Investment Climate and Business Environment Research Fund

The Role of Harambee Contributions in Corruption:

Experimental Evidence from Kenya

By

Abraham K. Waithima[1]

Daystar University

Nairobi, Kenya

ICBE-RF Research Report No. 16/12

Investment Climate and Business Environment Research Fund
(ICBE-RF)
www.trustafrica.org/icbe

Dakar, April 2012

[1] Contact: akwaithima@daystar.ac.ke

This research report was supported by a grant from the Investment Climate and Business Environment (ICBE) Research Fund, a collaborative initiative of TrustAfrica and IDRC. It's a working paper and hence research in progress, circulated for discussion and comments. The findings and recommendations are those of the author(s), and do not necessarily reflect the views of the ICBE-RF Secretariat, TrustAfrica or IDRC

Abstract

This paper uses an experiment involving a public good game and a common pool resource game to investigate if individuals compensate their "Harambee" contributions by engaging in corruption. The results show an inverse relationship between public good contributions and common pool resource extractions, in that cooperator in public good contributions extract less from the common pool resource. To the extent that the experiment mimics the alleged link between contributions to harambee and corrupt acts of embezzlement ex-post, the basis for blaming harambee on corruption is not established by the results. Consistent with the findings documented in Henrich et al, 2001 which showed that Kenyan subjects brought their everyday experience of harambee into the public good setting, this paper also documents the fact that participants in the games brought their real life experience of harambee to bear on their decisions. This highlights the important and potentially positive reinforcing role that social norms and institutions can have on individual decisions.

Acknowledgement

The author appreciates financial assistance from ICBE/Trust Africa and Daystar University without which this work would have been impossible.

Table of Contents

List of tables

1. Introduction

Harambee (Swahili word for "let us all pull together") is a self-help initiative in Kenya that is used to bring people together to contribute towards the provision of communal goods. So important has been the initiative that over the period 1980-1984, 12% of all national capital formation was through harambee (Ngau, 1987) while by the end of 1980s, about 50% of all secondary schools were built through the initiative (Transparency International, 2003). With time, politicians found harambee to provide an appropriate avenue to sell their candidature to the electorates. Harambee contributions began to be seen as a ticket for politicians to buy their way into public offices only for them to compensate themselves by engaging in corruption once elected to public office (Waiguru, 2002). Because of its alleged link to corruption, the Public Officer Ethics Act (POAE) of 2003, outlawed the personal involvement of public officers in organizing harambees (Chweya, 2005). This paper makes a contribution by using experimental games to investigate the alleged link between harambee and corruption by examining whether individuals compensate their public good contributions (akin to harambee contributions) by their level of extraction from a common pool resource ex-post.

The original spirit of Harambee was that individuals would voluntarily contribute their resources in form of cash, although labour and other materials were also welcome towards the provision of a communal good (Ngau, 1987). Harambee was popularised in Kenya immediately after independence by her first president when he made the remarks:

> [2]"But you must know that Kenyatta alone cannot give you everything. All things we must do together to develop our country, to get education for our children, to have doctors, to build roads, to improve or provide all day-to-day essentials. I give you the call: Harambee!" (Jomo Kenyatta, 1963).

Several factors have been cited as contributing factors to the success of harambee which include the local nature of the goods financed through harambee where each donor sees their direct benefit from the good (Wilson, 1992). Secondly, the projects funded through harambee are mainly in the rural areas which are characterized by a stable population who are closely-knit

[2] This remark was made by Kenya's first president, Jomo Kenyatta in his first address to the nation in 1963 after independence. Kenyatta is credited to have popularised the harambee initiative in the country.

together (Barkan & Holmquist, 1986). In a stable population, those who contribute towards a project can see their long-term benefits from the project.

With time, harambee became a way of life in Kenya (Ng'ethe, 1979) and a traditional custom of Kenyans (Government of Kenya, 1997). The gains made in Kenya through harambee cannot be overstated. Through the harambee initiatives, dispensaries, churches and especially schools have been built (Chieni, 1998).

Towards the end of the 1980s, harambee had transformed itself into a lubricant of political corruption as harambee contributions became a measuring rod of the performance and suitability of political candidates especially towards a general election (Kibwana et al, 1996). From voluntary contributions, harambee contributions effectively became mandatory mainly enforced by the provincial administration, where public servants such as chiefs would decline rendering a service to a common citizen until they made a contribution towards a harambee. The harambee contributions were not just enforced on the citizens but they almost became a prerequisite for businessmen getting government contracts especially if the harambee was presided over by politicians (Chweya, 2005). Professionalism in execution of government contracts was in turn replaced by the level of generosity of businessmen's harambee contributions (Kibwana et al, 1996). At the provincial administration level, in a number of cases government service would only be rendered at the exchange of harambee contributions (Transparency International, 2003). Without proper accountability of the funds raised in harambees, those charged with the responsibility of overseeing the utilization of the funds began to misappropriate the funds and as a consequence, many Kenyans came to view harambee as a source of bribery and extortion (Kibwana et al, 2001). In politics, harambees had become an auction where poor voters sell political offices to the highest bidder, and politicians buy occupancy of local councils, parliament and even presidency (Transparency International, 2003). While the poor in Kenya viewed harambee as a means of uplifting their conditions, to the politicians it was an avenue of selling themselves to the public. In a sense, harambee led to the commercialization of leadership and power, making it impossible for less endowed people to compete with the rich for leadership positions. Towards the end of 1990s, politicians from the opposition were already calling for the banning of harambees because of its alleged link to corruption.

Even though harambees have been linked to corruption, there has not been any empirical work to establish the relationship between the two. It is this gap that this paper seeks to fill by exploring the role of harambee in corruption using experimental methodology. Previous work on public good games in Kenya is scant. A widely cited study on the effects of social norms on contributions to a public good game is Henrich et al (2001). Using subjects from 15 small-scale societies to run ultimatum, dictator and public good game, the study found the Orma community from Kenya to double their contributions in the public good game once they understood the game to be a harambee one. This finding shows the entrenchment of the harambee spirit in the minds of Kenyans.

Using a set up similar to the one by Sell and Yeongi (1997) and Fehr and Leibbrandt (2008), this paper uses a two-stage experiment consisting of a one-shot public good game in the first stage and a one-shot common pool resource game in the next. Sell and Yeongi's paper sought to determine if public goods and common pool resources generate equivalent levels of cooperation when payoffs are the same. The interest was driven by the social dilemmas presented by public goods and common pool resources. The dilemmas are generated by different decisions that individuals have to make. In a public good game, the dilemma arises from the fact that a player is asked to give up some of his resources in order to create a common resource to be shared by all. On the other hand, in a common-pool resource game, a player is asked to restrain from extracting from a resource he has a stake in jointly with others in his group. Sell and Yeongi (1997) found more cooperation in common pool resource extraction than in public good contributions, which they attributed to loss aversion and endowment effects[3].

Fehr and Leibbrandt (2008) used a similar procedure by combining a public good game and a common pool resource field experiment. They sought to examine the role of other-regarding and time preference for cooperation among fishermen in Brazil. They conducted a public good experiment followed by a field experiment to examine the mesh sizes of the fishnets used by fishermen. They found fishermen who were more cooperative in the public good experiment

[3] In the case of public good provision, a member of a group is required to give up some of their endowment to acquire a public good to be shared by all members of the group. Both loss aversion and endowment effect work against cooperation in public good provision. In the sustenance of a common pool resource, a member is asked to restrain from extracting from an endowment that he owns jointly with the other members of his group. Both loss aversion and endowment effect work to maintain cooperation in the sustenance of a common pool resource.

used nets with bigger mesh sizes thus exploiting the fishing ground less and imposing fewer future negative externalities on others and themselves.

This paper presents evidence of an inverse and significant relationship between individual levels of public good contributions and the level of common pool resource extractions. To the extent that public good contributions approximate harambee contributions, this paper does not find support for the allegations that individuals compensate their harambee contributions by overextraction ex-post. Instead, this paper finds cooperators in harambee to be other-regarding in common pool resource extractions. Consistent with the endowment effect and loss aversion, the results show more cooperation in subjects' restraint from taking from a common pool resource than in public good contribution. This accords with the findings by Sell and Yeongi (1997).

The findings also support the important role that socioeconomic factors play in the management of common resources. In line with the vast literature that shows the adverse effects of heterogeneity on common resource management, this paper finds both ethnic and gender heterogeneity within groups to have significant negative effects on common resource provision and maintenance.

