et al., 2019). Our interest is in examining norms in a public goods game, where both norms and expectations are likely to be relevant.

We augment equation 2 with an analogous term that captures the disutility in taking an action which is expected to be unpopular. E is a strictly convex increasing function and δ captures sensitivity to expectations, given the expected popularity of action a_c^e.

$$U_i(a_c) = V_i(a_c) - \gamma_i N(|a_c - a_c^*|) - \delta_i E(|a_c - a_c^e|) \tag{3}$$

There is often a loose boundary between norms and expectations, with overlap between

them. For example, Fehr and Schurtenberger (2018) reviews a substantial literature and argues that the norm of conditional cooperation is able to rationalise most of the evidence from public goods games (see Bicchieri, 2005, 2016, for related discussions). Here, the 'norm' is essentially an argument that *expectations* will influence behaviour: the norm of conditional cooperation is an expectation-based norm.

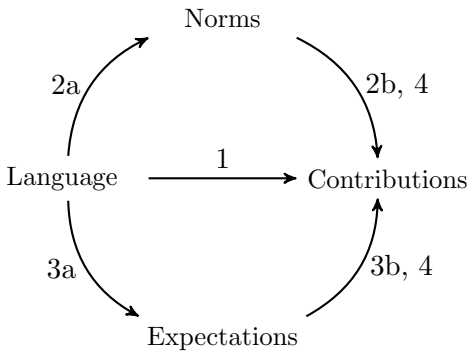
In our usage, we can be concrete about the terms by linking them directly to the data we will capture and how that is elicited. For the norms questions, subjects are attempting to guess the most popular option in their session. They are paid if they do so, and they know others are also engaged in the same pure coordination game (in the spirit of Mehta et al., 1994). For expectations, subjects are incentivised to correctly guess (within 10 points of) the percentage of subjects in their session that will contribute a given amount.

Conceptually, these are different propositions. It is perfectly possible for these two measures to be separate or dependent. For example, it might be common knowledge that there is a Gishu norm of low cooperation (Heald, 1989) which is recognised when subjects speak Lugishu, which is not the same as expecting others will feel bound by that norm. The difference between expectations and norms is of particular relevance in our study area. Clist and Verschoor (2017) found suggestive evidence that differences in contribution behaviour was not driven by conditional cooperation. Rather, when speaking Lugishu subjects were more likely to act as unconditional non-cooperators, and when speaking Luganda they were more likely to act as unconditional cooperators. Here, we will measure both expectations and norms directly, and test their strength.

3.1 Empirical Strategy

All analysis was preregistered (Clist and Hill, 2019). Within each family of hypotheses, we control for the number of tests conducted, controlling the FWER using the Hochberg procedure implemented in Stata by Newson (2010). We adopt the 5% significance level for all decisions, using the appropriate q values. Figure 2 summarises the testing families for our FWER approach and empirical tests.

Figure 2: Families of hypotheses



Family 1 simply tests whether language affects contributions in the public goods game, i.e. comparing $U_i(a_c)$ by language. We start with a parsimonious regression, with standard errors

clustered at the session level. Given the anticipated small number of clusters, we use wild cluster bootstraps as implemented by Roodman et al. (2019). The first regression will use the basic set up:

$$Y_i = \alpha + \beta Language_i + \epsilon_i$$

where Y_i is the contribution to the common pot. This is considered both with and without controls.

Moving to family 2, we ask whether language affects contributions through norms. As shown in figure 2, this is a two-part hypothesis: first, that language affects norms (2a), and in turn that norms affect contributions (2b). We offer three FWER strategies: the first controlling for family 2 as a whole, and the second for each sub set (2a and 2b) separately.

Family 2a tests whether norms differs by language. The standard approach (Krupka and Weber, 2013; Chang et al., 2019) has been to conduct a series of rank sum tests, to see whether the norm ratings differ between two groups. A concern here is that the series of tests mean that false positive results are made more likely. As such we follow the standard approach, but control for five tests. In translating a norm rating to a numerical scale we follow Krupka and Weber (2013) in coding the norm ratings as -1, -1/3, 1/3 and 1. In the language of (3), this is a test of $N(|a_c - a_c^*|)$ by language for $c = [0, 12]$.

The question for 2b is whether norms affect contributions, effectively testing γ parameter in (3). We follow Gächter et al. (2017) in modelling unobserved heterogeneity in the response to the treatment-level norm by using a mixed logit. The result is an estimated mean and standard deviation for γ. We include the level of the contribution as a control. If people were purely selfish and only constrained by norms, this would have a negative coefficient. However, we have no prior expectations over this parameter. It is worth noting that the identification of the effect of norms will be in relation to this linear effect of contributions.

