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Communalism Versus the Incentive to Free-Ride: Experimental Results From Economically Emergent Africa

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ABSTRACT

This paper reports results from a public good experiment conducted in the African nation of Botswana. Our findings provide a test of whether 'African communalism' influences willingness to contribute to the provision of public goods. As globalization expands markets, and economies such as Botswana's continue to modernize, there is an increasing need to understand how cultural factors might influence the valuation of public goods. We find evidence that stated willingness to contribute to a public good in a hypothetical setting is higher than actual contribution levels in a real setting. Hòwever, this is only true in the second and final round of the experiment, when participants in the real setting have learned to significantly lower their contribution levels. The results draw into question the existence of a communal spirit in economically emergent Africa when it comes to the provision of public goods.

Keywords: hypothetical bias; public good; willingness to pay; Botswana.

JEL Classification: C91, H41, O12

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Abstract. This paper reports results from a public good experiment conducted in the African nation of Botswana. Our findings provide a test of whether 'African communalism' influences willingness to contribute to the provision of public goods. As globalization expands markets, and economies such as Botswana's continue to modernize, there is an increasing need to understand how cultural factors might influence the valuation of public goods. We find evidence that stated willingness to contribute to a public good in a hypothetical setting is higher than actual contribution levels in a real setting. However, this is only true in the second and final round of the experiment, when participants in the real setting have learned to significantly lower their contribution levels. The results draw into question the existence of a communal spirit in economically emergent Africa when it comes to the provision of public goods.

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1. Introduction

Experimental studies of bargaining behavior and public-good provision have only recently been extended to international and cross-cultural settings. For example, Roth et al. (1991) find that latent cultural differences partially explain observed variation in two-player ultimatum bargaining games, but not in multi-player market behavior. Henrich (2000) finds a similar (but stronger) cultural effect for ultimatum bargaining between a sample of U.S. graduate students and Machiguenga tribesmen in the Peruvian Amazon.[1] In a more recent paper addressing the universality of hypothetical bias in dichotomous-choice contingent valuation (CV) settings, Tanner et al. (2007) find that the extent of this bias differs across location and cultures. Taken together, these experimental studies suggest that cultural differences can explain some of the variation in behavior associated with standard bargaining frameworks.[2] The current paper adds to this nascent experimental literature by measuring the extent to which hypothetical bias and similar problems associated with the provision of public goods exist in economically emergent Africa.[3]

The findings from the current study are important in two respects. First, the study adds to the accumulating body of knowledge about how different cultural or national identities influence economic behavior. As globalization expands markets, and economies such as Botswana's continue to modernize, there is an increasing need to understand how cultural factors will

[1] Henrich et al., (2001) expands the scope of these findings to 15 small-scale societies in 12 countries on five continents.
[2] To the contrary, Slonim and Roth (1998) and Cameron (1999) find little or no evidence of a cultural effect on ultimatum bargaining behavior.
[3] Hypothetical bias is any deviation of an individual's stated willingness to pay (WTP) from his true or revealed WTP due to the hypothetical nature of the good or payment mechanism. Positive (negative) hypothetical bias occurs when stated willingness to contribute is higher (lower) than the actual contribution level.

influence the valuation of public goods. This in turn motivates the additional need to measure the degree to which hypothetical bias might distort these valuations.

Second, our study provides test of whether 'communalism' as espoused by African historians and philosophers is able to overcome the standard problems associated with the provision of public goods.[4] With respect to Botswana, Jensen and Gaie explain the communal ethic through metaphoric juxtaposition of the words *motho* (meaning the individual identity of a person) and *botho* (meaning a community of persons):

> "*Botho* is complex in that it supposes the primacy of the community whilst on the other hand, simultaneously maintains and recognizes the importance of the individual. . . . the individual has the right and duty to pursue what is in their interest and what is in their interest should be rightly seen as a member of the community of interests. The individual can only find fulfillment in the collective while the collective can only be fulfilled by individual participation. In short *botho* presupposes the integration of society with the individual members playing a significant role in this integration as nicely captured by another Setswana saying that "*motho ke motho ka ba bangwe*" (a person is a person by and through others) (page 7)."

Cultural anthropologists have examined how socio-economic disruptions caused by early white settlement and recent modernization have led to the erosion of communalism and cooperation as social norms throughout southern Africa (Schapera, 1938 and Comaroff, 1985). In light of these societal changes, we test whether the *Botho* communal ethic is strong enough to overcome the coordination problems associated with the provision of public goods.