2. Social dilemma arising from common resources

Non-excludability makes public goods and common pool resources prone to the problem of free-riding and overexploitation respectively. The difference between public goods and common pool resources lies in their level of subtractability (Camerer, 2003). While public goods are considered low in subtractability and one person's use does not appreciably limit the use by the other, a common pool resource, is high in subtractability in that one person's use limits another's.

Taylor and Ward (1982) highlight several conditions under which a public good game will take the form of a prisoner's dilemma. Among these conditions is if each player does best for himself by free riding while the others contribute[4]. Without compulsory contributions, harambee fits perfectly into a prisoner's dilemma case. If a single harambee initiative is able to raise the funds required for a particular public good, this then would be like an n-player one-shot public good game. Some studies such as Marxwell and Ames (1981) and Gintis (2000) found that in a one-

[4] Other conditions are (a) if no player can profitably provide any of the good by himself and (b) if all players contribute, each player’s welfare is improved.

shot public good game, most subjects contribute half of their initial endowment towards the public good and therefore shows that not everyone behaves purely selfishly in a one-shot public good game.

Free riding becomes evident with repeated public good games with the level of contributions decaying as the game progresses. The decay in contributions has been attributed to learning and strategies hypotheses (Andreoni, 1988). Utilizing games where individuals were matched as partners in some groups and strangers in others, Andreoni (1988) found both hypotheses to be insufficient in explaining the decay in contributions, and argues that the decay is rather brought about by a group's attempt to establish a social norm of punishing free-riders. Further explanation of the decay in public good contributions is "regret theory" (Loomis & Sugden, 1982). The theory posits that if a subject in one round of play discovers that he did better by free riding, he becomes "elated" and is likely to free ride more in the next round. On the other hand if a subject discovers that he did worse in one round (contributed more than other group members), he has "regret" and will cut down his contributions in consequent rounds. The combined effects of the formerly "elated" and "regret" subject is decay in contributions as the game progresses.

A common pool resource consists of a natural or humanly created resource which is large enough to make it costly to exclude potential beneficiaries (Carpenter, 1998). The common pool resource dilemma was first identified by Gordon (1954) in the fisheries sector. The difficulty of exclusion and the high subtractibility of a common pool resource leads to the common pool resource dilemma that Hardin terms as "the tragedy of the commons" (Hardin, 1968). The unsustainability of common pool resource stems from the conflict between individual and collective interests. Cooperation in common pool resource is measured by an individual's measure of restraint in extraction from the common pool resource. Ostrom et al, (1992) show that communication among group members immediately following a session of interaction can be an effective tool in boosting cooperation. They specifically found the net yield from a common pool resource to rise to an average of 74% of the maximum yield directly after allowing communication. However, even with communication, net yield declines to an average of 55% as the game progresses over subsequent rounds. Sell and Yeongi (1997) using a one-shot public good and common pool resource game and a simple payoff structure found cooperation in the common pool resource extraction to be 62.8% on average compared to 49.6% in the public good game.

Just as with a public good, the social dilemma arises because an individual's payoff is higher when they defect than when they cooperate. Yet all users of the common pool resource get lower payoffs if all defect than if they cooperate (Dawes, 1980). The dominant strategy in a common pool resource game is for a subject to extract more than their fair share of the resource. Laboratory experiments show voluntary cooperation among subjects in order to sustain common pool resources or public goods (see Camerer, 2003; Croson, 2008; Fehr & Gachter, 2000; Ledyard, 1995) especially if other subjects cooperate (see Fischbacher et al, 2001; Frey and Meier, 2004; Shang and Croson, 2008). In contributing to a public good and maintaining a common pool resource, some studies have shown that subjects care about the welfare of others (other-regarding preferences) (see Andreoni, 1988; Bolton and Ockensfels, 2000; Charnes and Rabin, 2002; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006).

3. Socioeconomic factors and common resources

Heterogeneity, whether in the form of ethnicity, gender or income, has been shown to affect cooperative behavior. Individuals are likely to cooperate more when there is a sense of group identity, which is stronger in more homogenous groups where members develop a group identity based on what they are, do or have (Kramer & Brewer, 1984). Cardennas (2003) shows that participants' wealth and inequality within a community reduces cooperation in the usage of a common resource when groups were allowed to have face-to-face communication between rounds. LaFerrara (1998) found a similar relationship between a community's income inequality and the degree of participation in groups which provide economic benefits or informal insurance to their members in Tanzania.

Ethnic heterogeneity has also been shown to impact on public good provision. Banerjee et al, (2005) shows that more caste or religious fractionalization across Indian states is associated with lower levels of public good provision. Across communities in Northern Pakistan, Khwaja (2000) found that infrastructure is better maintained where there is less heterogeneity in terms of clan, religion and political division. Using school records in western Kenya, Miguel and Gugerty (2004) tried to determine if ethnicity enforces social sanctions, and found that where a greater percentage of parents of a particular school were drawn from the same ethnic group, such schools tended to be better funded than where parents were drawn from diverse ethnic groups. These results are similar to Goldin and Katz (1997) who finds that public secondary schooling expanded slowly in ethnically diverse U.S. school districts from 1910 to 1940. For U.S. school funding, similar results were found by Alesina et al, (1999) and Poterba (1997).

The reason for better funding of a school where parents are ethnically homogenous, as Miguel and Gugerty (2004) argue, is that such parents are better able to impose social sanctions so as to minimize free-riding. This result is supported by Besley et al, (1993) and Habyarimana et al, (2007a). Habyarimana et al, (2007a) for example, using experimental games among subjects drawn from slums in the neighborhood of Kampala, identify three mechanisms that link ethnic heterogeneity to public good underprovision namely "preferences", "technology" and "strategy selection". Successful public good provision in a homogeneous ethnic community is attributed to a strategy selection mechanism in which co-ethnics play cooperative equilibria whereas non-coethnics do not. Besley et al, (1993) found no evidence for a prominent preference mechanism that emphasizes the commonality of tastes within ethnic groups. This is in contrast to the finding by Bates (1973) who finds ethnic groups that are geographically concentrated may have divergent interests over outcomes that have a geographical component, especially the location of public investments. Co-ethnics are willing to bear the cost of providing a public good if they believe that most of the beneficiaries will be co-ethnic, and this may account for the high rate of provision for public goods in a homogeneous community (see for example Vigdor, 2004; Poterba, 1997).

While there is consensus about the negative effects of ethnic heterogeneity on public good provision, the evidence on gender is far more mixed. Women have been found to be more cooperative in contributing towards public goods than men (see for example Kleiman and Rubinstein, 1996; Seguino and Lutz, 1996; Nowell and Tinkler, 1994). This finding is attributed to the difference in how men and women perceive moral problems. While women perceive the moral problem as being about care and relationships, men think about morality in terms of rights and rules (Gillian, 1982). Other researchers have, however, found women to contribute significantly less than men towards public good provision (see for example Brown-Kruse and Hummels, 1993; Sell and Wilson, 1991; Rapoport and Chammah, 1965). Cadsby and Maynes (1998) using the same experimental design as Brown-Kruse and Hummels (1993) do not find significant difference between men and women's contribution towards public good. Both Cadsby and Maynes (1998) and Nowell and Tinkler (1994), however, found higher cooperation in an all-female group which they attributed to the tendency of females to behave more like each other.

These studies differ in their experimental design in several respects such as whether they are repeated or one-shot games, the freedom given to the subjects regarding the amount to contribute, with some allowing subjects to contribute any amount while others required subjects to contribute all or nothing, the ability of the subjects to monitor the actions of the other group members, and finally the level of interaction allowed between subjects. The differences in experimental design, to a large extent might account for the differences in the findings.

Just like the effects of gender and gender composition on common resources are varied, so is the effect of group size. Kollock (1998) and Poteete & Ostron (2004) for example show that group size can have adverse effects on common resource management coming through its effect on group trust. As group size increases, so does the degree of divergence in interest, thus eroding the opportunities for frequent interactions to build reputation. This in turn erodes cooperative behavior. There is, however, no consensus that group size increases free riding, Bonacich, Shure, and Meeker (1976) using an N-person prisoner's dilemma tasks reported mixed results on the effect of group size and cooperation[5].

Isaac and Walker (1988) clarify that it is not the pure "number effect" that leads to free riding. Rather it is the decline in marginal per capita return (MPCR) as the group size grows. When MPCR to investment in a public good is adjusted to compensate for the increase in group size, the conventional hypothesis that free riding is exacerbated in large groups is not supported (Isaac & Walker, 1988). It is only when MPCR declines with group size that the conventional hypothesis is supported. The effect of group size on common resources is also dependent on the marginal cost of individual contributions. If the marginal cost is sufficiently high, the probability of success increases with group size in which case larger groups achieve higher levels of collective provision than smaller ones (Esteban & Ray, 2001).