Moving to family 3, we ask whether language affects contributions through expectations. As in family 2, we provide 3 FWER strategies: a, b and joint, and do not control for the other mechanism. The 3a mechanism is analogous to family 2a, and so we keep all tests the same. There are differences in the nature of the data: norms is a four-point scale, whereas expectations could be any percentage that is a multiple of 10 between 0 and 100. However, pilot experiments lead us to expect a similar level of variation, with most guesses likely to be in the 10-40% range. To keep comparability with 2b, we will approach expectations in the same way as norms: as averaged over the entire treatment for a given contribution level (in family 4 we will return to the issue of individual level expectations/norms). This means we are not at this stage asking whether a given individual is a conditional cooperator. Rather, we ask whether the session-level differences in contributions can be explained by the session-level differences in expectations, as would be expected if conditional cooperation plays a part in determining behaviour.

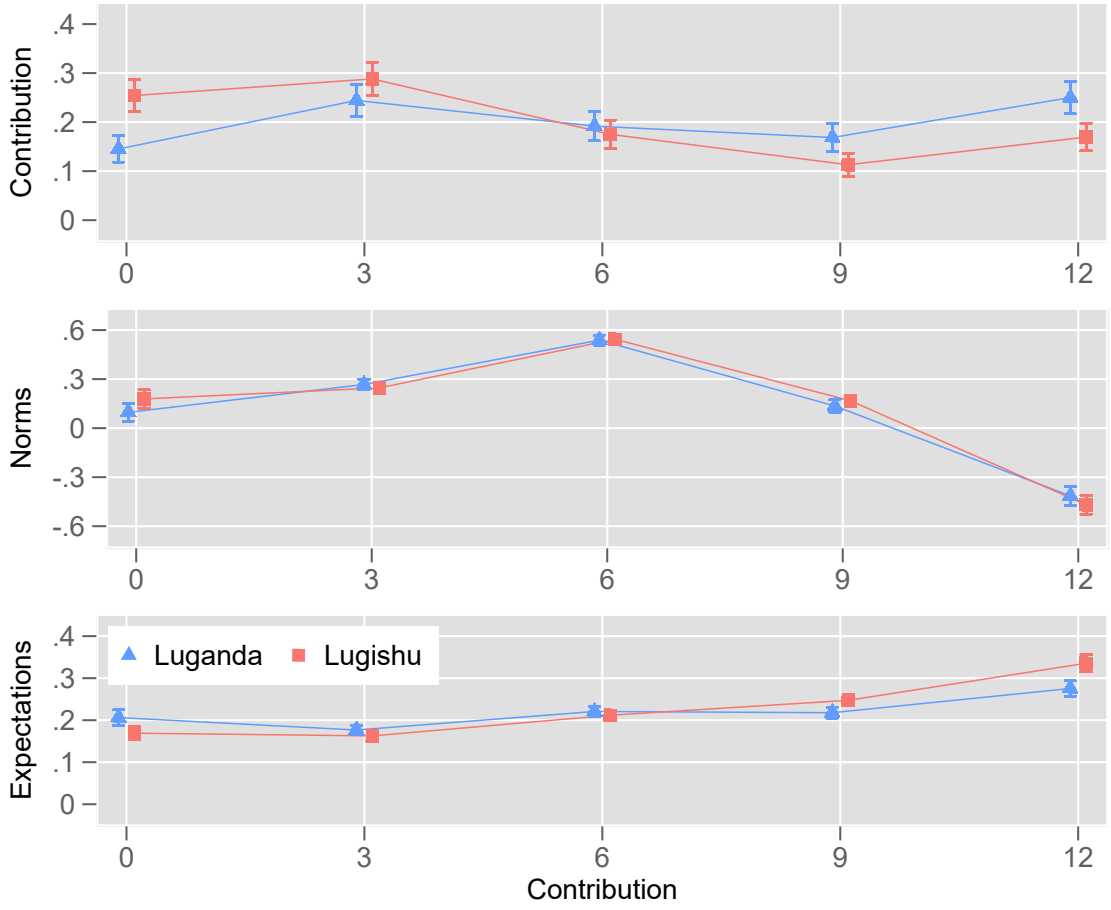
Moving to family 4, we consider the effects on norms and expectations on contributions at the same time. In testing family 4, we present two strategies. First, we follow the standard approach of the norms literature (e.g. Krupka and Weber, 2013) by including treatment-level ratings, in our case for norms and expectations. Second, we depart by running the same tests but using individual-level ratings. This second test is able to show whether individuals are

conditional cooperators, and whether they feel bound by the norm as they perceive it.

4 Results

The average contribution in Luganda is 6.40 and in Lugisu is 4.97. Figure 3 shows contribution decisions, norm ratings and expectations across the distribution by language. The top panel shows that contributions are higher in Luganda. There is no obvious difference in norms, and subjects expect others to be more generous in Lugishu sessions.

Figure 3: Average Contributions, Norms and Expectations, by Session Language



Moving to the statistical tests, table 2 shows the language difference is significant at the 5% level, even after calculating wild cluster bootstrapped p values and correcting for multiple hypothesis tests. The effect size is 28.9%. This replicates the previous finding that people give more in the national language than in the local. The effect size is *remarkably* close to the effect size in Clist and Verschoor (2017), who report a difference of 28.8%.

