

# MENTAL ACCOUNTING IN A DEVELOPMENT CONTEXT: A FIELD EXPERIMENT

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## SUMMARY

Mental accounting is the way households organise and manage financial activities. In this paper spending patterns are compared between three different distribution mechanisms of cash transfer programmes: via the traditional authority – the chief, and via unconditional and conditional individual distribution. The three distribution mechanisms were randomly allocated to 69 villages in rural Sierra Leone, and resulting spending patterns compared using regression analysis. Results show that villages where money was distributed through the traditional authority were more likely to choose public goods projects and spent more vouchers on consumption rather than investment goods. No difference was found between unconditional and conditional individual distribution. Overall, money was found to be not fungible: the distribution mechanism influences spending patterns. These results fit with mental accounting and psychological theory, supporting in particular the importance of framing in the decision-making process.

Keywords: Fungibility, field experiment, mental accounting, Sierra Leone, cash transfer programmes

## INTRODUCTION

Social transfer programmes in developing countries are increasingly based on the provision of cash rather than goods. Recipients commonly prefer cash because it allows them to decide for themselves which good or service to procure (Harvey 2005). Cash also provides second-round benefits through stimulating the local economy (Cuny and Hill 1999). In 2009, there were 29 developing countries that had one or more cash transfer programmes in place (World Bank 2009). Cash transfers are also becoming more prevalent in humanitarian aid (Harvey 2005, Harvey 2006). This increasing prevalence of cash transfer programmes makes it important to know how recipients spend the cash. Orthodox economic theory assumes money is fungible, i.e. the way money is received does not influence how it is spent. This fungibility assumption was challenged by Thaler (1980), who suggested a theory of consumer choice that later became known as mental accounting.<sup>1</sup> It describes the way individuals and households keep track of where their money is going and keep spending under control (Thaler 1985). This paper fits with mental accounting theory and tests the fungibility assumption by directly comparing household spending decisions under three distinct distribution programmes.

Distributions mechanisms might affect spending patterns through changing the decision frame, the degree of confidence in the distributing organisation, and the degree of perceived ownership over the received gains. The decision frame refers to the options that are evaluated jointly (Kahneman and Tversky 1984). This frame is influenced by the way a problem is presented externally (Thaler 1999). Framing decision outcomes in terms of gains rather than losses, was found to radically alter respondents' choices (Tversky and Kahneman 1981). Similarly, emphasising group benefits of decisions in public goods games was found to increase contributions to the public good (De Cremer and Vugt 1998, Cookson 2000). The degree of confidence in the distributing organisation affects one of the characteristics of the gain itself: its perceived degree of permanence. Other characteristics of income gains that affect spending patterns are the size of the gain and whether the gain is expected (Thaler 1990). The degree of perceived ownership is primarily affected by whether income is earned or unearned.

Spending patterns are influenced by whether an income gain is transient or permanent. The permanent income hypothesis states that the marginal propensity to consume (MPC) out of permanent income is higher than out of transient income (Friedman 1957). In this theory, income is perfectly fungible and transient gains are largely saved to allow an equal part of the gain to be consumed in each period of the remaining lifetime of the receiving individual. Empirical evidence has decidedly refuted the theory. In fact, the MPC out of transient income was found to generally exceed that out of permanent income (Courant et al. 1986). Thaler (1990) explains this observation by individuals self-imposing rules of thumb to keep household accounting manageable by creating a mechanism of self-control<sup>2</sup>. However, the transient / permanent divide might not always be clear. In the case of development programmes, gains which are intended to be permanent might be perceived to be transient, through a lack of trust in the providing institution. O'Curry and Strahilevitz (2001) found that in situations where gains are uncertain, spending is more frivolous. Hence, the higher the perceived permanence of the gain, the more likely it is spent like regular income.

Other characteristics of income gains that affect spending patterns are the size of the gain and whether the gain is expected. Differing spending patterns out of small and large windfall gains were first noted by Kreinin (1961) when comparing spending by Israeli war victims out of second world war restitution payments with earlier results of Bodkin (1959) on spending of life insurance dividends by American veterans of the second world war. Landsberger (1966) explicitly tested for the importance of windfall size and found MPCs to decline in the size of the windfall (see Keeler et al. (1985) for an overview of more recent evidence). For windfalls of 7% or less of income, the MPC even exceeded one, indicating that consumption increased by more than the windfall, something he noted was behaviour '*different from that which economic theory generally considers to be rational*'. Recent work on the effect of coupons – tiny windfalls - on online grocery spending found similarly

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<sup>1</sup> Actually, in this paper he used the term 'psychological accounting'. The term 'mental accounting' was first used by Kahneman and Tversky (1984)

<sup>2</sup> In an earlier work together with Shefrin he argues for an alternative life cycle hypothesis called the "Behavioural Life Cycle Hypothesis" (Shefrin and Thaler 1988).

large MPCs, which can be explained by mental accounting theory (Milkman and Beshears 2009). In general, the larger the gain, the more closely the spending pattern out of that gain resembles that of regular income.

Another dimension which influences the frivolity of spending is the degree to which the windfall is expected. Arkes et al. (1994) found that whereas expected gains were spent in a similar way to regular income, unexpected gains were spent faster and more wastefully. In economics, this effect is called the house money effect after the way early winnings in casinos are spent (Thaler and Johnson 1990). Unexpected income is placed in a different mental account, with a higher marginal propensity to consume. In effect, the money in this account is perceived by the owner to have a lower value than regular income or expected gains. Clark (2002) relates the windfall or house money effect to behaviour in public goods games and posit that individuals are more willing to invest in public goods when their starting incomes are unexpected windfall gains<sup>3</sup>. They cite Oberholzer-Gee and Eichenberger (1999) who found indirect evidence of this effect in dictator games. These authors interpret their findings to mean subjects '*purchase more 'public-spiritness' by contributing more than they would have if they had to venture their own income*'. In other words, when windfall gains are expected, they are more likely to be spent as regular income.

Empirical evidence on differing spending patterns between earned and unearned income is thin and relatively recent. Davies et al. (2009) found that the marginal propensity to consume out of income from remittances was lower than out of income from other sources, including earned income. Contrarily, in a more direct comparison of earned and unearned income, Christiaensen and Pan (2010) found higher consumption out of unearned income, including remittances, and higher investment out of earned income. Results from public goods experiments are equally mixed. Cherry (2001) tested public goods contributions in dictator games, and found earned money caused more individualistic behaviour. However, in a later work by the same author, contributions to public goods did not differ between earned and unearned endowments (Cherry et al. 2005). Therefore it is not a priori clear whether earning rather than being granted income increases or decreases consumption.