[5] Similarly, Gaube (2001) and Lipford (1995) show that contributions by church members does not decline with an increase with membership

4. Research methodology

Many studies on corruption including the well-established Corruption Perception Index (CPI)[6] by Transparency International have relied mainly on survey data. Questions abound on the reliability of the findings of such research. The questions emanate from doubts as to whether people truthfully report their involvement in corruption. Three general concerns regarding survey data based on behavioral questions have been raised, these relate to "hypothetical bias", "idealized persona bias" and "incentive compatibility" (Carpenter , 2002).

To illustrate hypothetical bias, consider the likely response to the question "Would you ever accept a bribe offered to you?" An individual's response to this question can only be hypothetical and may not necessarily reflect what the individual would do if they were actually offered a bribe. The idealized persona bias can be illustrated by the response to the question "How many times in a week do you encounter situations where a bribe is demanded from you?" A person answering this question may either respond on the basis of what he thinks the researcher wants to hear or in relation to the would like to be. The incentive compatibility issue with survey data arises from the fact that there is no incentive in survey research for the respondent to take the survey seriously (Bertrand & Mullainathan, 2001).

The challenges with studying corruption using surveys are compounded by the secrecy of corruption involvement because of its illegality. Experiments then become a natural alternative in studying corruption. Laboratory experiments offer the possibility to overcoming unobservability of corrupt activity by generating data from a bribery game while controlling the environment and the characteristics of the subjects involved (Roth, 1988). In an experiment, a subject is confronted by a non-trivial amount of money and his final payoff is solely dependent on his actions in the experiment. The monetary reward acts as an incentive for the subject to reveal his type. To show the different results obtained from surveys and experiments, a number of studies have compared "measure of trust" findings from both survey and experiments (see for example Glaeser et al, 2000; Burks et al, 2008; Glaeser et al, 1999; Ben-Ner and Puttermann, 1999). These studies find measures of trust from experiments to be largely uncorrelated with

[6] Corruption Perception Index (CPI) combines information from different expert and business surveys on the perceived level of public-sector corruption in a country. The index ranges from 0 (most corrupt) to 10 (least corrupt).

responses to survey questions designed to measure social capital. They find that respondents who indicate they are trusting do not exhibit this trust in an experiment with monetary stakes.

Similar discrepancies have emerged when findings from surveys and experiments on corruption are compared. Good examples of this are the findings from two key surveys that show women to be less corrupt than men (see Dollar et al, 2001and Swamy et al 2001). The findings of these two studies have been the basis for advocating for the greater involvement of women in the public service. Most experiments on gender and corruption have however not found gender differences in corruption (see for example Alatas et al, 2009; Armantier and Boly, 2008; Frank and Lamsdorff, 2008)[7].

The difference in the findings may be attributed to the difference in what the two sets of studies were investigating. For example, in one of the surveys that Swamy et al (2001) conducted, the researchers examined responses to hypothetical questions on whether one can be justified for accepting a bribe in the line of their work. A larger percentage of women (77.3%) than men (72.3%) supported the statement that "someone accepting a bribe in the course of their duties can never be justified". However, the fact that a respondent does not think that accepting a bribe is justifiable does not mean that they would not act corruptly offered an actual bribe.

There is obviously a need for being cautious in interpreting experimental findings and their general application because conditions in a laboratory differ from those in the real world with all its complexity. The second reason for the caution is the fact that experiments mainly draw their subjects from students who are not a representative of the general population. Levitt and List (2007) and List (2006) have suggested the incorporation of field experiments to complement laboratory experiment findings. On this front, the evidence in relation to corruption is encouraging. Armantier and Boly (2008) conducted a bribery game combining a lab experiment in Montreal and a field experiment in Burkina Faso. While the study did not find any difference with regard to subjects acting opportunistically in both the laboratory and field set up, increasing

[7] In contrast, other experimental studies have found gender differences in the propensity to act corruptly (see for example Rivas, 2008; Frank and Schulze, 2000).

the bribe amount was found to exacerbate corruption in the field set up but not in the laboratory situation[8].

This paper adopts experimental games as a research methodology first because of the novelty of the methodology in the Kenyan context and secondly because all studies on corruption in Kenya has been based on surveys. Thus, not only will this work contribute to the existing work on corruption but it will also make a significant contribution in the use of experimental methodology in the Kenyan context.

4.1 Experimental design

The experimental design used in this paper attempts to mimic the allegations that harambee contributors compensate their contributions to harambee by engaging in corruption ex-post. The two-stage experiment consists of a public good game played first followed by common pool resource game[9].

The games were played in groups of 10 randomly assigned subjects. The set up, as pointed out earlier, is adopted from Sell and Yeongi (1997)[10] whose objective was to determine if levels of cooperation are similar in respect of public goods and common pool resources. The motivation for adopting Sell and Yeongi's model is its simplicity and the fact that it uses similar payoff functions in both the public good and common pool resource games. The public good game set up fits into what is generally referred to as a simple linear public good game adopted from Isaac

[8] The experiment involved grading of exam papers where the 11th paper had some US$ Bills and a message stating "Please find few mistakes in my exam paper". To distinguish between laboratory and field experiment, subjects in the laboratory set up were informed that they were involved in an experiment while those in the field set up were only made aware that they were in an experiment after they had graded the papers.

[9] It would have been informative if the games could have been played in reverse order as well to provide clarity on the direction of causality. This was not possible mainly because of two reasons. First is the objective of the chapter is to investigate if individuals compensate their public good contributions by their extractions from the common pool resource. Secondly, is the budgetary constraint.

[10] Sell and Yeongi's experiment consisted of groups of four. In the public good game each member was endowed with 25 tokens which he could invest in either a private account earning one cent per token or a group account earning three cents. The group earning would then be shared equally among the group members regardless of individual member's investment. In the common pool resource game, each individual was given a chance to withdraw from a group account to invest in a private account. The earnings in the private account was one cent and whatever remained in the group account earned three cents per token which would be shared equally among the group members irrespective of what an individual had withdrawn from the group account to invest in the private account. Both the public and common pool resource had similar payoff function with MPCR equal to 0.75.

and Walker (1988)[11]. For the common pool resource game, Ostrom et al (1992) use a more complicated payoff function where the yield from the common pool resource reaches a maximum when individuals invest some but not all of their endowment in the common pool resource[12].

The two stages of the experiment are explained below.

4.1.1 Stage one: The public good game

The public good game began with each member of a group getting an initial endowment W (100 tokens). From their endowment, each member was given a chance to privately and anonymously make a contribution $X_i \in [0, 100]$to their group kitty which grew at rate h where $1 < h < n$. At the end of the game, the common kitty was shared equally among the group members regardless of one's contribution. Under these general rules, a subject's utility function is of the form:

$$U_i = f\{h(X_{i,}X_{-i})\} \ldots\ldots(3)$$

Where h is the growth factor

X_i = the amount contributed by the i^{th} member to the group kitty.

---

[11] The payoff for the i^{th} player in group j in Isaac and Walker's set up is determined as:

$$P_{ij} = W_i - x_i + (1/n)G(x_i + \sum_{xj}) \ldots\ldots(1)$$

Where W_i is the initial endowment for player i, x_i is his contribution to public good, n is the group size, G is the pool's growth factor and $\sum_{xj}$) is the sum of the other players contribution to public good.

[12] As such the payoff function for individual i in Ostrom, Walker, and Gardener (1992) is given as:

$$u_i(x) = we \; if \; x_i = 0$$
$$= w(e - x_i) + \left(x_i / \sum x_i\right) F(\sum x_i) if \; x_i > 0 \ldots\ldots(2)$$

where e is an individual's resource endowment, x_i is individual $i's$ investment in common pool resource and $0 \leq \; x_i \leq e. w$ is the normalized marginal payoff when investment is outside of common pool resource. $F(\sum x_i)$ is a production function that specifies the group return to investment in the common pool resource. F is a concave function, with $F(0) = 0, F'(0) > w$ and $F'(ne) < 0.$ n is the group size.
Equation 2 reflects the fact that if individuals invest all their endowments in the outside alternative, they get a sure payoff we, whereas if they invest some of their endowments in the common pool resource, they get a sure payoff $w(e - x_i)$ plus a payoff from the common pool resource, which depends on the total investment in that resource $F(\sum x_i)$ multiplied by their share in the group investment $\left(x_i / \sum x_i\right)$. The set up in Ostrom et al (1992) deals with a man-made common pool resource which depends on individual contributions for its sustenance. The common pool resource adopted in this thesis is a natural resource such as a fishery from which individuals extract and where an individual's contribution to its sustenance is in their restraint in extraction.