In stark contrast to Tanner et al.'s (2007) result for university students in Niger, which suggests the existence of *negative* hypothetical bias, we find evidence of *positive* hypothetical bias among our sample of university students in the country of Botswana.[5] In other words, we

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[4] See Senghor (1965), Menkiti (1979), Shutte (1993), Gyekye (1997), and Wiredu and Irele (2006) for in-depth discussions of African communalism.

[5] It is important to remember that, similar to the vast majority of experimental studies in the literature, our sample consists solely of university students. This suggests that a communal spirit in Botswana may not be as strong among the younger, higher-educated generation as living standards rise over time. It remains an open question as to whether such a spirit persists in older and younger less-educated generations.

find evidence that stated willingness to contribute to a public good in a hypothetical setting is higher than actual contribution levels in a real setting. However, this is only true in the second and final round of the experiment, when participants in the real setting have learned to significantly lower their contribution levels. The results draw into question the existence of a communal spirit in economically emergent Africa when it comes to the provision of public goods.

We acknowledge that degree of hypothetical bias is not a *relative* measure of a given culture's effect on the provision of public goods. A relative measure would help answer the question, is the level at which individuals voluntarily contribute to the provision of a public good large or small relative to, say, another nation or cultural group? Thus, estimating the degree of hypothetical bias at best provides an *absolute* measure of the effect of culture on public good provision. In the present context "absolute" means the degree to which cooperation (or communalism) in the provision of the public good is feigned. For example, if positive hypothetical bias is found in our sample, then we have some evidence for rejecting the hypothesis that the degree of cooperation found in a hypothetical setting will be sustained in a real setting, i.e., that a genuine cooperative ethic may not be as strong as we might otherwise have presumed. At worst, the cooperative ethic might not exist at all.

In the next section, we discuss the experimental design used in this study to test for hypothetical bias in our sample. In Section 3 we discuss both our sample frame and the data obtained from our public good experiment. Section 3 also provides summary statistics. Our empirical model is presented in Section 4, and the results based on this model are provided in Section 5. Section 6 concludes.

2. Experimental Design

The primary objective of the experiment is to create a laboratory to test whether African communalism helps participants avoid the standard problems associated with the provision of public goods, such as coordination failures and the incentive to free ride. To accomplish this objective, we incorporate several specific features into the experiment.[6]

First, we elicit values for a 'generic' rather than a 'homegrown' public good. In this way, we avoid confounding our measurement of hypothetical bias with any social determinants of the good's value. For example, if we had instead selected 'expanded wilderness protection in the Kalahari Desert' or 'private funding for secondary education' as the public good for which values were to be elicited, social pressures such as the 'purchase of moral satisfaction' (Kahneman and Knetsch, 1992) and the 'desire to conform socially' (Bernheim, 1994) would have been more likely to confound our estimates of hypothetical bias.[7] Further, our goal was to maintain as many traditional features of public good experiments as possible, such as induced valuation and the incentive to free ride.[8] This is perhaps best accomplished by eliciting values for a generic public good.

Second, we wish to create a scenario that closely mimics how CV has traditionally been conducted in the field. This entails elicitation of WTP for a public good without the imposition of a provision-point mechanism, or closed-referendum format. A provision-point mechanism typically sets a minimum positive aggregate contribution threshold necessary for provision of the public good (Rondeau et al, 1999). The main advantage of this type of mechanism is its incentive-compatibility (Carson et al., 2000). However, in cases where a realistic provision point

[6] The experimental design is presented in the Appendix.
[7] Expanded wilderness protection in the Central Kalahari Desert and private funding of secondary school education are two popular issues in Botswana at the moment.
[8] For further details on public good experiments, see chapter two in the *Handbook on Experimental Economics* by Ledyard (1995).

is unknown (which seems to be the predominant case in the CV literature), imposition of such a mechanism is unrealistic. We therefore use an open-referendum format in our experiment so that no minimum positive aggregate contribution threshold is arbitrarily set prior to eliciting the participants' WTP values.[9]

Third, we designed the experiment to test for the presence of hypothetical bias. The existence of hypothetical bias indicates that although individuals may wish to contribute at high levels, they understand the inherent coordination problems and incentives to deviate from the cooperative strategy. Toward this end, half the participants were given the option of contributing to the public good using real money (revealed-preference group), while the other half simply stated their hypothetical contribution level (stated-preference group). By contrasting the average contribution levels of the two groups, we are able to directly test for the existence of hypothetical bias.