The discussion above focused on individual behaviour, which is realistic when decisions are made privately and independently. However, when decisions are made publicly and potentially have a benefit for meeting participants, characteristics of the group within which benefits are shared should be taken into account. The importance of group characteristics is evident from public goods games, where differences between full, limited, and zero information regarding characteristics and decisions of other members is consistently found to be substantial (Cherry et al. 2002, Chan et al. 1999).

Group characteristics relevant for decision making on public goods evolve around group homogeneity and heterogeneity. Most authors find that heterogeneity of member characteristics in groups decreases public good contributions. This effect is found in public goods games (Cherry et al. 2005) as well as field tests (Miguel and Gugerty 2005). The mechanism through which heterogeneity decreases contributions is not known, although there is some evidence that social sanctions might play an important role. Such sanctions are easier to enforce in groups with the same ethnic origin (Habyarimana et al. 2007). Because the dominant strategy in a public goods game is to not contribute anything, enforcement might be required to elicit positive contributions. The importance of monitoring and social sanctions are corroborated by work of Carpenter (2007), who found contributions to be lower in the presence of hindrances to monitoring only when public goods games included punishment.

The town chief has an important role in public decision making. He represent traditional authority in the village and is responsible for making decisions on matters of public interest and punishing lawbreakers (Aguwa 2002, Little 1947). It is the chief that can exert the pressure required to make individuals deviate from their dominant strategy of not contributing and elicit positive public goods contributions. Chief wealth serves an additional enforcement function, as goodwill with the chief is a form of insurance increasing in value with the size of his wealth (Binswanger and McIntire 1987). A final consideration is the level of trust in the chief. Trust has been shown to increase public goods contributions in laboratory experiments in both psychology and economics (Parks 1994, Anderson et

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<sup>3</sup> Although Clarke does not find support for this hypothesis, it is later provided by Harrison (2007) using the same data.

al. 2004). Most of these researches focus on general levels of trust, whereas this paper specifically considers the role of trust in the chief.

This paper tests the fungibility assumption by comparing spending patterns between three different distribution mechanisms: via the traditional authority – the chief, and via unconditional and conditional individual distribution. In particular, it assesses (1) the effect of these mechanisms on the choice between public and private spending, (2) the effect of these mechanisms on the choice between private consumption and investment. Given the large theory on mental accounting, money is not expected to be fungible: the distribution mechanism is expected to influence spending.

The paper will proceed with a description of the research programme. In section 3, the various data collection rounds will be explained, followed by a description of the research methodology and in section 4. Section 5 contains results of the randomization and regression output as well as a discussion. Finally, section 6 concludes.

## PROGRAMME

The research was conducted in Sierra Leone, around the borders of the Gola Forest National park, next to the border with Liberia. The park was managed by the Gola Forest Programme (GFP), sponsored by the Royal Society for the Protection of Birds, the European Union, Fonds Français pour l'Environnement Mondial, Conservation International and the Darwin Institute. In exchange for giving up hunting and logging rights within the park boundaries, a contract was signed that provides the seven chiefdoms surrounding the park with annual payments in perpetuity. To assess the effectiveness of different ways of distributing these funds, a research programme was set up including Cambridge, Chicago and Wageningen University. This programme was conducted in six of the seven chiefdoms. The seventh chiefdom, Makpele, had already allocated the funds to construct a hospital in the chiefdom headquarter town of Zimmi.

For the research, three distinct treatments were compared. The first treatment was the chief treatment, where vouchers were handed out through traditional governing structures, i.e. the chief. In the second treatment, vouchers were handed out to individual households identified in an earlier census round. The third treatment was the voucher for work treatment (VfW), in which individual households had to work on a section of public road in exchange for the vouchers. Roads were selected that did not lead directly to the village, to avoid double benefits. The work programme was implemented in cooperation with the National Commission for Social Action (NaCSA) which is the government body responsible for implementing cash and food for work programmes in Sierra Leone. Regardless of the treatment allocated to their village, each household was eligible to receive six vouchers.

Vouchers were chosen instead of cash because most villages and regional markets were too small to supply goods in sufficient quantities. Each voucher had a value of 10,000 Leones and was given a unique identification code to enable measurement of trading in vouchers. Vouchers were redeemable for items from a list of forty-one goods<sup>4</sup> which were thought to be an accurate representation of household needs, containing both consumption and investment goods. When vouchers were spent on a project benefiting the entire village, they were classified as public goods. To ensure households could obtain goods useful to them, trading in vouchers was actively encouraged<sup>5</sup>. Each voucher was inscribed with its monetary value in local currency, such that if households wanted an item which was not on the list, they could exchange it for cash with other households. Moreover, care was taken to ensure prices on the goods menu reflected local market prices as accurately as possible. Prices were communicated to the households and a list containing all items for which the vouchers were redeemable was left in each village at the visit during which the vouchers were distributed. Orders were taken one week later, during another visit. These lists contained not only prices and item descriptions, but also pictures to facilitate comprehension by illiterates. Irrespective of treatment,

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<sup>4</sup> Appendix D

<sup>5</sup> In practice very little trading took place, which was taken as evidence the provided list accurately reflected household needs

households could choose to spend vouchers individually, or decide to bundle vouchers with multiple households or even the entire village.

## DATA COLLECTION

The research programme consisted out of four stages, in two of which data was collected. First, during March and April 2011 a census was conducted in all 69 eligible villages. During the same visit, up to 30 households per village were randomly selected to participate in a household survey. In total, 1790 households were interviewed. Furthermore, a village level survey was conducted and village chiefs were given a separate survey. Second, treatments were allocated to villages and vouchers distributed to a total of 2896 households. Treatments were allocated randomly, with stratification at the chiefdom level. As a result of the stratification allocation was not completely balanced: 24 villages received the chief treatment, 21 the household treatment, and 24 the voucher for work treatment. Voucher distributions under the different treatments followed a similar procedure described below. A pre-announced village meeting was held in which the programme was explained by a representative from the Gola Forest Programme (GFP) and a member of the research team. Under the voucher for work treatment, first the programme was explained, after which the work was executed - supervised by NaCSA. Households were divided into two groups, working on alternate days to allow combining the programme with their regular activities. Each household sent a representative and received one voucher of 10,000 Leones for each day of work - well above the market wage – for a maximum of six days. Most households worked all days and 99.3% of potential vouchers were handed out. After the work had finished, a research team visited the village to distribute the vouchers during a pre-announced village meeting. Third, one week after the vouchers had been distributed, a team returned to record orders. Household representatives holding vouchers were interviewed individually, their orders recorded and a brief survey about voucher trade was conducted. Each household received a copy of the order as a receipt. This survey round finished in June 2011. Fourth and finally, goods were distributed to individual households or village representatives in the case of public projects.