4.1 Norms and Expectations: Differences by Language

Table 3 reports the norm ratings by language. Following Krupka and Weber (2013), the scale runs from -1 to 1, denoting 'very socially unacceptable' and 'very socially acceptable', with mid

Table 2: Does Session Language Affect Contribution Choice?

	(1)	(2)
Lugishu Session	-1.435**	-1.469**
	(-2.74)	(-2.73)
Female		0.0814
		(0.17)
Age		0.117
		(0.90)
Years in Kampala		0.127
		(0.43)
# people known in session		-0.0173
		(-0.31)
Constant	6.401***	3.701
	(19.09)	(1.28)
Wild-Cluster Bootstrap p-value	0.026	0.029
Hochberg q-value	0.029	0.029
N	349	349

Note: t statistics in parentheses. *** p<.01, ** p<.05, * p<.1. The dependent variable is the contribution to the common pot in thousands of Ugandan Shillings, and spans 0-12 in increments of 3.

points ($\pm 1/3$) referring to 'somewhat'. As clear from the middle panel of figure 3, there is very little difference in norms by language. Table 3 shows that, once multiple testing corrections have been applied, the resulting q values are above 0.995. The is strong evidence against the idea that norms differ by language.

It is interesting to note the shape of norms: the most socially acceptable action is to give half of the endowment to the common pot, even though the midpoint was not mentioned in the script. More surprisingly, people correctly state that the norm is not to give everything. In fact, contributing everything is the least socially acceptable action, with an average rating of -0.44. 'Hump' players are well documented (Fischbacher and Gachter, 2010; Fischbacher et al., 2001), where individuals behave like pure altruists when contributions are high and like conditional cooperators when contributions are low. Kimbrough and Vostroknutov (2016) also find a hump-shaped norms distribution in a PGG when applying the Krupka and Weber (2013) elicitation method.

The hump in norms is not due to misunderstanding. The experiment was well understood, with 52% of subjects correctly guessing the most common appropriateness level (comparable to 55% in Krupka and Weber (2013)). Further the instructions were also correctly interpreted; only 11 of 360 subjects (3%) failed the control questions.

Table 3: Norm differences by session language

	Norm Rating								Test Stats.	
	Luganda				Lugisu				Rank Sum	
Contribution	-1	-1/3	1/3	1	-1	-1/3	1/3	1	p value	q value
0	32	43	51	46	33	42	35	67	0.25	0.9956
3	3	36	108	25	3	36	119	19	0.65	0.9956
6	1	9	98	64	0	9	103	65	1.00	0.9956
9	6	65	75	26	1	67	84	25	0.60	0.9956
12	94	32	19	27	108	25	16	28	0.35	0.9956

Note: N=172 for Luganda, and 177 for Lugisu. The q value refers to the multiple hypothesis corrected p-values, using the Hochberg procedure.

Moving to expectations, table 4 reports the mean and standard deviations of expectations by language for each contribution level. As is clear from the bottom panel of 3, there is a small difference. In Lugishu, more people are expected to contribute the full amount (34.6% versus 27.7%), and fewer people are expected to contribute nothing (17.2% versus 21.9%). Table 4 shows that individual tests do show one significant difference at the 5% level, but this does not survive the multiple testing hypothesis correction.

Table 4: Expectations, by Session Language

	Luganda		Lugisu		Test Stat.	
Contribution	Mean	sd	Mean	sd	p value	q value
0	20.6	23.1	16.9	21.1	0.08*	0.24
3	17.7	13.8	16.3	12.8	0.38	0.61
6	22.1	15.5	21.2	15.0	0.61	0.61
9	21.8	16.7	24.7	17.6	0.05*	0.22
12	27.5	23.6	33.6	27.0	0.05*	0.22

Note: The test statistic comes from a rank sum test. The q value refers to the Hochberg multiple hypothesis testing procedure.

Together, these results show that while there are significant differences in contributions by language, there is not a significant difference in incentivised norm ratings or expectations. This rules out norms and expectations as the mechanism, suggesting that language affects internalised preferences (cf. the effects of framing, where frames cannot affect people who have fully internalised the frame-related preferences: Benjamin et al., 2010). In effect, subjects have multiple sets of preferences which are activated by the language.

4.2 Norms, Expectations and Contributions

Table 5 reports a number of mixed logit regressions, in which the unobserved heterogeneity in norm or expectation sensitivity are estimated (first separately and then jointly). In each case a linear effect of contributions is included as a control: if people were selfish this would be negative. The identification of the effect of norms and/or expectations here is done at two

different levels, across the different contribution intervals. 'Treatment level' denotes the average norm and/or expectation rating for that language. This is how Krupka and Weber (2013) identifies the effects of norms. However, as we use the same sample to make decisions and elicit norms and expectations we have an additional option. 'Individual level' denotes how a subject responds *to their own* norm ratings and expectations. A conditional cooperator would have a positive coefficient, as they would be drawn towards what they expect others to do. Likewise, norm-followers would have a positive coefficient on norm ratings: responding positively to the norm as they see it.