Fourth, we provide an information treatment where half the participants read through an example of the experiment themselves and then the researcher quickly re-read the example out loud. Participants were allowed to ask questions about the experiment at any point in time. Also as part of the information treatment, two sentences were added to the second-to-last paragraph of the example,

> "What this row of numbers tells us is that the payout is 5 Pula for a person who chose to invest something and 10 Pula for a person who chose to invest nothing. Now, let's see how much Pula each of the five people participating in this example takes home with them from the experiment."

[9] We do, however, effectively set a provision point at zero, i.e., if no one makes a positive investment in the public good, then the net payout to everyone is zero. See below for more details about the investment decision and what is meant by 'net payout.'

Participants in the information control group read through the example on their own, without any additional input provided by the researcher, and without the two additional sentences included at the end.[10]

To begin the experiment, each participant in the real treatment was provided with 50 Pula (approximately US $10) with which to make an investment decision in the public good. Participants in the hypothetical treatment were reminded that they would "not be paid anything more or less," while participants in the real treatment were informed that they were "investing for real." This type of distinction between the hypothetical and real treatments was reiterated in the directions for the experiment itself (see page 3 of the experiment in the Appendix).

As the Payout Chart makes clear, the investment decision incorporates a free-riding incentive and a prisoner's dilemma (as well as the properties of non-exclusion and non-rivalry in consumption). The incentive for free-riding occurs because, all else equal, those who choose not to invest any of their 50 Pula obtain a higher payout than those who choose to invest some positive amount. A prisoner's dilemma occurs because choosing to invest increases the average group investment, which in turn leads to a higher payout for everyone.

The investment question (on page 3 of the experiment) is presented in a standard single-bounded dichotomous-choice format. In the case of the real treatment the investment question reads, "This question requires a choice for which your net payout from the experiment will ultimately be determined." The bid amounts (used in place of the "**XX**") were randomly selected from the interval (5, 15, 25, 35, and 45) Pula.

[10] The experimental design presented in the Appendix is for the hypothetical and information treatments. The designs for the other treatments are available from the authors upon request. The experiment is a simplified version of that used in Aadland et al. (2007) to measure the interaction between cheap talk and anchoring bias in CV.

After answering the investment question on page 3 (and thus completing round one of the experiment), each participant was provided with a Net Payout Worksheet. The worksheet enabled a participant to calculate her net payout from round one, and thus determine the total amount of money she would have left the experiment with if this had been the only round played. Each participant then repeated the experiment again (round two), facing the same respective bid amount as was randomly drawn in round one.[11]

Upon completion of round two, a fair coin was flipped to determine which of the two rounds would determine the participants' actual net payout. The participants were informed of the coin-flip procedure prior to beginning round one of the experiment. The reason for randomizing which net payout would actually be paid, rather than simply basing the payout on round two's outcome, was to induce the students to answer the investment question in round one more seriously than they otherwise might have. Finally, the students answered a series of demographic questions (see the Appendix for the specific wording of the questions).

3. Data

The experiment was pre-tested with a group of 30 graduate students in the University of Botswana (UB) Business School. Several changes were made to the experimental design as a result of the pre-test, mostly geared toward fine-tuning the instructions. During the week following the pre-test, approximately 100 undergraduate students from the Business School were recruited to participate in the actual experiment.

[11] By not varying a given participant's bid amount between rounds we ensured that any change in her response to the investment question would be based solely on any additional information she had gained from completing the Net Payout Worksheet.

The experiment was run in four separate sessions (one session per day), with approximately 25 students per session. Overall summary statistics for each of the variables obtained from the experiment are provided in Table 1.

[INSERT TABLE 1 HERE]

As indicated in Table 1, fewer participants answered "yes" to their respective bid amounts in round two of the experiment than in round one (the mean for WTP_1 is larger than the mean for WTP_2). Slightly less than half of the participants are male, and most are Botswana citizens in their junior year or below. Few participants classify themselves as being rich in income and as having fathered or mothered a child. The majority consider themselves as being "happy" or "very happy" with their lives. Few participants made "small" or "large" mistakes in calculating their net payouts from round one of the experiment using the Net Payout Worksheet.

Table 2 provides an (unconditional) comparison of the percentage of participants who answered "yes" to their respective bid amounts in rounds one and two of the experiment across the hypothetical ($hyp = 1$) and real ($hyp = 0$) treatments.