All data was collected through structured interviews with village and household representatives by a team of local staff fluent in both English and Mende, the local language. Data was double-entered in CSPro, a software package developed by the US Census Bureau for entering, tabulating and mapping survey data. To conduct the analysis, baseline survey data on individual, chief, and village level was matched to recorded orders giving a final sample of 1783 households.<sup>6</sup>

## METHODOLOGY

The research design enabled a direct test of the fungibility of money between the different treatments conditional on the randomisation having been successful. The success of the randomisation was tested by comparing household, village, and chief characteristics over the three different distribution programmes. Given that many variables were dummies and hence followed a non-normal distribution, the non-parametric Kruskal-Wallis test (Kruskal and Wallis 1952) was used to test for differences between the treatments. It allowed testing of general differences between the groups, which could stem from parameter or distributional differences (Newson 2002).

If the randomisation was successful, the treatments were truly exogenous and any difference in spending patterns was attributable to the treatments. Pairwise comparisons between treatments on the percentage of vouchers spent on consumption, investment and public goods was used to verify differences in spending patterns. The t-test, the most commonly used method, required normally distributed variables and equal between-group variances. Normality was tested with both Shapiro-Wilk and Shapiro-Francia tests (Shapiro and Francia 1972, Shapiro and Wilk 1965) and equal group variances was tested using Levene's test<sup>7</sup> (Levene 1960, Brown and Forsythe 1974). Welch's extensions were used to increase robustness against non-normality (Satterthwaite 1946, Welch 1947),

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<sup>6</sup> The difference with the number of interviewed households stems from missing or low quality data.

<sup>7</sup> Bartlett's test also tests for equal variances but requires normality M.S. Bartlett (1937)

which were found to be approximately valid for a wide range of finite samples (Sawilowsky and Blair 1992). An alternative pairwise comparison test used, not requiring normality or equal group variances, was the non-parametric Mann-Whitney-Wilcoxon test (MWW) (Wilcoxon 1945, Mann and Whitney 1947). Both tests were used, because under non-normality and unequal variances, it was not clear what the null hypotheses of the tests were; significant test results indicated a general difference between groups (Fay and Proschan 2010). In most situations, the MWW test has higher power (Blair and Higgins 1980). Significant differences indicated the method of distribution matters, i.e. that money is not fully fungible.

Rejecting the fungibility hypothesis in itself cannot explain observed differences, and therefore the importance of various factors thought to influence the public / private and consumption / investment decision were tested using regression analysis. In the programme, 42 villages unanimously chose a public goods project, whereas in 20 villages no vouchers at all were spent on public goods. This result indicated that an important part of the decision process was not made at the individual but at the group level. Therefore, the public goods decision was analysed at the village level, to determine which particular group characteristics were most important in determining the likelihood of a unanimous public project. The variable of interest was binary and equal to one for villages where a unanimous public project was chosen.

$$y_v = \alpha_v + \delta_v T_v + \beta_v X_v + \gamma_v Y_v + \theta_v Z_v + u_v$$

Where T was a vector containing treatment dummies, X contained variables measuring village heterogeneity, Y contained chief characteristics, and Z was village size, a control variable. The subscripts indicate all variables were measured at the village level. The treatments chief and voucher for work were included as dummies and compared to the household treatment. Village heterogeneity was measured by ethnicity, religion, and income distribution. Ethnicity was defined as a dummy variable equal to one when not more than 90% of the people in the village belonged to the same ethnicity. The religious heterogeneity variable was constructed similarly. Income distribution was measured by the standard deviation of the rice harvest of individual households, where higher standard deviations indicate higher income inequality. Included chief characteristics were wealth, trust, and authority. Chief wealth was measured by the size of his farm, in acres. Trust in the chief was the percentage of households in the village that indicated to trust their chief. Chief authority was the time it took the chief to coordinate people to execute the brushing task<sup>8</sup>. Finally, village size was measured by the number of households in the village and included as a control variable, as the ease of coordination is likely to fall with group size.

The private goods decision was analysed at the household level. The variable of interest is the proportion of vouchers spent on consumption. Because a profound difference between treatments in the public private goods decision, analysing the private goods decision for the entire dataset is expected to lead to biased coefficients. To remove this selection bias a Heckman model was used (Heckman 1979). The dependent variable in the selection equation was a dummy variable equal to one when households spent all or part of their vouchers on private goods. The treatment dummies and village sized were included as explanatory variables. In the second stage equation, the dependent variable was the percentage vouchers spent on consumption goods. The second stage equation was:

$$y_i = \alpha_i + \delta_i T_i + \beta_i X_i + u_i$$

Where T was a vector containing treatment dummies, X contained variables measuring household characteristics, and Y was a vector of control variables at the village level. The coefficients on the treatment dummies were the main variables of interest. Included household characteristics were the size of the rice harvest in bushels. Rice was the main crop and produced by all farming households. A bushel is a bag of approximately 50 kilograms. Because smaller windfalls are more likely to be consumed, wealthier households were expected to consume more out of their windfall gain. The second household variable was a dummy equal to one if the household indicated farming was not their primary source of income. Most investment goods were farm goods, so households that did not farm

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<sup>8</sup> See appendix E for an explanation

were expected to have higher consumption. Finally, a binary variable equal to one when households indicated they trusted their chief was included, to test the importance of framing in decision making. Unfortunately, commonly used household characteristics were not available as control variables, and the cross-section nature of the data did not allow for including household fixed effects so results should be interpreted with some caution. Standard errors were clustered at the village level.

## RESULTS

### RANDOMIZATION

An important assumption underlying the empirical approach was that the randomization of the treatments was successful. Results of the treatment group comparison are presented in appendix F. For none of the tested variables, the null of the different groups coming from the same population could be rejected. Hence, the randomisation appears to have been successful.

### FUNGIBILITY OF MONEY

Economic theory postulates money is fungible, which implies that the way and context in which money is received does not influence the way it is spent. If this were true, there would be no difference in spending on consumption, investment, and public goods between the chief, household (HH) and voucher for work (VfW) treatments. Means and standard deviations of the three outcome variables and test results are presented in table 1 below.

**Table 1: Spending outcomes**

Treatment:	Chief	HH	VfW	Total
Consumption	0.0956 (0.249)	0.166 <sup>a</sup> (0.216)	0.176 <sup>a</sup> (0.278)	0.145 (0.249)
Investment	0.0639 (0.182)	0.229 (0.301)	0.174 (0.300)	0.152 (0.270)
Public	0.841 (0.366)	0.606 <sup>a</sup> (0.488)	0.651 <sup>a</sup> (0.472)	0.703 (0.448)

Numbers indicate the share of vouchers spent on consumption, investment, and public goods per treatment. Standard deviations are shown between brackets.