X_{-i} = the amount contributed by other members.

For the i^{th} member, $\frac{\partial U_i}{\partial X_i} > 0, \frac{\partial U_i}{\partial X_{-i}} > 0, \frac{\partial U_i}{\partial (W - X_i)} > 0$ while $\frac{\partial U_i}{\partial (W - X_{-i})} < 0$. A player's payoff is increasing in the amount of his contributions but each token contributed to the public good provides a private return that is less than the contribution (Hofmeyr et al, 2007). For example, assuming $h = 5$ and $n = 10$ then the marginal per capita return (MPCR) is 0.5[13]. A group member faces a dilemma as to how much to contribute to the public good and how much to keep for himself. An individual's payoff in group j at the end of the game is:

$$P_{ij} = W - X_i + \frac{h(\sum_{i=1}^{n} X_i)}{n_j} \qquad (4)$$

Let $h(\sum_{i=1}^{n} X_i) = \Omega_j$ so that $P_{ij} = W - X_i + \frac{\Omega_j}{\Omega_j}$. Table 1 shows payoffs in a two-player public good game where Ω_{jmk} is the group's kitty when both players cooperate, Ω_{jm} and Ω_{jk} are respectively the kitty when only player M or K cooperates while the other defects.

Table 1: Payoffs for a two-player public good game

Player M	Player K	
	Cooperate	Defect
Cooperate	$W_m - X_m + (\frac{\Omega_{jmk}}{2})$	$W_m - X_m + (\frac{\Omega_{jm}}{2})$
	$W_k - X_k + (\frac{\Omega_{jmk}}{2})$	$W_k + (\frac{\Omega_{jm}}{2})$
Defect	$W_m + (\frac{\Omega_{jk}}{2})$	W_m
	$W_k - X_k + (\frac{\Omega_{jk}}{2})$	W_k

From the payoffs, it is Pareto efficient for both players to cooperate and contribute their entire endowment to the public good since their payoffs would be higher than any other payoff. The set up of the game presents one dominant strategy; that of defection since each individual can do better by free riding on the other members' contributions. Just as in a prisoner's dilemma (PD),

[13] For group j, $MPCR_j = \frac{h}{n_j}$. In the true sense of a public good, the public good described here does not fit a "pure" public good which is characterized as having perfect nonrivalry in consumption. For a pure public good, increasing group size does not reduce the marginal benefit of the public good to other consumers. The public good described here fits into the "impure" public good which can be jointly consumed but in which increases in group size tend to diminish the marginal benefit to all consumers (Isaac & Walker, 1988).

defection in public good games is a Pareto inferior strategy even though a dominant one. If all members defected, everyone would end up getting their initial endowment equal to W.

In the current set up, if all members of a group defected, everyone ended up with 100 tokens. At the other extreme, if every member cooperated by contributing their entire endowment, each would end up with 500 tokens.

4.1.2 Stage Two: The common pool resource game

At this stage, each group was given an initial endowment $G = 1000$ tokens and each member of a group was given a chance to independently and anonymously extract an amount $R_i \leq G$ from the pool. Each subject kept to himself the amount he extracted from the pool. The amount that each left in the pool grew by a factor g where $1 < g < n$. So as to avoid retaliation in extractions, each member of a group found the pool with similar amount i.e. G. In this set up the i^{th} player in group j faces a utility function of the form:

$$U_i = f\{R_i, R_{-i}, g(G - R_i, G - R_{-i})\} \ldots\ldots (5)$$

Where R_i is the i^{th} player's level of extraction.

R_{-i} is the level of extraction by the other players.

$G - R_i$ is the amount left in the resource pool by the i^{th} player

$G - R_{-i}$ is the amount left in the resource pool by the other players

For the i^{th} player $\frac{\partial U_i}{\partial R_i} > 0, \frac{\partial U_i}{\partial R_{-i}} > 0, \frac{\partial U_i}{\partial (G-R_i)} > 0$ and $\frac{\partial U_i}{\partial (G-R_{-i})} > 0$. The payoff for i^{th} player in group j is:

$$F_{ij} = R_i + \frac{g\{\sum_{i=1}^{n}(G-R_i)\}}{n_j} \ldots\ldots (6)$$

For a player, the marginal utility derived from the amount extracted is higher than the amount he leaves in the pool, thus $\frac{\partial U_i}{\partial R_i} > \frac{\partial U_i}{\partial (G-R_i)}$ since whatever he leaves in the pool is shared equally by all the group members. Just as in the public good game, in the common pool resource game, a player faces a dilemma of how much to extract for himself and the amount to leave in the common pool. A player's utility is increasing in the amount left in the common pool as well as in the amount extracted. However, the net yield of a unit left in the common pool yields to the player less than a unit he extracts. Assuming g=5 and n=10 then the MPCR from a one unit resource left in the pool is 0.5 and an individual can always do better by extracting more than their fair share of the common pool resource.

In the common pool resource game, cooperation is measured by the level of restraint from extracting. If all members of a group cooperated fully, each would end up with a payoff of 5,000 tokens. Using the notations of the utility function in equation 5, Table 2 presents the payoffs for a two-person common pool resource game. But just like in the prisoner's dilemma whose equilibrium is defection, the equilibrium in this game is to extract the full amount of the common pool resource. In equilibrium then, each player ends up with a payoff less than the Pareto efficient one[14]. A potential hypothesis is that an individual who is concerned about fairness and equity could only extract for himself $R_i \leq R_j = \frac{G}{n_j}$while one who is selfish would extract $R_i > R_j$.

Table 2: Payoffs for a two-player common pool resource game

Player M	Player K	
	Defect	Cooperate
Defect	G	$G + \frac{g}{2}(G - R_j)$
	G	$R + \frac{g}{2}(G - R_j)$
Cooperate	$R_j + \frac{g}{2}(G - R_j)$	W_m
	$G + \frac{g}{2}(G - R_j)$	$R_j + \frac{g}{2}(G - 2R_j)$

4.2 Game procedure

On the day of the experiments, subjects gathered in a large hall and the principal researcher explained that in groups of 10 people they would take part in a two-stage experiment.

In the first stage each member would receive an initial endowment of 100 tokens from which each would have a chance to voluntarily and independently make a contribution to a common kitty. The experimenter would then multiply the sum of a group's contributions by five and the proceeds would be shared equally among the group members, irrespective of an individual

[14] Note that $G < (R_j + g(G - R_j))$ since $1 < g < n$. Most groups had a membership of 10 subjects and g=5. The value of g and G was common knowledge to all the subjects.

member's contribution. In the second part of the game, subjects were informed that each member of a group would be given a chance to privately extract resources from a common pool (1000 tokens for each group). A subject would keep for themselves the amount they extracted. Whatever remained in the common pool after each member of a group had their chance to extract something for themselves would be multiplied by 5 and thereafter be shared equally among the group members irrespective of what an individual member appropriated to himself.

Subjects were informed that no member would get to know how much the other members of the group had either contributed in the first game or extracted in the second game. A member's payoff would be dependent on his own actions in the game and that of the other members of his group. Examples of how individual actions in the game impacted individual and group payoffs were worked out in addition to the time allocated for questions.

After the explanations, subjects were randomly grouped into groups of ten[15] and allowed time to interact, get to know each other and lay strategies to maximize their group payoffs. Each group was given the opportunity to independently clarify whatever was unclear with the principal researcher. Once the procedures were clear, each group was directed into a classroom in which there was a computer and a research assistant[16]. Each group sat facing away from the computer. This was done to ensure that each subject's decisions in the games were strictly private. The computer interactive interface displayed on each subject's computer screen is presented on table 10 in the appendix[17]. Once a subject had had his chance to play the game, he was requested to fill in an electronic questionnaire. Note that no subject got to know his payoff until each member of a group had played the game. The questions in the questionnaire were about bio-data and a subject's opinion about harambee and corruption. To avoid interaction between those who had

[15] In a number of centres, the number of participants was not exactly divisible by 10, some groups ended up with fewer or more subjects. See Table 4 for a summary of the group sizes. Since the growth factor remained the same, MPCR declined with the group size. The growth factor was held constant mainly to keep the games simple and the fact that the games were pre-programmed.

[16] To ensure consistency of instructions, the same research assistants were used in all the universities.