[INSERT TABLE 2 HERE]

The comparison between the hypothetical and real treatments in Table 2 suggests an absence of hypothetical bias (either positive or negative) in round one of the experiment, i.e., the mean values for WTP_1 (hyp=0) and WTP_1 (hyp=1) are not statistically different from one another at the 5% significance level.[12] To the contrary, the same comparison for round two suggests the existence of positive hypothetical bias in that round, i.e., the mean values for WTP_2 (hyp=0) and WTP_2 (hyp=1) are statistically different from one another. Therefore, we find evidence in

[12] The means test for this ratio comparison, and each of the remaining ratio comparisons discussed below, was conducted using the online T-test tool developed by Simple Interactive Statistical Analysis (SISA), available at http://www.quantitativeskills.com/sisa/index.htm. The specific test used was Fisher Exact, which calculates an exact probability value for the relationship between two dichotomous variables, as found in a two-by-two cross table.

support of positive hypothetical bias in our sample of UB students, but only after the participants have completed round one of the experiment.[13]

The results in Table 2 can also be used to test for the effect of information participants received *during* the experiment. Specifically, the mean of WTP_1 (hyp=1) can be compared with the mean of WTP_2 (hyp=1) to test for a between-round information effect in the hypothetical treatment, and the means of WTP_1 (hyp=0) and WTP_2 (hyp=0) can likewise be compared for a between-round information effect in the real treatment.

The means test suggests that participants in the real treatment responded to the between-round information by reducing their acceptance of the offered bid: the mean of WTP_2 (hyp=0) is statistically lower than the mean of WTP_1 (hyp=0) at the 5% level of significance. However, participants in the hypothetical treatment did not respond to this information: the mean of WTP_2 (hyp=1) is not statistically different than the mean of WTP_1 (hyp=1). In other words, it appears that participants in the real treatment learned that cooperation (without coordination) does not pay, but free-riding does.[14]

4. Empirical Model

The empirical model for estimating conditional treatment effects is premised on standard consumer theory. In our particular case, a participant's true WTP (denoted WTP^*) is determined by the share of his investment income (i.e., the 50 Pula provided at the beginning of the experiment) he would willingly forego so as to obtain the level of the public good he expects will

[13] These results concur with the results of corresponding Chi-Square tests, as conducted in Cummings, et al. (1995), where the null hypothesis is that the likelihood of a "yes" response is unrelated to whether the WTP question is real or hypothetical.

[14] Although not presented in Table 2, we also compared the means for the *prior* information effects. We found no evidence that the prior information mattered. An enlarged version of Table 2 including the means tests for the prior information treatments is available from the authors upon request.

result from the experiment and still maintain his original (pre-public good) utility level. As discussed in detail below, we estimate a bivariate probit model to account for possible error correlation between the individual's first- and second-round investment decisions (Greene, 2008).

Based on their responses to the investment question, participant *i*'s latent WTP* may be placed in one of two regions: $(-\infty, \tau_i)$ in the event of answering "no" to the investment question and $[\tau_i, \infty)$ in the event of answering "yes," for $i = 1,.....,n$. We specify a reduced-form linear expression for $WTP^*_{i,j}$ where the vector of explanatory variables $\boldsymbol{X}_{i,j}$ includes the *hyp* treatment effects and a subset of the variables described in Table 1:

$$WTP^*_{i,j} = \boldsymbol{X}_{i,j}\boldsymbol{\beta}_j + \epsilon_{i,j} \tag{1}$$

where $\boldsymbol{\beta}_j$ is a vector of coefficients, $j = 1,2$ denotes the round of the experiment, and the errors $\epsilon_{i,j}$ are assumed to have a bivariate normal distribution with correlation parameter ρ.

The binary variable $WTP_{i,j}$ is defined in Table 1 and will equal one if $WTP^*_{i,j} > \tau_i$, where τ does not change for the individual between rounds of the experiment. Using the definition for $WTP_{i,j}$ and (1), we can define the necessary probabilities for maximum-likelihood estimation. The four relevant probabilities are

$$P_i^{1,1} = Pr\left(WTP_{i,1} = 1\,, WTP_{i,2} = 1\right) = \Phi\left(\frac{(\boldsymbol{X}_{i1}\boldsymbol{\beta}_1 - \tau_i)}{\sigma_1}, \frac{(\boldsymbol{X}_{i2}\boldsymbol{\beta}_2 - \tau_i)}{\sigma_2}, \rho\right) \tag{2.1}$$

$$P_i^{0,1} = Pr\left(WTP_{i,1} = 0\,, WTP_{i,2} = 1\right) = \Phi\left(\frac{(\tau_i - \boldsymbol{X}_{i1}\boldsymbol{\beta}_1)}{\sigma_1}, \frac{(\boldsymbol{X}_{i2}\boldsymbol{\beta}_2 - \tau_i)}{\sigma_2}, \rho\right) \tag{2.2}$$