Normality was firmly rejected for all subgroups within the consumption and investment variables. Test results for the subgroups within the public goods variable were less determinate. The hypothesis of equal group variances was firmly rejected for all variables. Hence, results of the Mann-Whitney-Wilcoxon (MWW) test were probably more reliable. Both tests gave similar results and indicated significant differences in spending patterns between the chief, household, and voucher for work treatment: the way vouchers were distributed had an important influence on how they were spent. For consumption, there was no significant difference between the HH and VfW treatment, but spending on consumption under either (16.6% and 17.6%) was significantly higher than under the chief treatment (9.6%). Investment spending was significantly different under each treatment, ranging from 22.9% of vouchers under the household treatment to 6.4% under the chief treatment. Public goods spending was significantly higher under the chief treatment (84.1%) than under the household (60.6%) and VfW (65.1%) treatment, and remarkably high overall: 70.3% of distributed vouchers were spent on public goods. Most community projects involved construction or renovation of public buildings, including barris<sup>9</sup>, public toilets, and guesthouses.

Differences in spending patterns on public goods between treatments can be attributed not only to the differences in means, but also to the difference in distributions, as shown in table 2. Unanimous

<sup>9</sup> A barri is a covered structure in the centre of the village where community meetings are held

public goods projects were more numerous under the chief treatment, whereas under the HH and VfW treatment it was more common that no public project was undertaken and all vouchers were spent

**Table 2: Choices per village**

Public goods spending:	Chief	HH	VfW	Total
100%	20	9	13	42
1-99%	-	4	3	7
0%	4	8	8	20
All	24	21	24	69

Numbers indicate the number of villages that fit in a particular spending pattern, per treatment

privately. In all but one of the seven villages where public goods decisions were not unanimous, most households in the village contributed all their vouchers to the public goods project, while other households did not contribute at all. In the other village in this group, every household contributed one voucher to the public project, and spent the rest of their vouchers on private goods. Clearly, in most villages there existed a high degree of village-level coordination in public goods spending. Therefore, the public goods decision was analysed at village level.

## PUBLIC GOODS DECISION

Results of the regressions on the public goods decision are presented in table 3. Descriptive statistics of variables included in the regression analysis are presented in appendix G. The dependent variable was binary and equal to one when a village unanimously decided to spend all their vouchers on public goods project. The HH treatment was the base group in all regressions.

**Table 3: Regression output public decision**

	(1)	(2)	(3)	(4)
Chief	1.897*** (2.70)	2.081** (2.39)	1.997*** (2.67)	2.639** (2.57)
VfW	0.455 (0.76)	0.567 (0.78)	0.480 (0.76)	1.212 (1.42)
Chief wealth		0.008 (1.50)		0.011* (1.65)
Chief trust		9.830** (2.38)		12.213** (2.40)
Chief authority		0.008 (0.58)		0.007 (0.90)
Harvest size (sd)			-0.074 (-0.81)	-0.132 (-1.19)
Mixed religions			-0.203 (-0.20)	-0.417 (-0.34)
Mixed tribes			-0.849 (-0.97)	1.802 (1.39)
Village size				-0.022 (-1.40)
Pseudo R-squared	0.097	0.259	0.122	0.336
Observations	69	61	68	60

Marginal effects; t statistics in parentheses

\* p<.10    \*\* p<.05    \*\*\* p<.01

The first regression includes only the treatment variables. Clearly, the chief treatment had a strong positive effect on the likelihood of a unanimous public project. It was highly significant and robust to the inclusion of other explanatory variables. The significance of the coefficient might be explained by framing and the perceived degree of ownership of the gain. Framing refers to the way the a decision is presented externally, rather than a change in measurable attributes (Thaler 1999). Tversky and Kahneman (1981) showed that framing a problem differently, for example by putting emphasis on gains rather than losses in a dual choice decision problem, radically changed respondents' choices. The chief treatment might change the decision frame by emphasising the group characteristics of the vouchers, because they start in the chiefs hands and are handed out by him. This 'we-frame' was shown to substantially increase public goods contributions in lab experiment settings by Cookson (2000). In his experiments, subjects contributed more after have done exercises which emphasised the value of various individual actions to the group. In psychology, public good contributions were found to be higher in the group of participants where collective identity rather than personal identity was stressed (De Cremer and Vugt 1998). In their study, the only difference between treatments was that the first group was told the study was comparing results between universities, whereas the other was told the comparison was between subjects. In other words, by putting the responsibility of the distribution of the vouchers at the village level, vouchers might be perceived as village rather than individual income, and spent accordingly. Another explanation for the importance of the chief treatment might be found in the perceived degree of ownership. Households might simply not feel the vouchers are really theirs when they receive them from the same chief that presides the village meeting on whether or not to undertake a public project. Clark (2002) explained higher spending on public goods from windfall gains by a smaller perceived degree of ownership. In fact, over-contribution to public goods when choices are observed by group members is widely reported (Ledyard 1995). However, if the degree of ownership was an important factor the VfW treatment would be expected to have a negative effect on the likelihood of a public goods project – a prediction not supported by the data. Earlier work by Cherry et al. (2005) also found that earning rather than receiving vouchers had no effect on spending patterns. However, in his research he considered individual decision making, rather than the group level decision making analysed in this paper.

In the second regression, chief characteristics were added to the model. Out of the selected chief characteristics the reported degree of trust in the chief had most explanatory power and a large and positive effect on the likelihood of a unanimous public goods project. The importance of chief trust was robust to the inclusion of village-level heterogeneity variables. Higher levels of general or specific trust are generally associated with higher contributions to public goods (Qin et al. 2011, Tu et al. 2011). Leonard et al. (2010) reported that social capital, measured by trust and social networks, had a stronger effect than ethnic diversity and other group characteristics, similar to the results found here. If reported trust related specifically to the chief, it would be expected that the effect of trust would be stronger under the chief treatment. However, no such evidence was found in our data, as the coefficient on the interaction term was insignificant and had the wrong sign. Therefore the included trust variable might well be an indicator of in-group or general trust, and might not necessarily be primarily chief-dependent. Chief wealth measured by land holdings had a positive effect on the likelihood of a public goods project in line with expectations (Binswanger and McIntire 1987). Although the effect was only significant when factors of village heterogeneity were accounted for and even then only at the 10% level. The developed measure for chief authority had no effect. It was far from significant, and had the wrong sign. This insignificance might either be explained by the inaccuracy of the developed measure, or the lack of importance of chief authority. Unfortunately, it was not possible to identify the exact cause given data limitations.