[17] Note that each subject made their decision on how much to extract from the common pool resource immediately after their decision on how much to contribute to the public good. Only once an individual had completed both decisions, was the next member of the group invited to play the game. A subject only got to know the combined payoff when every member of the group had had their chance to contribute towards the public good and extract from the common pool resource.

had their chance to play the game and those who were waiting for their turns, once a subject was done, he/she was directed to a waiting hall.

4.3 Subject pool

The experiment was conducted among 941 undergraduate and postgraduate students drawn from 14 universities and colleges spread all over Kenya. The universities are located in the various Kenyan provinces. On average 67 students from each university or college took part in the experiment. Of the 941 students, 644 (representing 68.4%) were male and the majority (98%) of the subjects were in the age bracket 18-30 years. The ethnic and religious distribution of the sample is presented in Table 3.

Table 3: Demographic distribution of the sample

Gender composition	
	Percent
Male	68.4
female	31.6
Ethnic composition	
Kikuyu	36.7
Luhya	12.3
Luo	11.7
Kalenjin	14.6
Kisii	5.7
Kamba	9.14
Others	9.78
Religious composition	
Protestant	69.9
Catholic	24
Muslim	4.6
Others	1.5

In total, there were 99 groups with group sizes ranging from six to twelve. Table 4 presents a summary of the group sizes and the mean public good contribution and common pool resource extraction per each group size.

Table 4: Public good contributions and common pool resource extractions on the basis of group size

Group size	Proportion of sample	Average proportion of endowment contributed in public good	Average proportion of common pool resource extracted
6	0.01	1.00	0.001
7	0.02	0.48	0.600
8	0.08	0.71	0.192
9	0.35	0.64	0.254
10	0.42	0.63	0.229
11	0.10	0.43	0.096
12	0.02	0.59	0.117

5. Results

Result one: Only a small percentage of the sample chose to free-ride

Table 5 compares public good contributions and common pool resource extractions on the basis of various demographic aspects of the sample. Regardless of social categorization, the data shows strong departure from the game theoretic prediction of free riding in public good provision. On average, subjects contributed 61.3% of their initial endowment to the public good which is consistent with the findings in one-shot public good games that subjects on average contribute between 40% to 60% of their endowment (Dawes & Thaler, 1988). Moreover, the mean contributions compare well with the contributions made by the Orma participants in Henrich, Boyd, Bowles, Camerer, Fehr, and Ginitis (2001) who contributed 58% of their initial endowment in the public good game. Approximately half of the subjects contributed more than 50% of their initial endowment. Contrary to the game theoretic prediction of free riding in a public good game, only 1.3% of the sample contributed nothing while a fifth of the sample acted in true altruistic manner by contributing their entire initial endowment of 100 tokens.

Table 5: Comparing contributions in public good and extractions from the common pool resource on several categories

Category		Contributions in the public good game			Common pool resource extraction			
			Proportion that contributed					
			Zero tokens	100 tokens		Proportion that extracted		
		Proportion contributed	(Free-riders)	Entire endowment	Proportion extracted	Less than R_j	R_j	More than R_j
Gender	Male	0.60	0.017	0.201	0.225	0.380	0.266	0.354
	Female	0.64	0.003	0.194	0.216	0.446	0.231	0.323
Religion	Protestants	0.62	0.012	0.213	0.222	0.400	0.260	0.340
	Catholic	0.58	0.018	0.158	0.213	0.405	0.239	0.356
	Muslim	0.60	0.000	0.214	0.262	0.405	0.262	0.333
	Other-rel	0.62	0.000	0.133	0.257	0.333	0.267	0.400
Ethnicity	Kikuyu	0.64	0.020	0.227	0.192	0.472	0.233	0.294
	Luo	0.61	0.009	0.162	0.244	0.324	0.279	0.396
	Luhya	0.54	0.009	0.165	0.247	0.278	0.339	0.383
	Kalenjin	0.63	0.007	0.179	0.265	0.400	0.190	0.410
	Kisii	0.59	0.000	0.167	0.260	0.260	0.260	0.480
	Kamba	0.56	0.023	0.191	0.220	0.404	0.292	0.303
	Other-ethn	0.64	0.000	0.236	0.192	0.461	0.258	0.281
All		0.613	0.013	0.199	0.222	0.401	0.255	0.344

On average, subjects extracted 22.2% of the common pool. While 3.19% of the sample chose not to extract anything from the common pool resource, 2.66% extracted the entire 1000 tokens. The measure of overextraction from common pool resource used here is $C_i = R_i - R_j$ where R_i as earlier defined is the amount that an individual i in group j extracts from common pool resource and R_j is the equitable amount of common pool resource to each member in group j. $C_i < 0$ if an individual extracted less than R_j, $C_i = 0$ if an individual only extracts R_j and $C_i > 0$ where an individual extracted an amount greater than R_j . Contrary to the game theoretical prediction of overexploitation of common pool resource, 40.1% of the sample extracted less than R_j, 25.5% extracted exactly R_j and only 34.4% extracted more than R_j.

On average women contributed a higher proportion of their initial endowment in the public good game than men. The difference is marginally significant $(MW, z = 1.52, p = 0.12)$. The proportion of male free-riders in the public good game is significantly higher than that of women, with the proportion of male free-riders being 1.7% compared to 0.3% female free-riders

($MW, z = 1.72, p = 0.09$). Even though men on average extracted more in the common pool resource than women, the difference is not statistically significant ($MW, z = 1.28, p = 0.20$).

The average contribution in the public good and the extraction in common pool resource game compares well across ethnic and religious groups, with no significant differences.

Result two: Individuals who make low public good contributions are significantly more likely to overextract in common pool resource game

Table 6 uses R_j as a separation point and reveals that the amount of common pool resource extractions decreases with the amount of contributions towards the public good. The table also shows that the highest proportion of free riders in the public good game is among those who extracted more than their fair share from the common pool resource. For example, while 4.5% of the free-riders extracted more than their fair share, 1.7% extracted less than their fair share. Finally the results in the table reveals that the proportion of the subjects that contributed their entire initial endowment decline with the amount of common pool resource extractions. For example, of those who contributed their entire endowment in the public good game, 22.3% extracted less R_j in the common pool resource game and only 16.2% extracted more than R_j.

Table 6: Comparisons of subjects action in both the public good and common pool resource game

	Extraction in the common pool resource game		
	Extracts less than R_j	Extracts R_j	Extracts more than R_j
Mean contribution in the public good game	64.26	62.48	51.81
Proportion of free riders in the public good game	0.017	0.00	0.045
Proportion that contributed 100% of endowment	0.223	0.196	0.162

These results are confirmed by the regression results presented in Table 7 in which both OLS and Hierarchical Linear Model (HLM) regression are presented. HLM[18] helps to conceptualize

[18] The basic concept behind HLM are presented section B in the appendix, for fuller understanding (see for example Velez et al, 2006; Baltangi et al, 2001; Singer, 1998; Raudenbush and Bryk, 1986; Lindley and Smith, 1972) and for application (see for example Burns and Visser, 2008; Ruppert, Wand, and Caroll, 2003; Diggle, Heagerty, Liang, and Zeger, 2002).

decisions taken in multiple levels and takes into account nesting at both the individual and group levels (Raudenbush & Bryk, 1986). Group is the unit of interest and the subjects are nested within groups[19]. Table 7 presents OLS and HLM regression results on the determinants of individual extractions in the common pool resource.