$$P_i^{1,0} = Pr\left(WTP_{i,1} = 1\,, WTP_{i,2} = 0\right) = \Phi\left(\frac{(\boldsymbol{X}_{i1}\boldsymbol{\beta}_1 - \tau_i)}{\sigma_1}, \frac{(\tau_i - \boldsymbol{X}_{i2}\boldsymbol{\beta}_2)}{\sigma_2}, \rho\right) \tag{2.3}$$

$$P_i^{0,0} = 1 - P_i^{1,1} - P_i^{0,1} - P_i^{1,0} \tag{2.4}$$

where Φ is the bivariate standard normal CDF and σ_j is the standard deviation of $\epsilon_{i,j}$. The associated likelihood function is

$$L(\boldsymbol{\beta}_1, \boldsymbol{\beta}_2, \sigma_1, \sigma_2, \rho) =$$

$$\prod_{i=1}^{n} \left[\left(P_i^{1,1}\right)^{WTP_{i1}WTP_{i2}} \left(P_i^{0,1}\right)^{(1-WTP_{i1})WTP_{i2}} \left(P_i^{1,0}\right)^{WTP_{i1}(1-WTP_{i2})} \left(P_i^{0,0}\right)^{(1-WTP_{i1})(1-WTP_{i2})} \right]$$

This is a bivariate version of the interval regression model described in Woolridge (2002).[15]

5. Results

Table 3 reports the coefficient estimates and associated standard errors from the maximum likelihood estimation.[16] We find evidence that the round-one and round-two error terms are positively correlated (ρ is positive and statistically significant at the 1% level), suggesting that estimation of the bivariate model is preferred over a univariate approach. For round one, only the coefficient estimate for bid τ is statistically significant (at the 10% level), implying the absence of hypothetical bias and no effect of prior-information in round one of the experiment –

[15] We also estimated separate binomial probit models for rounds one and two using the Cameron and James (1987) approach. The coefficient estimates and their associated standard errors from these separate estimations were qualitatively similar to those obtained from the bivariate model in (2). The results for the separately estimated models are available upon request from the authors.

[16] NLOGIT version 3.0.10 is used to estimate equation (2). We estimated (2) with both the full and a reduced set of variables included in Table 1. Since several of the variables were insignificant in those regressions, we dropped the demographic variables from the models presented in Table 3. We also estimated OLS models using WTP_0 as the regressand, but found that few of the variables could explain variation in this open-ended measure of WTP. Both the input and output NLOGIT files for these models are available from the authors upon request.

a result that concurs with the unconditional mean comparisons shown in Table 2 and discussed in Section 3.[17]

[INSERT TABLE 3 HERE]

However, the story is different for round two. The coefficients for *info* and *hyp* are both statistically significant (at the 10% and 1% levels, respectively). Individuals in the hypothetical treatment are more likely to accept the bid than those facing an actual decision of whether to contribute to the public good. In other words, we find evidence of positive hypothetical bias in round two of the experiment – again a result that concurs with the unconditional mean comparisons shown in Table 2. We also find that additional information provided prior to round one of the experiment helps reduce the individual's probability of accepting the bid, but the effect is weaker than for hypothetical bias both in terms of its magnitude and statistical significance.

In addition to the bivariate model, we estimated two separate univariate models to check for between-round information effects on the respective sub-groups of individuals investing hypothetically and for real. These regressions relate to the unconditional means tests for between-round information effects shown in Table 2 (and discussed in Section 3). The results are presented in Table 4.

[INSERT TABLE 4 HERE]

In the first model, we investigate the behavior of individuals who switched from investing a positive amount in round one of the experiment to investing nothing in round two (i.e., for individuals who responded "yes" to their bid amount in round one but "no" in round two;

[17] We also regressed τ on WTP_0 to check for anchoring bias using a continuous measure of WTP. The coefficient on τ was positive and statistically significant at the 10% level, suggesting the existence of anchoring bias in our sample. However, without any variation in τ across rounds of the experiment, we are unable to identify this effect in the dichotomous-choice framework.

chgwtpdn = 1). We find that the coefficient estimate for *hyp* is significant at the 1% level of significance. This suggests that individuals investing for real were more likely to switch from having said "yes" in round one to saying "no" in round two. In other words, similar to our unconditional results in Section 3 we find evidence that individuals in the real treatment learned that cooperation does not pay, but free-riding does.