None of the village heterogeneity variables was significant in any regression. This is an unexpected result, albeit not uncommon in the literature (Leonard et al. 2010). In fact, Bardhan and Dayton-Johnson (2002) found a negative effect of heterogeneity on collective action. The control variable, village size, was also insignificant although it did have the expected sign.

## PRIVATE GOODS DECISION

Results of the Heckman regression on the private consumption / investment decision are presented in table 4. Both first-stage and second-stage results are reported. In the first-stage or selection equation

the dependent variable was a dummy equal to one when the household spent at least one voucher on private goods. In the second-stage regression, the percentage of privately spent vouchers going to consumption was the dependent variable. Of the vouchers spent on private goods, 50.3% was spent on consumption, the other part on investment. Because of missing values of harvest size and chief trust, the sample size was somewhat reduced as is evident from the table of descriptive statistics presented in appendix G.

**Table 4: Regression output consumption decision**

Second-stage regressions	(1)	(2)	(3)
Chief	0.098 (0.88)	0.078 (0.73)	0.235** (1.97)
VfW	0.064 (0.55)	0.059 (0.49)	0.060 (0.51)
Harvest size	0.003 (1.40)	0.003 (1.50)	0.003 (1.36)
No farmer dummy	0.381*** (4.79)	0.391*** (5.13)	0.408*** (5.50)
Trustworthy chief		-0.062 (-1.11)	-0.020 (-0.32)
Trust*Chief			-0.189* (-1.67)
Constant	0.322** (2.47)	0.360*** (2.64)	0.336** (2.49)
<b>Selection equation</b>			
Chief	-0.894** (-2.00)	-0.900** (-2.02)	-0.899** (-2.01)
VfW	-0.180 (-0.47)	-0.181 (-0.47)	-0.181 (-0.47)
Village size	0.011** (2.09)	0.012** (2.13)	0.012** (2.13)
Constant	-0.725** (-2.04)	-0.754** (-2.12)	-0.754** (-2.12)
Observations	1649	1634	1634

t statistics in parentheses

\* p<.10    \*\* p<.05    \*\*\* p<.01

Variables included in the selection equation are at the village level, since the public / private decision was made at this level in 63 out of 69 included villages<sup>10</sup>.

In the first two regressions, the treatments have no discernible effect on the spending pattern of the privately spent vouchers. This is remarkable, especially since other empirical work found highly significant differences in spending patterns between earned an unearned income (Christiaensen and Pan 2010). Harvest size did have the expected sign, but was insignificant at commonly chosen critical values. Households that did not primarily depend on farming for their livelihood on average spent around 40% more vouchers on consumption rather than investment, an effect which was highly significant. Chief trust was found to be important in explaining the public / private decision, but did not have an influence on the consumption / investment decision. When households indicated they

<sup>10</sup> In 42 villages a public project was unanimously chosen, in 20 villages all spending was private, and in one village every household contributed 1 voucher to a public project and spent the rest privately.

trusted their chief, they were expected to be more likely to spend their vouchers on investment instead of consumption. Although the variable did have the expected sign it was far from significant.

The third regression included an interaction term of the chief treatment with the reported trust in the chief. The coefficient on the interaction term was negative and significant. When households indicated to trust their chief and received their vouchers from the chief, they were more likely to spend their vouchers on investment rather than consumption. Furthermore, the coefficient on the chief treatment also became significant in the third regression. The positive sign implied that on average, households under the chief treatment were more likely to spend their vouchers on consumption, although out of this group, households that trusted their chief spent less vouchers on consumption. The importance of trust in the private spending decision might be explained by the same factor explaining the increased likelihood of unanimous public goods projects under the chief treatment: framing. O'Curry and Strahilevitz (2001) postulate that the higher the certainty of acquisition, the more likely people opt for utilitarian instead of hedonic goods. Utilitarian goods are defined as functional purchases, whereas hedonic goods are frivolous in nature. In the context of the research, when households consider the income a one-off gain, because they do not consider it likely they will receive the income again in the future, vouchers are used for consumption. However, when trust in the chief is high, income is considered more permanent and therefore spent more like regular income.

## CONCLUSION

In this paper the fungibility assumption common in orthodox economic theory was directly tested using a large-scale randomized field experiment. The significant differences between spending patterns under different treatments provide robust evidence to reject this assumption. Moreover, observed distributions of spending decisions on public goods strongly suggests decisions on the public / private axis were made at the village rather than individual level. Therefore the public decision was analysed at the village level. In these regressions the most important divide was between vouchers distributed through the chief and vouchers distributed individually, either by direct distribution to households or in exchange for labour. No discernible difference was found between earned and unearned vouchers. Another important factor increasing the likelihood of a unanimous public goods project was the percentage of households that indicated to trust the chief. Village heterogeneity did not significantly affect the decision. Subsequently, the private spending decision was analysed. On average, the percentage of vouchers spent on private consumption was higher under the chief treatment, however, households in chief treatment villages that indicated to trust the chief spent less on consumption.

Overall the results correspond well to predictions made by mental accounting theory. Particularly framing effects appear to play an important role, both in the public / private as well as in the consumption / investment decision. In the public goods decision, distribution through the chief makes households have a community frame in mind when making spending decisions. Therefore, vouchers distributed through the chief are more likely to get spent on projects benefiting the community. In the private spending decision the level of trust in the chief is only important when vouchers are distributed through the chief treatment: chief characteristics only matter when they are taken into account in the decision making process. When the chief is trusted, households invest more of their vouchers, potentially because of an increased confidence in the future.

A remarkable result is the lack of significance of the voucher for work (VfW) treatment in both the public / private as well as the consumption / investment decision. The expectation that earned money is spent more rationally is not only part of popular belief, but also found in policy making at macro and micro level. Just think about the assumed advantages of loans versus grants, and reluctance of non-humanitarian development programmes to provide goods at no cost to the user. The experimental set-up of the research programme and the large scale at which it was conducted provide strong evidence to reconsider such assumptions. However, more research is needed before generalising these findings to settings other than rural Sierra Leone.

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## APPENDIX A - PROTOCOL TREATMENT A (CHIEF) – VOUCHER DISTRIBUTION

### Upon arrival in the village:

1. Ask the chief to convene a community meeting. Invite all interested members of the village.
2. Before the meeting tell the chief what we plan to do. Obtain his permission to run the program as you describe it to him. Thank him for his cooperation.
3. Once the community meeting has started:

### Gola Forest Programme community development representative:

- General introduction about who we are and why we are in the village.
- We are here representing the Gola Forest Programme and the government of Sierra Leone.
- We want to help your village by providing you with livelihood aid to show our mutual support for conserving the Gola Forest.