Table 7: Determinants of factors that influence an individual's common pool resource extractions

Variable	Pooled OLS		Pooled OLS adjusted for group clustering		HLM	
	(1)	(2)	(3)	(4)	(5)	(6)
Proportional of initial endowment contributed		0.149*** (0.042)		-0.149* (0.088)		-0.240*** (0.040)
Ethnic heterogeneity	0.129	0.110	0.129	0.110	0.150	0.111
(ELF)	(0.081)	(0.080)	(0.147)	(0.143)	(0.190)	(0.194)
MPCR	0.557***	0.586***	0.557	0.586	0.564	0.645
	(0.178)	(0.177)	(0.463)	(0.463)	(0.405)	(0.412
Proportion of women in the group	0.419*** (0.063)	0.433*** (0.063)	0.419*** (0.138)	0.433*** (0.139)	0.409*** (0.147)	0.436*** (0.150)
Subject is male	0.030	0.0321	0.030*	0.032**	0.030**	0.031**
	(0.021)	(0.021)	(0.016)	(0.016)	(0.014)	(0.014)
Subject has benefitted from harambee	-0.011 (0.031)	-0.001 (0.031)	-0.011 (0.032)	-0.001 (0.032)	-0.011 (0.021)	0.008 (0.021)
Harambee is achieving objective	-0.025 (0.022)	0.029 (0.027)	-0.025 (0.032)	0.029 (0.034)	-0.066*** (0.018)	-0.014 (0.019)
Harambee is cause of corruption	0.030 (0.021)	0.002 (0.023)	0.030 0.028)	0.002 (0.023)	0.046*** (0.016)	0.015 (0.017)
Ethnic dummies	Yes	Yes			Yes	Yes
Religious dummies	Yes	Yes			Yes	Yes
Regional dummies	Yes	Yes			Yes	Yes
Constant	-0.229	-0.173	-0.229	-0.173	-0.220	-0.128
	(0.130)	(0.131)	(0.302)	(0.301)	(0.288)	(0.293)
Observations	941	941	941	941	941	941
R-squared	0.115	0.127	0.115	0.127		
Number of groups			99	99	99	99

Standard errors in parentheses. *** $p < 0.01$,** $p < 0.05$,* $p < 0.1$

OLS with cluster and HLM take care of the clustering at the group level

[19] If only individual decisions and actions are taken into account in the analysis as in column (1) of Table 7, this would leave out some valuable information and decisions that were taken within each group. HLM takes the group characteristics into account.

Table 8: Determinants of factors that influence an individual's public good contributions

Variable	Pooled OLS	OLS adjusted for group clustering	HLM
	(1)	(2)	(3)
Ethnic heterogeneity	-0.128**	-0.128	-0.166
(ELF)	(0.063)	(0.138)	(0.160)
MPCR	0.195	0.195	0.312
	(0.138)	(0.268)	(0.340)
Proportion of women in a group	0.093* (0.049)	0.093 0.085	0.124 (0.124)
Subject is male	0.014	0.014	0.005
	(0.016)	(0.013)	(0.011)
Subject has benefitted from harambee	0.068*** (0.024)	0.068** (0.029)	0.082*** (0.017)
Harambee is achieving its objective	0.363*** (0.017)	0.363*** (0.032)	0.216*** (0.014)
Harambee is one of the causes of corruption	-0.187*** (0.017)	-0.187 (0.027)	-0.129*** (0.013)
Ethnic dummies	Yes	Yes	Yes
Religious dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
Constant	0.379***	0.379*	0.392
	(0.101)	(0.212)	(0.241)
Observations	941	941	941
R-squared	0.567	0.567	
Number of groups		99	99

Standard errors in parentheses. $*** \ p < 0.01, ** \ p < 0.05, * \ p < 0.1$

OLS with cluster and HLM take care of the clustering at the group level

The results show the proportion of the initial endowment contributed in public good game to have a negative and significant impact on the proportion of the common pool resource extracted. These results suggest that those who cooperate in public good provision did not compensate themselves by overextracting from the common pool resource. Rather, those who contribute a lot in the public good game extracted less in the common pool resource game.

Result three: There is more cooperation in the restraint from common pool resource extraction than in public good contributions

Following the work by Sell and Yeongi (1997), individual cooperation in the public good game is measured in terms of the proportion of initial endowment contributed towards the public good ($\frac{x_i}{100}$), while cooperation in the common pool resource game is measured by the proportion of the pool that each individual member leaves in the pool ($\frac{G-R_i}{1000}$). The mean cooperation in the public good contribution is 0.613 while cooperation as measured by the restraint from extraction is 0.778. There is therefore more cooperation in the restraint from taking from the common pool than in contributions to the public good. The difference is significant (t=-12.44,ρ=0.00). The levels of cooperation reported here in both public good contribution and restraint from taking are higher than those reported by Sell and Yeongi (1997). In Sell and Yeongi (1997), the measure of cooperation in the public good game was 49.6% as compared to 62.8% in the restraint from taking from the common pool resource.

Result four: Individuals in an ethnically heterogeneous group contributed less towards a public good and extracted more from a common pool resource

Using an ELF[20] of 0.5 as a separating point, the groups whose ELF is 0.5 and less on average contributed significantly more than a group whose ELF was greater than 0.5. The group whose ELF was less than 0.5 on average contributed 75.91 compared to 59.43 tokens for groups whose ELF is above 0.5. The difference is significant $(MW, z = 4.88, p = 0.00)$. Similarly, in the common pool resource game, on average, the more ethnically diverse groups extracted significantly more compared to the more ethnically homogenous groups (233.56 compared to 130.71, $MW, z = -5.68, p = 0.00$). See Table 9 for the comparisons.

Table 9: Public good contributions, common pool resource extractions and ELF comparisons

Measure of ELF	Mean public good contribution	Mean common pool resource extraction
Less or equal to $\frac{1}{2}$	75.91	130.71
Greater than $\frac{1}{2}$	59.43	233.56

These results are supported by the regression results of Tables 7 and 8, albeit the regression coefficients are insignificant. Individuals in ethnically heterogenous groups contributed less in the public good game (Table 8) and extracted more from the common pool resource (Table 7)[21].

[20] Ethno-linguistic Fractionalization Factor (ELF) ranges between 0 (most ethnically homogenous) and 1 (most ethnically heterogeneous).

[21] The insignificance of the measure of ethnic heterogeneity on the level of contribution in the public good and the common pool resource games is not surprising given that ethnic heterogeneity is a group specific characteristic.

Result five: Gender composition matters in both public good provision and in common pool resource extraction

As the proportion of women in a group increases, the proportion of initial endowment contributed towards the public good rises (Table 8) although the coefficient is not significant. At the same time, extraction from the common pool resource rises significantly. This is a puzzle. Note also that male subjects are more likely to contribute to the public good and extract from the common pool resource[22].

Result six: A subject's attitude and experience with harambee is significantly correlated with their level of public good contribution

As results in Table 8 show, the three dummies on ones attitude and experience with harambee have a significant impact on ones public good contributions. The results show that if one has benefitted from harambee which is the majority of the subjects in the sample, they contributed significantly more than those who indicated not to have benefitted. If a subject was of the opinion that harambee is achieving its objective, they contributed more towards public good. Those who were of the opinion that harambee is one of the causes of corruption contributed significantly less than those who do not consider harambee to be a cause of corruption. Interestingly, the regression presented in Table 7 suggest that individuals who indicated that harambee was a cause of corruption extracted more in the CPR game, albeit the coefficient is insignificant once one accounts for contribution in the public good game.

6. Discussion and conclusion

The results show an inverse relationship between public good contributions and common pool resource extractions, in that cooperators in public good contributions extract less from the common pool resource. To the extent that the experiments mimic the alleged link between

---

Given that subjects had time before the game to discuss what they should do, the correlation between decisions made by individual group members would be inextricably tied to the demographic profile of the group.

[22] It was speculated that as gender heterogeneity (proportion of women) increases, men tended to extract more from the common pool resource. To validate this speculation, a regression was run with an interaction term between male subject and the proportion of women in a group. The coefficient of the term (male subject*proportion of women in a group) was insignificant both as a determinant of public good contributions and extraction from the common pool resource. Results of this regression are not reported here.

contributions to harambee and corrupt acts of embezzlement ex-post, the basis for blaming harambee on corruption is not established by the results. This result is similar to the one by Fehr and Leibbrandt (2008) who conducted both field and laboratory experiments to determine the relationship between the size of mesh on fishing net and contributions in a public good experiment among a fishing community in Brazil. The study found that those who cooperated in the public good game used fishing nets with bigger mesh sizes. A smaller mesh size indicates a higher likelihood of catching smaller fish before they reach maturity thus imposing negative externality on other fishermen as well as themselves.

The analysis of the responses from the post-game questionnaire supports the results of the experiments. The subjects do not see harambee as the cause of corruption. Instead, they see corruption as the cause of abuse to the harambee spirit. If this is true, banning harambee based on the allegation that it causes corruption will not reduce corruption and this has proved to be true. Since the enactment of POEA in 2003, barring politicians and public officials from actively participating in harambees, this move has not contributed to lowering the level corruption in Kenya.

The results show that an increase in the gender diversity in a group, measured by the proportion of women in a group leads to an increase in public good contributions but also an increase in common pool resource extractions. Gender diversity thus has a positive impact in enhancing cooperation in contributions but at the same time it seems to introduce competition in common pool resource extractions thereby reducing cooperation in the restraint from taking. This is in contrast to the findings by Cadsby and Maynes (1998) and Nowell and Tinkler (1994) who found higher cooperation in an all-female group which they attributed to the tendency of females to behave more like each other. This is a puzzle and it is not immediately clear why this result occurs.