At the treatment level, for norms, there is not a significant effect, but there is some evidence of heterogeneity. For expectations, there is strong evidence of heterogeneity, with a q value of 0.00001 on the standard deviation element of expectations. This means that people have varying degrees of sensitivity to expectations, δ in the language of (3). Despite the heterogeneity implied, it is striking that the mean point estimate for expectation sensitivity is negative (-8.724). This means that, controlling for the linear selfishness or selflessness, people tend to be less likely to do things if they expect others to do them. This is the opposite result to conditional cooperation. The effect is clear in figure 3. The least expected behaviour is to contribute 3,000 shillings, but this is the most popular behaviour. We now move to examining expectations and norms together.

Table 5: Mixed Logit for sensitivity to norms and expectations to contribution

	Treatment Level			Individual
Mean				
Contribution	-0.0394**	0.0375	0.0300	-0.0371**
	(-2.05)	(1.42)	(1.07)	(-2.28)
Norm	-0.161		-0.692*	-0.279**
	(-0.71)		(-1.71)	(-2.50)
	[0.48]		[0.35]	[0.06]*
Expectation		-8.724***	-14.22***	-0.244
		(-2.97)	(-3.81)	(-0.53)
		[0.002]***	[0.001]**	[0.60]
SD				
Norm	1.274*		2.899***	0.878***
	(1.86)		(3.87)	(3.12)
	[0.13]		[0.001]***	[0.01]**
Expectation		-16.82***	8.483	0.931
		(-4.49)	(1.18)	(0.62)
		[0.00001]***	[0.60]	[0.60]

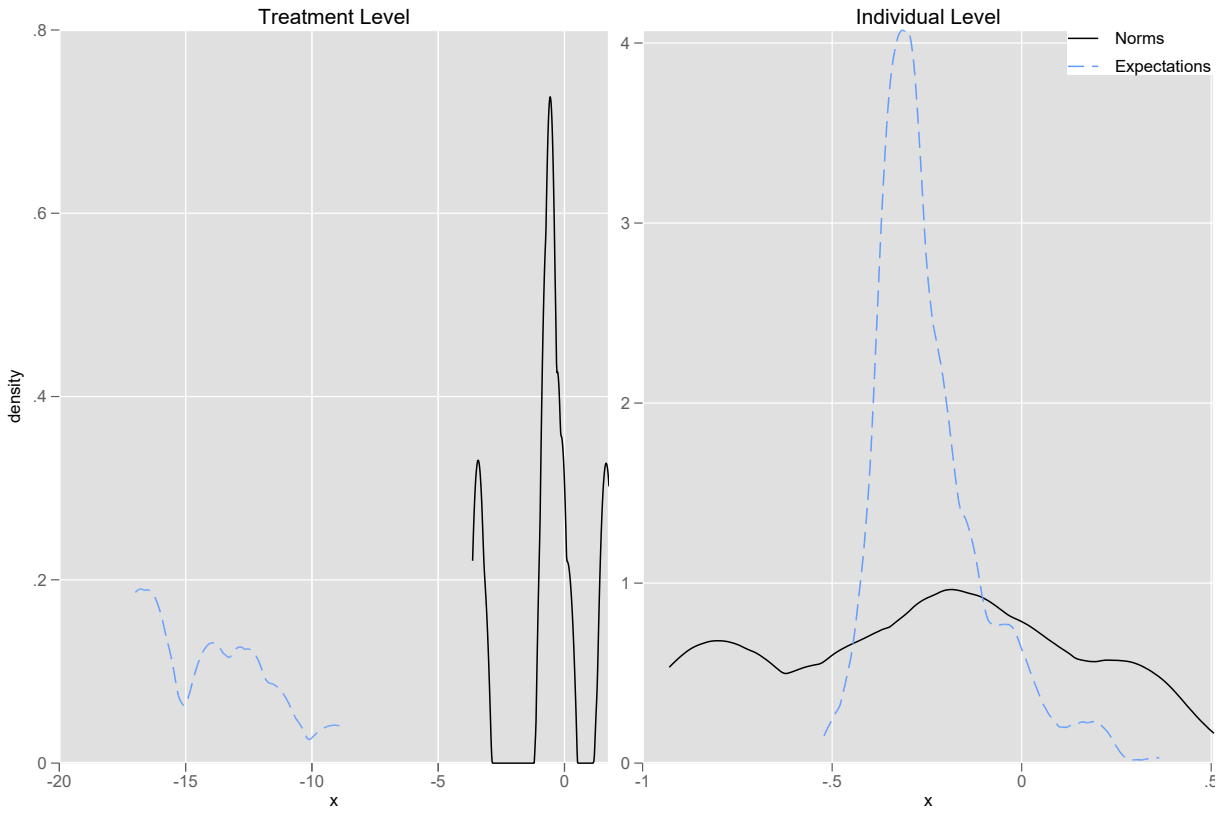
Note: This makes use of the `mixlogit` command in Stata (Hole, 2007). t statistics are included in parentheses. q values are in square brackets and refers to the Hochberg multiple hypothesis testing procedure. *** $p < 0.01$, ** $p < .05$, * $p < .1$. N=1,660.