### Research assistant:

- Read some of the names from the “*Master Household Census List*” from visit 1 to the community to check if the list is correct. Choose every fifth name on the list to check, i.e. #5, #10, #15, #20 etc.
  - i. If the list is correct – skip the next step.
  - ii. If the list is not correct – do a new census using the *Master Household Census Correction List* before continuing.
- We have here vouchers for your community. These pieces of paper represent amounts of money that you can spend with us on certain goods to help your family, friends, farm, or village. Each voucher has a value of 10,000 Le (show one of the vouchers to the community).
- None of this money will be paid in cash. It will be paid in vouchers. These vouchers can be redeemed for the goods on this menu (show the menu). The menu contains different types of goods:
  - i. Goods for in your house such as: salt, maggi, and rice.
  - ii. Goods for on your farm, such as: hoes, brushing knives and cacao seedlings.
  - iii. Goods for the village, such as: a generator, a water tank, and cement and zinc sheets for a community building project. Some of these are expensive, so you can get vouchers from multiple households, or even the whole village together to buy them.
- The vouchers are only valid for this project. You cannot save the vouchers for later.
- The vouchers are only valid in this community. Any remaining funds will be returned to the chiefdom development fund.
- There are \_\_\_\_\_ number of households in your village.
- We are giving your chief \_\_\_\_\_ vouchers for the community. This amount is based on the size of your village. Here is the list with all the households. Read the list out to the community (Hand the list to the chief).
- The chief must distribute the vouchers over the household in the village. The chief decides how many vouchers each household receives. Here are the vouchers, chief. (Hand the vouchers to the chief). Give the chief time to count all the vouchers before continuing. (NOTE: The vouchers do not need to be numbered in this treatment)

### Talk to the whole community again:

- If you, as a household, have received vouchers from the chief, you are free to trade them with other households or combine your vouchers with other households to buy things together, as you like.
- We will be back one week from now. Think of what you want to purchase so you are ready to order when we come back. We will leave the list of items you can buy with your vouchers here. Read all the items on the menu and their prices in Mende to the community. You can only use the vouchers to buy items from the menu, not other goods (Hand over the menu – pin it to the wall of the barri).

- When we come back, we will ask each household in private how many vouchers they have received from the chief, and what they want to purchase with those vouchers. Make sure you have the vouchers with you when we return – no vouchers = no order. All vouchers will be collected by the research team.
- Whatever you want to order will be private. We will not tell others in your village. We will also make sure the goods are delivered privately. The goods will be in a bag so other households cannot see which goods you have received.
- When we have collected your orders, we need some time to buy the goods and bring them to you. The goods will arrive before the rainy season.
- 4. Ask if anyone has any questions.
- 5. Make sure that there are no misunderstandings.
- 6. Thank the village members for their time and leave the village.

## APPENDIX B - PROTOCOL TREATMENT B (INDIVIDUAL HOUSEHOLDS) – VOUCHER DISTRIBUTION

### Upon arrival in the village:

1. Ask the chief to convene a community meeting. Invite all interested members of the village.
2. Before the meeting tell the chief what we plan to do. Obtain his permission to run the program as you describe it to him. Thank him for his cooperation.
3. Once the community meeting has started, announce that,

### Gola Forest Programme community development representative:

- General introduction about who we are and why we are in the village.
- We are here representing the Gola Forest Programme and the government of Sierra Leone.
- We want to help your village by providing you with livelihood aid to show our mutual support for conserving the Gola Forest.

### Research assistant:

- Read some of the names from the “*Master Household Census List*” from visit 1 to the community to check if the list is correct. Choose every fifth name on the list to check, ie. #5, #10, #15, #20 etc.
  - i. If the list is correct – skip the next step.
  - ii. If the list is not correct – do a new census using a blank *Master Household Census Correction List* before continuing.
- We have here vouchers for your community. These pieces of paper represent amounts of money that you can spend with us on certain goods to help your family, friends, farm, or village. Each voucher has a value of 10,000 Le (show one of the vouchers to the community).
- None of this money will be paid in cash. It will be paid in vouchers. These vouchers can be redeemed for the goods on this menu (show the menu). The menu contains different types of goods:
  - i. Goods for in your house such as: salt, maggi, and rice.
  - ii. Goods for on your farm, such as: hoes, brushing knives and cacao seedlings.
  - iii. Goods for the village, such as: a generator, a water tank, and cement and zinc sheets for a community building project. Some of these are expensive, so you can get vouchers from multiple households, or even the whole village together to buy them.
- The vouchers are only valid for this project. You cannot save the vouchers for later.
- The vouchers are only valid in this community. Any remaining funds will be returned to the chiefdom development fund.
- There are \_\_\_\_\_ number of households in your village.
- We are giving every household 60,000 Le worth of vouchers. That means every household will get six vouchers.

- You are free to trade the vouchers among yourselves or combine yours with other households, as you like.
  - We will be back one week from now. Think of what you want to purchase so you are ready to order when we come back. We will leave the list of items you can buy with your vouchers here. Read all the items on the menu and their prices in Mende to the community. You can only use the vouchers to buy items from the menu, not other goods (Hand over the menu – pin it to the wall of the barri).
  - When we come back, we will ask each household in private what they want to purchase with their vouchers. Make sure you have the vouchers with you when we return – no vouchers = no order. All vouchers will be collected by the research team.
  - Whatever you want to order will be private. We will not tell others in your village. We will also make sure the goods are delivered privately. The goods will be in a bag or box so other households cannot see which goods you have received.
  - When we have collected your orders, we need some time to buy the goods and bring them to you. The goods will arrive before the rainy season.
4. Ask if anyone has any questions.
  5. Make sure that there are no misunderstandings.
  6. Distribute the vouchers to each household. Call the households one by one (using the *Master Household Census Correction List* or *Master Household Census List*).
  7. On each voucher, write village code (if not already on the voucher), the household number and the sequence number (1 to 6 – there are 6 vouchers per household).
  8. Hand every household a packet of vouchers worth Le 60,000. Count the vouchers into the hand of the person receiving them. Each household must sign on the household census list for having received the vouchers.
  9. Thank the village members for their time and leave the village.

## APPENDIX C – PROTOCOL TREATMENT C (VOUCHER FOR WORK)

For the voucher for work treatment a cooperation was started with NaCSA, the government organisation responsible for organising road maintenance through cash for work programmes. Work sites were selected within two miles from all the villages working on the site. Each site was a stretch of road that the intended amount of participants would be able to work on for six days. Only roads that none of the targeted villages would normally be responsible for were selected.