In the second regression, we investigate the behavior of individuals who switched from investing nothing in round one of the experiment to investing a positive amount in round two (i.e., individuals who responded "no" to their bid amount in round one but "yes" in round two; *chgwtpup* = 1). We find no statistical evidence of hypothetical bias in this instance. Individuals investing hypothetically were no more likely than those investing for real to increase their investment between rounds of the experiment.

6. Summary and Conclusions

This paper reports evidence of positive hypothetical bias in a CV-based public good experiment conducted with university students in the African nation of Botswana. To our knowledge, this is the first such evidence of positive hypothetical bias for an African country – the only previous public-good experiment, conducted with university students in the country of Niger, reports evidence of *negative* hypothetical bias.

Further, we find weak evidence that the sharing of additional information (about the public good) *prior* to the actual experiment has a negative effect on the probability that those investing in the public good will accept their respective bid amounts. The fact that positive hypothetical bias is found only in the second round of a two-round experiment – after participants have used a worksheet to calculate their respective net payouts from round one – suggests that additional

information provided *during* (i.e., between rounds of) the experiment is more effective than prior information in helping participants who are investing for real to identify their true willingness to pay for the public good. However, additional between-round information does not eliminate positive hypothetical bias in the sense that it does not help participants who are investing hypothetically to identify their true willingness to pay.

In an absolute sense, the finding of positive hypothetical bias in our sample draws into question the hypothesis that Batswana exhibit a 'communal spirit' when it comes to the provision of public goods. By "absolute" we mean the degree to which cooperation in the provision of the good is feigned. The existence of positive hypothetical bias therefore suggests that a genuine communal spirit (what is commonly referred to as 'African communalism') may not be as strong in Botswana as we might have otherwise presumed.

Further, the finding that additional information provided during the experiment helps only those participants who are investing for real to identify their true willingness to pay for the public good suggests that mitigating hypothetical bias in CV-based research will require more than just the provision of information. Additional mitigation measures will also be necessary, such as *ex ante* reminder statements (see Aadland and Caplan, 2006; List, 2001; Cummings and Taylor, 1999) and *ex post* calibration of WTP (List and Shogren, 1998; Harrison et al., 1999).

The findings in this study should be judged with two caveats in mind. First, the sampling frame for the experiment is confined to UB business students. Therefore, while it may be representative of that particular subgroup of students, our sample may not be representative of the UB student body at large; it certainly is not representative of the Botswana population in general. Second, Botswana is generally considered to be an economically emergent country, in the sense that its economic growth since independence in 1966 has been both steady and high

relative to the vast majority of the world's other developing countries (World Bank Group, 2000). Thus, generalizing this paper's results to the rest of Africa, let alone the lesser-developed world at large, is questionable.

As a result of these caveats, the role for future research is clear. More public good experiments need to be conducted in Africa and other lesser-developed areas of the world, preferably with larger and more representative samples of university students and, better yet, national populations at large. Ideally, a variety of public good mechanisms, such as provision- and non-provision-points, will be tested in the laboratory. As in the more-developed world, results from a broad base of experimental research will then help guide the design of survey instruments for field research throughout the lesser-developed world. Indeed, the current pace at which markets and non-markets (e.g., global externalities) are becoming linked internationally compels us to understand how welfare is determined within a more interconnected world.

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Table 1. Variable Names, Definitions, Sample Means and Standard Deviations (N=102).

Variable Name	Definition	Mean	SD
WTP_1	=1 if "yes" to bid amount in the first round of the experiment, =0 otherwise.	0.46	0.50
WTP_2	=1 if "yes" to bid amount in the second round of the experiment, =0 otherwise.	0.38	0.49
τ	=bid amount (5, 15, 25, 35, or 45 Pula).	24.51	14.10
hyp	=1 if experimental session is hypothetical, =0 otherwise.	0.48	0.50
info	=1 if additional information about the example was given to participants prior to the actual experiment, =0 otherwise.	0.56	0.50
male	=1 if male, =0 otherwise.	0.46	0.50
nation	=1 if Motswana, =0 otherwise.	0.92	0.27
class	=1 if in junior year or below, =0 otherwise.	0.83	0.38
gpa	=self-reported cumulative grade point average (5.0 highest).	3.36	0.59
field	=1 if accounting major, =0 otherwise (which includes not having declared a major yet and double majors).	0.59	0.49
rich	=1 if self-reported income is greater than 3000 Pula per month, =0 otherwise.	0.14	0.35
middle	=1 if self-reported income is between 1500 and 3000 Pula per month, =0 otherwise.	0.54	0.50
risk	=1 if risk averse, =0 otherwise.	0.42	0.50
child	=1 if a mother or father, =0 if not.	0.11	0.31
happy	=1 if "happy" or "very happy" with life, =0 otherwise (including "unsure").	0.80	0.40
smprob	=1 if mistake on net payout worksheet did not preclude correct calculation of net payout, =0 otherwise.	0.09	0.29
bgprob	=1 if mistake on net payout worksheet resulted in incorrect calculation of net payout, =0 otherwise.	0.21	0.41
chgwtpup	=1 if participant marked "no" to investment question in first round and "yes" to investment question in second round, =0 otherwise.	0.08	0.27
chgwtpdn	=1 if participant marked "yes" to investment question in first round and "no" to investment question in second round, =0 otherwise.	0.16	0.37
WTP_0	=participant's ideal (open-ended) bid amount (in Pula).	17.17	13.86
sense	=1 if WTP_0 was not larger than a bid amount that was rejected either in both rounds or the second round only, =0 otherwise.	0.80	0.40