The two rightmost columns of table 5 show the likelihood of a given choice modelled as a function of the contribution itself (which would be negative for selfish types), norms and expectations. This has been calculated at both the treatment and individual level and heterogeneity is allowed in the sensitivity to norms and expectations.

Starting with the treatment-level variables, table 5 shows the average subject is more likely to rebel against norms and expectations than conform to them. The coefficient estimate for expectations (-14.22) is large and significant, with large but insignificant heterogeneity (8.483). By contrast the point estimate for norm sensitivity is small (-0.692) and insignificant, but the heterogeneity is larger (2.899) and significant. The difference is partly because of the range of the two variables: norms range from -1 to 1, whereas expectations can range from 0 to 100. In terms of marginal effects, for a 1 unit increase in the social acceptability of a norm the likelihood of a individual choosing an option reduces by 1%. For a 10% increase in expectations, an individual is 19% less likely to choose an option.

Figure 4 makes clear the distribution of parameters. At the treatment-level there are some norm-followers, but the majority are either relatively indifferent or more likely to diverge than conform.

Figure 4: Heterogeneity in sensitivity to norms and expectations



Note: we use 1,000 replications to plot the distribution of parameters. This makes use of the `mixlogit` command in Stata (Hole, 2007).

Moving to individual level sensitivities, the heterogeneity is again evident. The only coefficient to survive the (stringent) multiple hypothesis tests for the individual level variables is the spread of norm sensitivity. Figure 4 makes this clear, with 23% of people having a positive estimated norm sensitivity to their own understanding of the norm. Only 4% of people have a positive estimated expectation sensitivity parameter. This contrary behaviour is evident in the descriptive statistics shown in figure 3. However, it is remarkable that people are non-conformists even to their own expectations and norms.

5 Discussion & Conclusion

Until recently, multilingualism and the associated effects on behaviour has received little attention by economists, despite its relevance in daily life for the majority of the world. A small number of 'neo-Whorfian' studies show cross-country differences, reporting correlations between language features and real world outcomes or survey responses in time preferences, gender discrimination and hierarchy (Chen, 2013; Jakiela and Ozier, 2018; Galor et al., 2018). A distinct, and more promising, literature has shown differences in lab or field experiments when language is randomised and subjects are bilingual (Clist and Verschoor, 2017; Li, 2017; Lambarraa and Riener, 2015). However, none of the above are preregistered which may signal publication bias.

We initially contribute to this literature by replicating a previous result: subjects do indeed give more in a public goods game when they are randomly allocated to play the game in their the national language (Luganda) than in their local language (Lugishu). Not only do we find the same result to be significant, the effect size is practically identical (28.9% versus a previous result of 28.8%). Our replication changed various factors, including the site (the capital city rather than a rural area), and subject pool (students rather than rural Ugandans), making the underlying result substantially more credible.

We also expand the existing literature and explore mechanisms. Using recent innovations in incentive-compatible elicitations of norms, we show that norms are virtually identical across the two languages. People do not have different revealed preferences in different languages because they are responding to different norms. We also test whether expectations differ by language. There is an insignificant difference, but we can also reject this as a mechanism. People are found to flout, rather than conform, to expectations. This is true both at the treatment level, but also at the individual level. In other words, people are *less* likely to take an action when others or they themselves find it to be normative or popular. Ruling out norms and expectations, we infer inherent preferences as the mechanism: language is a subtle 'prime', making a specific category more salient (Benjamin et al., 2010). Individuals have multiple sets of preferences, such as altruism, for each language they use.

Our results may have implications for how we understand the importance of language in everyday life. The Ugandan context is typical of many developing countries (Crystal, 2012), with most people communicating in multiple languages each day. We find the language in which an interaction takes place (keeping expectations over one's partner's identity constant) is important: a 30% difference in cooperation. If this is representative of daily life, multiple languages may mean multiple possible outcomes.

The size of the language-effect is also put into context when considering debates over country-level differences in stated preferences. Falk et al. (2018) report differences in positive reciprocity between Uganda and neighbouring Kenya of 0.13 standard deviations. In an incentivised experiment, we find differences in cooperation levels of 0.33 standard deviations. This illustrates that we identify a difference in cooperative behaviour that is not just significant, but large. The language in which people interact matters. In other situations this could conceivably operate through differences in norms or expectations. However, the Gishu prefer to be unconditional cooperators in the national language and unconditional non-cooperators in their own.

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Appendix from the Pre-Analysis Plan

6 Proposed timeline

A small pilot was completed in April 2019, with the full experiment scheduled for September 2019. This will be run by the Field Lab (`https://thefieldlabuganda.com/`) with support from the authors.

7 Funding

Funding for this study have been provided by the Centre for Behavioural and Experimental Social Science, UEA (`https://www.uea.ac.uk/cbess`). No other funding is attached to the project. Ethics approval for both the pilot and full study has been granted by the International Development Ethics Committee, University of East Anglia.