### Upon arrival in the village:

1. Ask the chief to convene a community meeting. Invite all interested members of the village.
2. Before the meeting tell the chief what we plan to do. Obtain his permission to run the program as you describe it to him. Thank him for his cooperation.
3. Once the community meeting has started, announce that,

### Clerk of Work from NaCSA:

- A road maintenance project is organized near the community.
- All of the households on the list are invited to send one representative to work on the project.
- Each household will receive one laminated slip that will identify them for the duration of the work (show the slips).
- The ones with a circle on their slip will work on one day, the ones with a triangle the other. This to give each household the opportunity to attend to their farm during the project.
- The households working on the project are expected to work for five hours a day.
- Each household can work for six days. So because everyone works one day, and is able to do other things the next, the programme will last for twelve days.
- Per day, each household earns a salary of Le 7,500. Because the work site is some way from the community, every participant gets Le 2,500 per day worked as a compensation for the distance covered. So in total, the remuneration is Le 10,000 per day.

- None of this money will be paid in cash. It will be paid in vouchers at the end of the project. These vouchers can be redeemed for goods on this menu (show the menu). The menu contains different types of goods:
  - i. Goods for in your house such as: salt, maggi, and rice.
  - ii. Goods for on your farm, such as: hoes, brushing knives and cacao suckers.
  - iii. Goods for construction project in your village, such as: cement and zinc sheets. Some of these are expensive, so you can get vouchers from multiple households, or even the whole village, together to buy them.
- You have one week to decide what you want to do with the vouchers. WUR staff will then visit you to record your choices.
- The goods will be delivered before the rainy season.
- Workers on the project have to bring their household slip to work, in order for the clerk of work to register that they worked. Based on this, the payment in vouchers will be made.
- Should the household not be able to send a member to the project on any given day, they can choose to send someone from another household as a representative.
- We only look at slip numbers when checking who works. So if you select someone to represent you, you will have to send your own slip along with this person to the work site.
- The household that owns the slip will get the vouchers for the work the representative does. The representative will not receive any vouchers from WUR for their work.
- It is up to the slip owner and the representative to make arrangements for any possible compensation to the representative.
- The representative will be asked by the clerk of work whether he/she belongs to the household that owns the slip. This is purely for our purposes. The household who owns the slip will receive the vouchers, and the community members themselves are then responsible for the compensation of representatives.
- Ensure that everything is clear to the community members.
- Hand out the slips: the number on the *Census List* will determine which slip a household will receive. (So call out their names one by one.)
- The community can then decide when to start the project.

#### Each day of the work:

- At the start of the work, inspect the slips of each of the workers and mark their attendance by checking the relevant box on the *Work Record Sheet*. For research purposes we would like to know whether a household is represented by another household, and if so, by which household. So ask this to everyone. If the household is represented, instead of the check mark, fill in the number of the household of the representative. If this is unknown, mark "R".
- Hand out the tools.
- Start the work.
- After the work has been done, the participants can go home.

#### Research assistant:

- We have here vouchers for your community. These pieces of paper represent amounts of money that you can spend with us on certain goods to help your family, friends, farm, or village. Each voucher has a value of 10,000 Le (show one of the vouchers to the community).
- None of this money will be paid in cash. It will be paid in vouchers. These vouchers can be redeemed for the goods on this menu (show the menu). The menu contains different types of goods:
  - i. Goods for in your house such as: salt, maggi, and rice.
  - ii. Goods for on your farm, such as: hoes, brushing knives and cacao seedlings.
  - iii. Goods for the village, such as: a generator, a water tank, and cement and zinc sheets for a community building project. Some of these are expensive, so you can get vouchers from multiple households, or even the whole village together to buy them.
- The vouchers are only valid for this project. You cannot save the vouchers for later.
- The vouchers are only valid in this community. Any remaining funds will be returned to the chiefdom development fund.

- We are giving every household 10,000 Le worth of vouchers for each day they worked.
  - You are free to trade the vouchers among yourselves or combine yours with other households, as you like.
  - We will be back one week from now. Think of what you want to purchase so you are ready to order when we come back. We will leave the list of items you can buy with your vouchers here. Read all the items on the menu and their prices in Mende to the community. You can only use the vouchers to buy items from the menu, not other goods (Hand over the menu – pin it to the wall of the barri).
  - When we come back, we will ask each household in private what they want to purchase with their vouchers. Make sure you have the vouchers with you when we return – no vouchers = no order. All vouchers will be collected by the research team.
  - Whatever you want to order will be private. We will not tell others in your village. We will also make sure the goods are delivered privately. The goods will be in a bag or box so other households cannot see which goods you have received.
  - When we have collected your orders, we need some time to buy the goods and bring them to you. The goods will arrive before the rainy season.
4. Ask if anyone has any questions.
  5. Make sure that there are no misunderstandings.
  6. Distribute the vouchers to each household. Call the households one by one (using the *Work Record Sheet*).
  7. On each voucher, write village code (if not already on the voucher), the household number and the sequence number (1 to 6 – there are a maximum of 6 vouchers per household).
  8. Count the vouchers into the hand of the person receiving them. Each household must sign on the household census list for having received the vouchers.
  9. Thank the village members for their time and leave the village.

#### APPENDIX D – ORDER LIST

The table below contains a list of all goods that could be exchanged for vouchers. Items 1-8 were grouped under consumption, all other goods under investment. In the *Voucher Collection Survey* households could indicate if an order constituted a community project.

	Description of goods	Price (Le)
1	Palm oil (pint)	1.200
2	Salt (butter cup)	500
3	Sugar (butter cup)	1.500
4	Maggi (pkt)	12.500
5	Mampo - Sandege (pkt)	6.500
6	Rice (buttercup)	800
7	Radio	75.000
8	Rubber bowl (medium)	12.000
9	Hoe (big)	15.000
10	Hoe (small)	5.000
11	Brushing knife	5.000
12	Upland cutlass	10.000
13	Upland seed rice (bushel)	40.000
14	IVS seed rice (bushel)	60.000
15	Cassava sticks - improved (bundle, 30)	10.000
16	Coffee seedling	2.500
17	Cacao seedling	2.500
18	Oil palm seedling - improved	10.000
19	Goat hammer	8.000