Table 2. Comparison of Mean WTP_1 and WTP_2.
(Hypothetical vs. Real and First-Round vs. Second-Round)

Variable	Mean	SD
WTP_1 (*hyp*=0)	0.42[a]	0.50
WTP_1 (*hyp*=1)	0.51	0.51
WTP_2 (*hyp=0*)	0.22[a,b]	0.42
WTP_2 (*hyp=1*)	0.55[b]	0.50

[a,b] Mean values demarcated with superscript *a* are statistically different from each other at the 5% level of significance. Similarly for mean values demarcated with superscript *b*.

Table 3. Bivariate Maximum Likelihood Results for Rounds One and Two.

Variable	Coefficient (Round 1)	Coefficient (Round 2)
Constant	0.0886 (0.3217)	-0.3576 (0.3403)
info	-0.0025 (0.2542)	-0.3622* (0.2637)
hyp	0.2401 (0.2529)	0.8458** (0.2637)
τ	-0.0125* (0.0090)	-0.0069 (0.0094)
ρ	0.7741** (0.1019)	
Log L	-115.0383	
Sample Size	102	

** Significant at 1% level, * Significant at 10% level. Standard errors are in parentheses.

Table 4. Univariate Maximum Likelihood Estimation Sorted by Change in Investment Decisions

Variable	**Coefficient (*chgwtpdn*)**	**Coefficient (*chgwtpup*)**
Constant	-0.2151 (0.5339)	-1.1988* (0.5917)
info	0.7513* (0.4565)	-0.3873 (0.4413)
hyp	-1.5301** (0.4544)	0.4033 (0.4377)
τ	0.0020 (0.0168)	0.0048 (0.0149)
Log L	-22.5976	-21.6425
Sample Size	47	55

** Significant at 1% level, * Significant at 5% level. Standard errors are in parentheses.

Appendix – Experimental Design

Instructions

You have been given 50 Pula to participate in this experiment. The money is yours to keep. You will not be paid anything more or less.

Before the actual experiment begins, a simple example is presented. The purpose of the example is to demonstrate how an individual's "net payout" from the experiment is determined. Net payout is an amount of money that an individual receives based on (1) how much of his own money he chooses to invest, and (2) how much money everyone else in the room chooses to invest. The actual experiment that you and the other students in this room are going to participate in will begin after you have gone through this example.

Example

Suppose there are only five individuals in a room, each of whom has been given 20 Pula. After studying the Payout Chart below, the individuals make the following decisions:

- Individual 1 chooses to invest nothing.
- Individual 2 chooses to invest 5 Pula.
- Individual 3 chooses to invest 10 Pula.
- Individuals 4 and 5 each choose to invest 15 Pula.

These choices result in a total of 45 Pula invested from the five individuals, for an average investment of 45 Pula ÷ 5 individuals = 9 Pula. Based on the Payout Chart below, we can now calculate each individual's net payout.

PAYOUT CHART – **THIS IS ONLY AN EXAMPLE**

Average Group Investment	Payout Ranges	
	"YES, I'll invest"	"NO, I won't invest"
	Payout (Pula)	Payout (Pula)
Greater than 0 Pula; Less than or equal to 10 Pula	5	10
Greater than 10 Pula; Less than or equal to 20 Pula	20	25

Begin by noting that for this example the average group investment of 9 Pula is between 0 Pula and 10 Pula in the Payout Chart, so we can focus on the first row of numbers. What this row of numbers tells us is that the payout is 5 Pula for a person who chose to invest something and 10 Pula for a person who chose to invest nothing. Now, let's see how much Pula each of the five people participating in this example take home with them from the experiment.