Ethnic heterogeneity in a group reduces cooperation in both public good contributions and common pool resource maintenance. These results are similar to those obtained by other researchers (see for example Banerjee et al, 2005; Miguel and Gugerty, 2004; Goldin and Katz, 1997 and Habyarimana et al, 2007a). The low contributions and high extractions in an ethnically heterogenous group is attributed to the inability of members of such groups to impose sanctions on non-cooperators (for example Miguel & Gugerty, 2004 and Habyarimana et al, 2007a). As a policy issue, policy makers need to be aware of the negative effects of a group's ethnic composition in the management of common resources. This is especially true in Kenya in the wake of the proposed devolution of government funds.

Consistent with the findings by Sell and Yeongi (1997) and Brewer and Kramer (1986), this paper finds more cooperation in the restraint from extraction than in contributions. The greater cooperation in common pool resource extraction than in public good contribution is attributed to loss aversion and endowment effects. This finding is of policy relevance. In part, it points to the fact that cooperation can be achieved in the sustenance of common resources and points to the fact that sustaining a common pool resource should be prioritized since creating one through initiatives such as harambee is difficult once one is destroyed. A case in point is the destruction of the largest water-catchment area in Kenya that is Mau forest. The government is currently finding it difficult in getting people to cooperate in its rehabilitation.

Finally, consistent with the findings documented in Henrich et al (2001) which showed that Kenyan subjects brought their everyday experience of harambee into the public good setting, this paper also documents the fact that participants in the games brought their real life experience of harambee to bear on their decisions. This highlights the important and potentially positive reinforcing role that social norms and institutions can have on individual decisions.

Bibliography

Alatas, V., Cameron, L., Chaudhuri, A., Erkal, N., & Gangadharan, L. (2009). Gender and corruption: Insights from experimental analysis. *Southern Economic Journal, 75*(3), 663-680.

Alesina, A., Baqir, R., & Easterly, W. (1999). Public goods and ethnic divisions. *Quarterly Journal of Economics*, *114*, 1243-1284.

Andreoni, J. (1988). Why free ride? Strategies and learning in public goods experiments. *Journal of Public Economics, 37*, 291-304.

Armantier, O., & Boly, A. (2008). Can corruption be studied in the lab? Comparing field and lab experiment. *Scientific Series*.

Baltangi, B., Song, S., & Jung, B. (2001). The unbalanced nested error component regression model. *Journal of Econometrics, 101*, 357-381.

Banerjee, A., Iyer, L., & Somanathan, R. (2005). History, social dividsions and public goods in rural India. *Journal of European Economic Association, 3*, 639-647.

Barkan, J., & Holmquist, F. (1986). Politics and peasantry in Kenya: The lessons of harambee.

Bates, R. (1973). Ethnicity in contemporary Africa,. *Programs in East African Studies*.

Ben-Ner, A., & Puttermann, L. (1999). Reciprocity in a two part dictator game. *Mimeo*.

Bertrand, M., & Mullainathan, S. (2001). Do people mean what they say? Implications for subjective survey data. *American Economic Review Papers and Proceedings, 91*, 67-72.

Besley, T., Coate, S., & Loury, G. (1993). The economics of rotating savings and credit associations. *American Economic Review, 83*, 792-810.

Bolton, G., & Ockensfels, A. (2000). A theory of Equity, repricoty and competition. *American economic Review, 90*, 163-193.

Bonacich, P., Shure, G. K., & Meeker, R. (1976). Cooperation and group size in the n-person prisoner's dilemma. *Journal of Conflct Resolution, 20*, 687-706.

Brewer, M., & Kramer, R. (1986). Choice behavior in social dilemmas: Effects of social identity, group size and decision framing. *Journal of Personality and Social Psychology, 50*, 543-549.

Brown-Kruse, J., & Hummels, D. (1993). Gender effects in laboratory public goods contribution: Do individuals put their money where theiry mouth is? *Journal of Economic Behavior and Organization, 22*, 255-268.

Burks, S., Carpenter, J., & Verhoogen, E. (2008). Playing both roles in the trust game: The golden rule and machiavellian behavior. *Mimeo*.

Burns, J., & Visser, M. (2008). Income inequality and the provision of public goods: When the real world mimics the lab. *University of Cape Town, Working Paper.*

Cadsby, C., & Maynes, E. (1998). Gender and free riding in a threshold public goods game: Experimental evidence. *Journal of Economic Behavior and Organization, 34*, 603-620.

Camerer, C. (2003). *Behavioral Game Theory*. Princeton University Press.

Cardennas, J. C. (2003). Real wealth and experimental cooperation: Experiments in the field lab. *Journal of Development Economics, 70*, 263-289.

Carpenter, J. (2002). Measuring social capital: Adding field experimental methods to the analytical toolbox. In J. Isham, T. Kelly, & S. Ramaswamy (Eds.), *Social Capital and Economic Development: Well-being in Developing Countries* (pp. 119-137). Edward Elgar Publishing Ltd.

Carpenter, S. (1998). Sustainability and common-pool resources: Alternatives to tragedy. *PHIL and TECH, 3*.

Charnes, G., & Rabin, M. (2002). Understanding social preferences with simple tests. *Quarterly Journal of Economics, 117*, 817-869.

Chieni, L. (1998). The harambee movement in Kenya: The role played by Kenyans and the government in the provision of education and other social services. *Institute of Distance Education*.

Chweya, L. (2005). The government anti-corruption programmes. In J. T. L. Chweya, & S. Akivanga (Eds.), *Control of Corruption in Kenya: Legal-Political Dimensions 2001-2004* (pp. 1-51). Claripress Ltd.

Croson, R. (2008). Theories of commitment, altruism and reciprocity: Evidence from linear public good games.

Dawes, R. (1980). Social dilemmas. *Annual Review of Psychology, 31*, 169-193.

Dawes, R., & Thaler, R. (1988). Cooperation. *Journal of Economic Perspectives, 2*(3), 187-197.

Diggle, P., Heagerty, P., Liang, K., & Zeger, S. (2002). *Analysis of Longitudinal Data, 2nd ed.* Oxford: Oxford University Press.

Dollar, D., Fisman, R., & Gatti, R. (2001). Are women really the "fairer" sex? Corruption and women in development. *Journal of Economic Behavior and Organization, 46*(4), 423-429.

Dufwenberg, M., & Kirchsteiger, G. (2004). A theory of sequential reciprocity. *Games and Economic Behavior, 47*, 268-298.

Esteban, J., & Ray, D. (2001). Collective action and group size paradox. *American Political Science Review, 95*, 663-672.

Falk, A., & Fischbacher, U. (2006). A theory of reciprocity. *Games and Economic Behavior, 54*, 293-315.

Fehr, E., & Gachter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review, 114*(3), 980-994.

Fehr, E., & Leibbrandt, A. (2008). Cooperativeness and impatience in the tragedy of commons. University of Zurich.

Fischbacher, U., Gachter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters, 71*, 397-404.

Frank, B., & Lamsdorff, J. (2008). Gender effects in laboratory corruption experiments.

Frank, B., & Schulze. (2000). Does economics make citizen corrupt? *Journal of Economic Behavior and Organization, 43*, 101-113.

Frey, B., & Meier, S. (2004). Social comparison and pro-social behavior: Testing conditional cooperation in a field experiment. *American Economic Review, 94*(5), 1717-1722.

Gaube, T. (2001). Group size and free riding when private and public goods are gross substitutes. *Economic Letters, 70*, 127-132.

Gillian, C. (1982). *In a different voice, psychological theory and women's development.* MA: Havard University Press.

Gintis, S. (2000). Beyond homo economicus: Evidence from experimental economics. *Ecological Economics, 35*, 311-322.

Glaeser, E., Laibson, D., Scheinkman, J., & Scoutter, C. (2000). Measuring trust. *Quarterly Journal of Economics, 115*(3), 811-846.

Glaeser, E., Liabson, D., Scheinkman, J., & Scoutter, B. (1999). What is social capital? The determinants of trust and trustworthiness.

Goldin, C., & Katz, L. (1997). Why United States led in education: Lessons from secondary school expansion, 1910 to 1940.

Gordon, H. (1954). The economic theory of a common-property resource: The fishries. *The Journal of Political Economy, 62*.

Government of Kenya. (1997). *Kenya development plan (1979-1983).* Nairobi: Government Printer.

Habyarimana, J., Humphreys, M., Posner, D., & Weinstein, J. (2007a). Why does ethnic diversity undermine public goods provision? *The American Political Science Review, 101*(4).