20	Fertilizer NPK 15/15 for rice (bag)	115.000
21	Fertilizer NPK 20/20 for cocoa + coffee (bag)	115.000
22	Fertilizer urea for rice + cocoa + coffee (bag)	115.000
23	Saw	50.000
24	Head pan	23.000
25	Pickaxe	26.000
26	Sewing machine	320.000
27	Shovel	28.000
28	Cement (bag)	40.000
29	Zinc sheet (bundle)	280.000
30	Zinc sheet	15.000
31	Iron rod (1/2 inch, 40 ft)	48.000
32	Iron rod (1/4 inch, 40 ft)	12.000
33	PVC pipe (40 ft)	52.000
34	PVC elbow/ T	12.000
35	Roofing Nail (pkt)	25.000
36	Nails 4" (pkt)	9.000
37	Nails 3" (pkt)	9.000
38	Water Tank (1000 l.)	1.300.000
39	Water Tank (500 l.)	800.000
40	Generator – 3KV	1.300.000
41	Generator – small, better than Tiger	600.000

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## APPENDIX E – BRUSHING TASK PROTOCOL

1. Tell the chief:
  - a. We want to know if you would be willing to organize an activity in your village.
  - b. If you are willing, we would like to ask you to clear grass from the paths around your community.
  - c. We would like you to brush and collect enough grass, weeds, and debris along your path that you can fill these \_\_\_\_\_ 50 kg bags (# of bags = # of village HHs / 3).
  - d. If you can organize everyone in the village to do this, and you bring back the sacks full of brushings, we will give you a bonus payment of 50,000 Le.
  - e. The villagers will not be paid for this activity.
  - f. We will time you to see how long it takes your village to complete the task, but that won't affect your bonus.
  - g. You must complete the task before we leave the village or else we cannot pay you.
  - h. We may also ask people in your village if they participated and how they felt about this activity.
  - i. Are you willing to do this? If yes, proceed to 2; if no, proceed to 3.
  
2. If the chief is willing,
  - a. Give him the appropriate number of 50 kg sacks (the total number of households divided by 3 and rounded down to the nearest whole number).
  - b. Tell him that the timer is starting now.
  - c. Write down the exact time you give him the sacks.
  - d. If the chief does return, record the time they complete the task by showing you all the filled bags on the *Brushing Task Record Sheet*.

- e. Promise him that we will pay him the bonus 50,000 Le when we pay everyone for his or her participation that day.
  - f. Record the number of people in the village who participate in the brushing on the *Brushing Task Record Sheet*.
  - g. Monitor the work to make sure that they are brushing their paths and not picking up dead or already cut materials.
  - h. If the chief does not return, also record it on the *Brushing Task Record Sheet*.
3. If the chief is **not** willing,
    - a. Tell him that we understand and that he does not have to participate.
    - b. Ask him why he does not want to participate, and record his answer on the *Brushing Task Record Sheet*.

## APPENDIX F – RANDOMISATION RESULTS

The table below shows the results of the randomisation. The first column contains the variables used to verify the randomisation. They are grouped into household, chief and village variables. Averages and standard deviations are shown per treatment and overall. The p-values refer to the Kruskal-Wallis test of equal groups. The null hypothesis of equality could not be rejected for any variable, showing that the randomisation appears to have been successful.

	Chief	HH	VfW	Total	p-values K-W
<b>Household</b>					
Tin roof dummy	0.340 (0.474)	0.303 (0.460)	0.381 (0.486)	0.342 (0.475)	0.1353
Mobile phone dummy	0.137 (0.344)	0.103 (0.304)	0.121 (0.326)	0.121 (0.327)	0.7476
No farmer dummy	0.0321 (0.176)	0.0189 (0.136)	0.0136 (0.116)	0.0221 (0.147)	0.7374
Harvest size	5.062 (5.092)	5.451 (5.149)	5.320 (7.450)	5.262 (5.975)	0.2697
Perceived honesty	0.899 (0.302)	0.920 (0.272)	0.922 (0.268)	0.913 (0.282)	0.6036
Meeting participant	0.894 (0.309)	0.912 (0.284)	0.909 (0.289)	0.904 (0.295)	0.8663
Trustworthy chief	0.865 (0.342)	0.901 (0.299)	0.883 (0.321)	0.882 (0.323)	0.5781
Comm. work frequency	3.012 (2.496)	2.901 (2.410)	3.154 (2.525)	3.025 (2.481)	0.2778
<b>Chief</b>					
Election year	1997.8 (12.92)	1992.8 (15.93)	1995.2 (13.92)	1995.3 (14.16)	0.8319
Age	59.37 (16.56)	61.61 (16.59)	59.19 (17.50)	60 (16.65)	0.8478
Education	0.684 (0.478)	0.778 (0.428)	0.810 (0.402)	0.759 (0.432)	0.8043
Land (acres)	70.47 (115.4)	33.56 (52.68)	110.2 (222.7)	73.40 (153.1)	0.8405

Wives	2.421 (1.387)	1.778 (0.878)	1.714 (1.056)	1.966 (1.154)	0.1188
Children	8.053 (3.391)	6.611 (2.831)	6.619 (3.542)	7.086 (3.300)	0.6275
<b>Village</b>					
Households	44.16 (28.60)	37 (25.28)	41.29 (31.02)	40.90 (28.19)	0.3606
Mixed religions	0.158 (0.375)	0.0556 (0.236)	0.0476 (0.218)	0.0862 (0.283)	0.5437
Mixed tribes	0.158 (0.375)	0.111 (0.323)	0.0476 (0.218)	0.103 (0.307)	0.6452
New roofs	30.21 (30.69)	23.11 (31.30)	27.10 (28.67)	26.88 (29.77)	0.4265
Cement walls	3 (3.756)	3.667 (8.832)	2.190 (3.669)	2.914 (5.729)	0.4657

## APPENDIX G – DESCRIPTIVE STATISTICS

Descriptive statistics of the public goods analysis are presented in the table below. All variables are at village level.

variable	N	mean	sd	min	max
Chief	69	0.35	0.48	0	1
HH	69	0.30	0.46	0	1
VfW	69	0.35	0.48	0	1
Chief wealth	64	66.95	147.01	2	900
Chief trust	69	0.89	0.10	0.46	1
Chief authority	65	51.80	116.34	11	705
Harvest size (sd)	69	4.71	3.18	1.25	18.71
Mixed religions	68	0.10	0.31	0	1
Mixed tribes	69	0.13	0.34	0	1
Village size	69	41.97	29.25	10	148

Descriptive statistics of the private goods analysis are presented in the table below. All variables are at household level.

variable	N	mean	sd	min	max
Chief	1783	0.37	0.48	0	1
HH	1783	0.30	0.46	0	1
VfW	1783	0.33	0.47	0	1
Harvest size	1735	5.32	5.98	0	99.9
No farmer dummy	1750	0.03	0.17	0	1
Chief trust dummy	1716	0.88	0.32	0	1

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