8 Experimental script (English)

Script: Kampala
Preparation of the experiment

Material needed:

- Pre-regristration sheets
- ID numbers
- A basket
- Two envelopes
- Money
- Paper and pen, data entry sheets, randomisation sheets
- Visual aids (manila paper)
- Box to collect tokens

Brief Explanation For Experimenters Only *We will play a public goods game in Luganda or Lugisu (randomly determined in advance of each session). Each subject will play it only once in one language and it is important that we don't draw extra attention to the fact that two different languages are used. This means all communication in a session must take place in the language of that session (even between experimenters). We need an even number of players in each session as players are paired. If there is an odd number players, choose the last person to arrive and give them a show-up fee of 9,000 Ugandan Shillings and send them away. It is important that subjects do not know who their partner is.*

Pre-screening *In advance of the experimental sessions, pre-screening sessions will have been completed in order to ensure that all subjects have a Bagisu background and that they can speak Lugisu fluently (proficiency in Luganda is assumed, based on local information). During the pre-screening, candidates were asked questions to ensure fluency.*

As subjects arrive *When people enter the meeting room, they are asked for their name and student number as recorded during pre-screening. These should match exactly. If subjects are not pre-registered, they will not be able to participate.*

Their name should then be recorded on the attendance register, alongside their game ID, which we give them on a card. We randomly match subjects, so these ID cards are important. At the end of the experiment, they hand in their card in exchange for their payment. The ID card allows us to identify them during the exercise while guaranteeing complete confidentiality. This is important, as they are able to earn real money in the exercise. Further instructions are given once sufficient people [10 - 30] have shown up.

Formal Introduction

Welcome. Thank you for taking the time to come today. [Introduce Experimenters and Assistants.] Later, you can ask any of us questions during today's programme. For this raise your hand so that we can come and answer your question in private.

We are from the Field Lab in Mbale, and are doing research in Kampala. We have invited you here today, because we want to learn about how people that are Bagishu, or from Bugishu region, make decisions. You are going to be asked to make decisions about money. The money that results from your decisions will be yours to keep.

What you need to do will be explained fully in a few minutes. But first we want to make a couple of things clear. First of all, this is not our money. We belong to a university in the UK, and this money has been given to us for research. Second, participation is voluntary. You may still choose not to participate in the exercise. Third, this is research about your decisions. Therefore you cannot talk with others. This is very important. I'm afraid that if we find you talking with others, we will politely ask you to leave, and you will not be able to earn any money here today. Of course, if you have questions, you can ask one of us. We also ask you to switch off your mobile phones.

Make sure that you listen carefully to us. You will be able to make some money here today, and it is important that you follow our instructions. During today's programme, you will be asked to make several decisions, which will be explained to you very clearly. Now, before we explain what you need to do, it is really important to bear one more thing in mind. The first decision that you will make is not a matter of getting it right or wrong. It is about what you prefer. It is important to think seriously about all your choices because they may affect how much money you can take home.

Explaining the Game

Today, you have randomly been paired with someone else in this room. You will not find out the identity of your partner, and they will not find out any information about you. All decisions

are anonymous. However, we can tell you that your partner is (or was) also a student here at Makerere [*or other university*] and is either a Mugishu or spent time in the Bugishu region. I will explain all of the decisions slowly, and ask you to write down your answers the paper in front of you. You cannot change your answers after they've been written down, so think carefully before you write anything. Any questions that you have can be answered privately.

You will be given 12,000 Ugandan shillings, and you can decide what to do with it. First, we will demonstrate the decision using real money. You will make your choice on paper in front of you. You have two possible options: you can place money in either a private envelope (show) or a common basket (show). You can choose to put some of the money in the common basket, and the rest in the private envelope, but only in intervals of 3,000 Shillings. You can choose to keep this money for yourself, by placing it in the private envelope (show). This is your money to take home with you. There is also a common basket, which both you and you partner can put money in (show). We will add half of the money in the common basket (show). It will then be shared equally between the two players (show).

Recap, together [short, direct answers only]:

- What happens with any money you decide to put in your private envelope? [*You take it home*]
- How much is added to any money you and your partner put in the common basket? [*Half*]
- And after half is added, how do we split the money in the common basket between you and your partner? [*Equally*]

1. Control questions

We will now check for your understanding, using 3 examples. Imagine two people are paired: person A and person B. They would not know who they are paired with. [*Demonstrate with real money, and using the visual aid. Read question number, pause with each instruction to write down, indicating where to write down.*]

***[To be determined during final piloting** - One or two of the following control questions should be solved collectively in the room with discussion. One or two will be answered seperately.]*

1. Imagine that person A chooses to put nothing in the common basket, and everything in the private envelope. And imagine that person B chooses to put nothing in the common basket, and everything in the private envelope. Write on your paper, in the appropriate boxes, how much is in the common basket. How much is there after we have added half. And how much each player goes home with.
2. Imagine that person A chooses to put everything in the common basket, and nothing in the private envelope. And imagine that person B chooses to put everything in the common basket, and nothing in the private envelope. Write on your paper, in the appropriate boxes, how much is in the common basket. How much is there after we have added half. And how much each player goes home with.