Individual 1 chose to invest nothing. He therefore receives a net payout of 10 Pula (10 Pula payout from the Payout Chart above less 0 Pula invested) and he leaves the room with a total of 30 Pula (the 20 Pula he started the experiment with plus his 10 Pula net payout). Individual 2 chose to invest 5 Pula. She therefore receives a net payout of 0 Pula (5 Pula payout from the Payout Chart above less 5 Pula invested) and she leaves the room with a total of 20 Pula. Individual 3 chose to invest 10 Pula. He therefore receives a net payout of -5 Pula (5 Pula payout from the Payout Chart above less 10 Pula invested) and he leaves the room with a total of 15 Pula. Individuals 4 and 5 each chose to invest 15 Pula. They therefore each receive a net payout of -10 Pula (5 Pula payout from the Payout Chart above less 15 Pula invested) and they each leave the room with a total of 10 Pula.

Are there any questions before we begin?

Experiment

Directions. Use the payout chart below to decide whether to hypothetically invest some or none of your 50 Pula. If this experiment were for real, your actual net payout would be determined by your own investment choice and the average investment of the group, as was demonstrated in the example. Note that if the total group investment is zero (and thus the average group investment is also zero), the net payout is zero to everyone.

PAYOUT CHART

Average Group Investment	Payout Ranges	
	"YES, I'll invest"	"NO, I won't invest"
	Payout (Pula)	Payout (Pula)
Greater than 0 Pula; Less than or equal to 10 Pula	5	10
Greater than 10 Pula; Less than or equal to 20 Pula	20	25
Greater than 20 Pula; Less than or equal to 30 Pula	35	40
Greater than 30 Pula; Less than or equal to 40 Pula	50	55
Greater than 40 Pula; Less than or equal to 45 Pula	65	70
Greater than 45 Pula; Less than or equal to 50 Pula	80	85

INVESTMENT QUESTION

This question requires a choice for which your net payout from the experiment would be hypothetically determined.

Are you willing to make an investment of **XX** Pula?

YES ☐

NO ☐

Net Payout Worksheet

1. Amount of Pula I was asked to invest. _____

[This is the Pula amount that was included in the Investment Question during the experiment.]

2. Amount of Pula that I agreed to invest. _____

[If you decided to check the "Yes" box for the Investment Question during the experiment, then re-enter the number that you have written on line 1 above onto line 2. If you checked the "No" box for the Investment Question, then enter 0 on line 2.]

3. My Payout from the experiment. _____

[This is the number that has been worked out on the board in front of the class and that corresponds to the amount of Pula that you agreed to invest.]

4. My Net Payout from the experiment. _____

[Subtract the amount you have written on line 2 from the amount on line 3. Note that this could be a negative number.]

5. The amount of money I leave the experiment with. _____

[Add 50 Pula to the amount on line 4.]

Demographic Questions

Please answer the following questions to the best of your ability. These questions are very important to us. Remember that all information is completely anonymous and confidential.

1. Gender: Male ☐ Female ☐

2. Age _____

3. Nationality/Ethnicity _____

4. Class Standing:
   - First Year ☐
   - Second Year ☐
   - Third Year ☐
   - Fourth Year ☐
   - Graduate ☐

5. Cumulative Grade Point Average _____

6. Have you declared a major field of study?

   Yes ☐ No ☐

   If yes, what is your major field of study? _____

7. In which range do you think your monthly consumption expenditure currently falls (consumption expenditure includes money that you spend (and that other people spend to support you) for things like food, clothing, housing, entertainment, cell phone, utility bills, savings at the bank, etc. It does not include money that you give or lend to other people)?

   ☐ Less than 1500 Pula per month.

   ☐ Greater than 1500 Pula but less than 3000 Pula per month.

   ☐ Greater than 3000 Pula but less than 4500 Pula per month.

   ☐ Greater than 4500 Pula but less than 6000 Pula per month.

   ☐ Greater than 6000 Pula per month.

8. Which would you choose?

☐ 50 Pula with certainty.

☐ 50% chance of 0 Pula; 50% chance of 100 Pula.

☐ I'm indifferent between the two choices above.

9. Do you have a son or a daughter?

Yes ☐ No ☐

10. Please check the box that best describes your current level of happiness in life.

☐ I am very unhappy with my life.

☐ I am unhappy with my life.

☐ I am happy with my life.

☐ I am very happy with my life.

☐ I am uncertain about my happiness in life.

11. If you could have chosen an amount yourself to invest in the experiment that you have just participated in, what would that amount have been (taken from your 50 Pula)? _____

Thank you for participating in this experiment!