3. Imagine that person A chooses to put everything in the common basket, and nothing in the private envelope. But, imagine that person B chooses to put nothing in the common basket, and everything in the private envelope. Write on your paper, in the appropriate boxes, how much is in the common basket. How much is there after we have added half. And how much each player goes home with.

Thank you. These are just examples, you can decide what you prefer. When you make the decision, you can choose an amount, between 0 and 12,000 shillings, to put in the private envelope. You can choose an amount, between 0 and 12,000 shillings, to put in the common basket. Remember that we will pay you real money at the end of the experiment, depending on what you and your partner decide. Please make your choice now, by ticking once for question 4. [*Indicate where on visual aid*]

2. Expectations

We will now ask you questions 5-16 about behaviour in this game. Once you have made all of these decisions on this page, we will randomly pick one question. If you get the answer correct in the question we pick, we will give you another 4,000 shillings as a bonus. Let us remind you that it is very important that you do not talk during the experiment, and that you only mark one box per question. If you mark more than one box you will not be able to receive the bonus.

We will now ask you to make 4 guesses on what people decided in this game. If this question is chosen you could earn another 4,000 shillings on top of the money from the first section of the experiment. You would win the bonus if you are within 10% of the real answer. So, if your guess is good but not perfect, you will still get the bonus.

- For question 5, there are five boxes, each showing difference scenarios.
- The left hand box shows that the entire 12,000 shillings have been placed in the private envelope.
- The right hand box shows that the entire 12,000 shillings has been places in the common basket.
- In each of the boxes, in intervals of 10%, how many people in this room do you think contributed the amounts shown? For example, 0, 10, 20, 30, 40%?

We previously played this game with over one hundred, randomly selected people in Nakaloke sub-county, near Mbale.

- Again, for question 6, there are five boxes, each showing difference scenarios.
- The left hand box shows that the entire 12,000 shillings have been placed in the private envelope.
- The right hand box shows that the entire 12,000 shillings has been places in the common basket.
- In each of the boxes, in intervals of 10%, how many people in Mbale do you think contributed the amounts shown?

3. Norms

Now we will give a series of situations where someone made a decision. I will ask you to consider the different possible choices available and to decide, for each of the possible actions, whether taking that action would be "socially acceptable" and "consistent with moral or proper social behaviour" or "socially unacceptable" and "inconsistent with moral or proper social behaviour."

By socially acceptable, we mean behaviour that most people agree is the "correct" or "ethical" thing to do. Another way to think about what we mean is that if someone were to select a socially unacceptable choice, then someone else might be angry at them for doing so.

If this set of questions is chosen, you could earn another 4,000 shillings on top of what you earned in the first section of the experiment. You would earn that money if you give the same answer as the *most popular choice*. For these questions, we are not interested in your preferences. Rather, we are interested in what you think the *most popular* choice would be.

We will now go through an example. Imagine someone is at a local coffee shop near campus. While there, they notice that someone has left a wallet at one of the tables. Someone sees, and must decide what to do. They have four possible choices, and you need to rate how socially acceptable, "correct" or "ethical" that action is.

[*Read each choice out, ask 'how would you rate that action?' give the 4 possible ratings, and get experimenter 2 to answer using the below scale. Use visual aid throughout*]

	Very socially unacceptable	Socially unacceptable	Socially acceptable	Very socially acceptable
	- -	-	+	++
Take the wallet	X			
Ask others nearby if the wallet belongs to them			X	
Leave the wallet where it is		X		
Give the wallet to the shop manager				X

[Experimenter 2:] I think most people in this room would say 'action' is 'rating'. So I would tick *here*.

Now that we've gone through an example, we will turn to our questions. Remember that if you give the same answer as the most popular option, and if that question is randomly chosen, you could earn extra money.

For questions 7-11 in Kampala, for the people in this room, imagine someone put nothing in the private envelope and everything in the common basket. Please rate this as either very socially unacceptable (–), somewhat socially unacceptable (-), somewhat socially acceptable (+) or very socially acceptable (++) by ticking once in that row.

You will see another four possible choices, where someone put either 3,000, 6,000, 9,000 or 12,000 in the private envelope. Please rate each choice as either very socially unacceptable (–), somewhat socially unacceptable (-), somewhat socially acceptable (+) or very socially acceptable (++). Remember, you can only get a bonus if you tick once per row.

For questions 12-16, imagine that instead of playing in Kampala, we are playing in Mbale. Everyone in this room is also playing the game, and that everything else is the same. The only difference is that we are imagining playing the game in Mbale. Please rate the same 5 choices as either very socially unacceptable (–), somewhat socially unacceptable (-), somewhat socially acceptable (+) or very socially acceptable (++). Remember, you can only get a bonus if you tick once per row.

4. Choice of bonus question

Now collect each the participants' answer sheets, with assistants writing ID number on answer sheets as they are collected. At the same time hand out the survey questions, again adding ID numbers. It is important that participants keep their ID cards as they will require this to collect their earnings at the end of the session.

Before participants begin to complete the survey questions, select someone at random to choose the bonus question blind from a cup. This cup should include the numbers from 5 - 16, denoting the different questions. Note questions 5 and 6 will need five intervals. There will be 20 questions to select from.

5. Survey

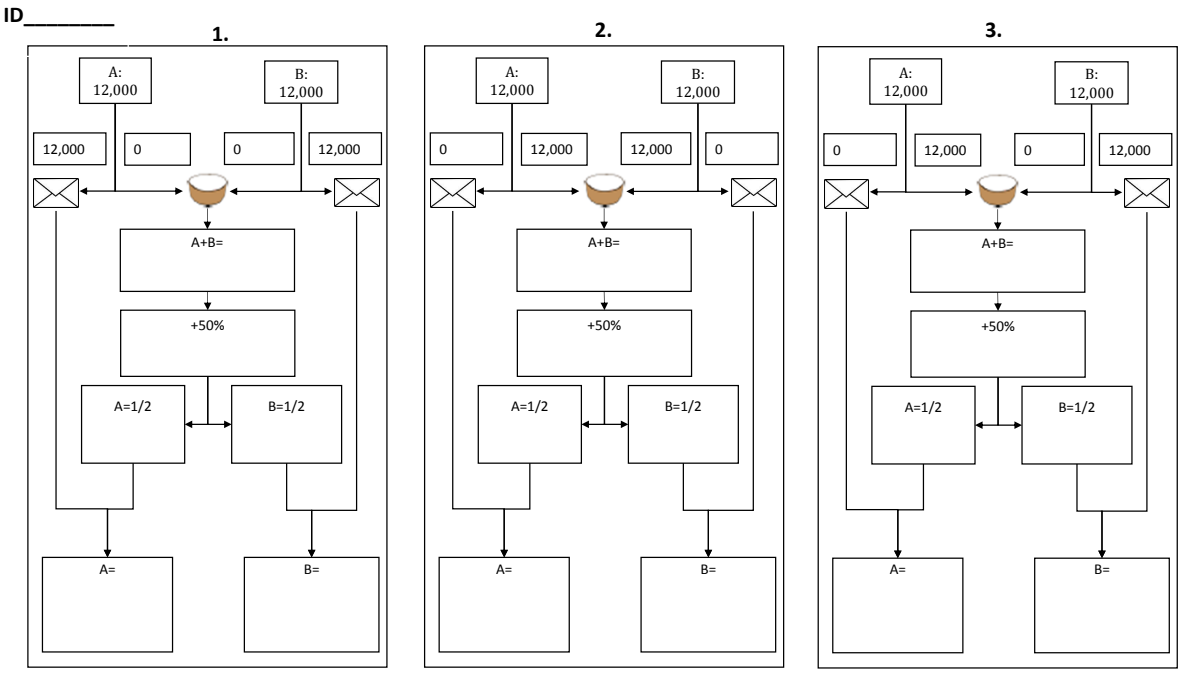
We will give you a new sheet. While we calculate your earnings, we'd like to ask a few general questions, to understand more about you. All information is anonymous, will not affect your earnings and is given voluntarily. If you wish not to answer a question, you are allowed to skip it.

1. How old are you? [In years]
2. What is your gender? [Male/Female]
3. How many years, in total, have you spent in Kampala? [Answer in whole years]
4. How many people in this room do you know by name? [Please don't include the experimenters].
5. How many days in the last year have you spent in Bugishu region?
6. Which language did you learn first?
7. Where were you born?
8. Where is your father from?
9. Where is your mother from?
10. Which language do you prefer to speak at home?
11. How important is it to follow social rules, even if there is a cost? Please answer [1] not at all important, [2] not very important, [3] somewhat important or [4] very important.

Thank you very much for your answers. You have now all completed all of the tasks. We now invite you to come forward, one by one, to collect up your earnings. Thank you for coming today, your participation has been greatly appreciated.

9 Decision Sheets

Below is the first page of the decision sheet, showing the control questions.



On the following page, the answer sheet shows the contribution decision (4), the two sets of expectations (5 and 6) and norms (7 and 16).

ID_____

4.

12,000	9,000	6,000	3,000	0	
☐	☐	☐	☐	☐	
0	3,000	6,000	9,000	12,000	

	 12,000  0	 9,000  3,000	 6,000  6,000	 3,000  9,000	 0  12,000
5. Kampala	%	%	%	%	%
6. Mbale	%	%	%	%	%

	Kampala	--	-	+	++
7.	 : 12,000  : 0				
8.	 : 9,000  : 3,000				
9.	 : 6,000  : 6,000				
10.	 : 3,000  : 9,000				
11.	 : 0  : 12,000				

	Mbale	--	-	+	++
12.	 : 12,000  : 0				
13.	 : 9,000  : 3,000				
14.	 : 6,000  : 6,000				
15.	 : 3,000  : 9,000				
16.	 : 0  : 12,000				

The final sheet shows where survey questions are answered. Note no language is used at any point.

ID:_____

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

	1	2	3	4
11.	☐	☐	☐	☐