Hardin, G. (1968). The tragedy of the commons. *Science*, 1243-1248.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., & Ginitis, H. (2001). In search of homo economicus: Behavioral experiments in 15 small-scale societies. *The American Economics Review, 91*(2), 73-78.

Hofmeyr, A., Burns, J., & Visser, M. (2007). Income inequality, reciprocity and public good provision: An experimental analysis. *South African Journal of Economics, 75*(3), 508-520.

Isaac, R., & Walker, J. (1988). Group size effects in public goods: The voluntary contributions mechanism. *The Quarterly Journal of Economics, 103*(1), 179-199.

Khwaja, A. (2000). Can good projects succeed in bad communities? Collective action in the Himalayas. *Mimeo*.

Kibwana, K., Akivanga, S., Mute, L., & Odhiambo, M. (2001). *Initiatives against Corruption in Kenya: Legal and Policy interventions 1995-2001*. Claripress Ltd.

Kibwana, K., Wanjala, S., & Okech-Owiti. (1996). *The Anatomy of Corruption in Kenya: Legal, Political and Socio-Economic Perspectives.* Claripress Ltd.

Kleiman, E., & Rubinstein, Y. (1996). Sex and the leuthold free rider experiment: Some results from an Israel sample. *The Journal of Economic Education, 27*(3), 238-257.

Kollock, P. (1998). Social dilemmas: The anatomy of cooperation. *Annual Review of Sociology, 24*, 183-214.

Kramer, R. M., & Brewer, M. B. (1984). Effect of group identity om resource use in simulated commons dilemma. *Journal of Personality and Social Psychology, 46*(5), 1044-1057.

LaFerrara, E. (1998). Inequality and participation: Theory and evidence from rural Tanzania. *Mimeo*.

Ledyard, J. (1995). Public goods: A survey of experimental research. In J. Kagel, & A. Roth (Eds.), *Handbook of Experimental Economics* (pp. 111-194). Princeton University Press.

Levitt, S., & List, J. (2007). What do laboratory experiments measuring social preferences tell us about the real world? *Journal of Economic Perspectives, 21*(2), 153-174.

Lindley, D., & Smith, A. (1972). Bayes estimates for the linear model. *Journal of the Royal Statistical Society, Series B, 34*, 1-41.

Lipford, J. (1995). Group size and the free-rider hypothesis: An examination of new evidence from churches. *Public Choice, 83*, 291-303.

List, J. (2006). Field esperiments: A bridge between lab and naturally occuring data. *Advances in Economic Analysis and Policy, 6*(2).

Loomis, G., & Sugden, R. (1982). Regret theory: An alternative theory of rational choice under uncertainity. *Economic Journal, 92*, 805-824.

Marxwell, G., & Ames, R. (1981). Economists free ride, does anyone else? *Journal of Public Economics, 15*, 295-310.

Miguel, E., & Gugerty, M. (2004). Ethic diversity, social sactions, and public good in Kenya.

Ngau, P. M. (1987). Tensions in empowerment: The experience of harambee (self-help) movement in Kenya. *Economic Development and Cultural Change*, 523-538.

Ng'ethe, J. (1979). Harambee and Development Participation in Kenya: The problems of peasants and elites' interaction with particular reference to harambee projects in Kiambu District.

Nowell, C., & Tinkler, S. (1994). The influence of gender on the provision of a public good. *Journal of Economic Behavior and Organization, 25*, 501-518.

Ostrom, E., Walker, J., & Gardener, R. (1992). Covenants with and without a sword: Self-governance is possible. *American Political Science Review, 86*(2), 404-417.

Poteete, A., & Ostron, E. (2004). Heterogeneity, group size and collective action: The role of institutions in forest management. *Development and Change, 35*, 435-461.

Poterba, J. (1997). Demographic structure and political economy of public education. *Journal of Policy Analysis and Management, 16*(1), 48-66.

Rapoport, A., & Chammah, A. (1965). Sex differences in factors contributing to the level of cooperation in the prisoner's dilemma game. *Journal of Persoanlity and Social Psychology, 2*, 831-838.

Raudenbush, S., & Bryk, A. (1986). A hierarchical model for studying school effects. *Sociology of Education, 59*, 1-17.

Rivas, F. (2008). An experiment on corruption and gender. *University of Granada Working Paper*.

Roth, A. (1988). Laboratory experimentation in economics: A methodological overview. *The Economic Journal, 98*, 974-1031.

Ruppert, D., Wand, M., & Caroll, R. (2003). *Semiparametric Regression.* Cambridge: Cambridge University Press.

Seguino, S., & Lutz, M. (1996). Gender and cooperative behavior: Economic man rides alone. *Feminist Economics, 2*, 1-21.

Sell, J., & Wilson, R. (1991). Levels of information and contributions to public goods. *Social Forces, 70*, 107-124.

Sell, J., & Yeongi, S. (1997). Comparing public goods with common pool resources: Three experiments. *Social Psychology Quartely, 60*, 118-137.

Shang, J., & Croson, R. (2008). Field experiments in charitable contributions: The impact of social influence on the voluntary provision of public goods.

Singer, J. (1998). Using sas proc mixed to fit multilevel models, hierarchical models and individual growth models. *Journal of Education and Behavioral Statistics, 24*(4), 323-355.

Swamy, A., Knack, S., Lee, Y., & Azfar, O. (2001). Gender and corruption. *Journal of Development Economics*, 25-55.

Taylor, M., & Ward, H. (1982). Chickens,whales and lumpy goods: Alternative models of public goods provision. *Political Studies*, 350-70.

Transparency International. (2003). *Harambee: The spirit of giving or reaping? Technical report.* Transparency International Kenya.

Velez, M., Murphy, J., & Stranlund, J. (2006). Within and between group variation of individual strategies in common pool resources: Evidence from field experiments. *University of Massachusetts-Amherst, Working Paper.*

Vigdor, J. (2004). Community composition and collective action: Analyzing initial mail response to the 2000 census. *Review of Economics and Statistics, 86*(1), 302-12.

Waiguru, A. (2002). Corruption and patronage politics: The case of harambee in Kenya.

Wilson, L. (1992). The harambee movement and efficient public good provision in Kenya. *Journal of Public Economics, 48*, 1-19.

Appendix A

A. Notes to subjects

A·1 Harambee and Common Pool Resource Game

- This game is played by a group of 10 people.
- The game consist of 2 sub-games; a public good (PG) and a common pool resource (CPR) game, the sub-games follow each other.
- Participants will randomly be assigned to groups and will be given time to interact and lay a strategy for the game.
- A member in any of the groups is not bound by the group strategy since the group's objective may be at variance with individual objective.

A1.1 Public Good game

- In the public good game each member will be given an initial endowment of 100 tokens from he makes a decision on how much to contribute to a common kitty.
- Each person's contribution is only known to himself.
- When every member has had a chance to contribute to the kitty, the experimenter will multiply the amount by 5.
- At the end of the game, the kitty is shared out equally among the group members regardless of individual members contributions.
- A member benefits from his contribution and that of other members.
- At the end of this game a player gets:

$$P_{ij} = W - X_i + \frac{h(\sum_{i=1}^{n} X_{ij})}{n} \quad \text{...} (7)$$

A.1.2 Common Pool Resource (CPR) game

- In the common pool resource game (CPR), we start off with 1000 tokens kitty available for the group.
- Each member will have a chance to anonymously extract an amount from the kitty.
- The amount that an individual extracts will only be known to the individual
- After everyone has had a chance to extract from the kitty, the experimenter will multiply the amount left by 5.
- At the end of the game, the kitty is shared out equally among the members regardless of what an individual member extracted from the common kitty.
- At the end of the game, a player gets

$$F_{ij} = R_i + \frac{g(\sum_{i=1}^{n}(G-R_i))}{n} \text{ ………………………………………………………………………(8)}$$

- Where Ri is what individual i extracts from the kitty, g is the factor by which the kitty grows, G is kitty available to the group, and n is number of people in the group.
- From the 2 games, the i^{th} player in group j final payoff is:

$$PF_{ij} = P_{ij} + F_{ij} \text{ …………………………………………………………………………(9)}$$

- Each player will be required to fill in a questionnaire before they get to know their final payoff.
- Read each question carefully and provide an honest answer.
- Note that each question must be answered before submission.

Table 10 shows the interactive panel of the game.

Table 10: The Interactive PG and CPR games panel

This game consists of 2 sub-games; harambee and common pool resource	
Indicate your gender	( ) Male
	( ) Female
Indicate your ethnic identity	( ) Kikuyu
	( ) Luhya
	( ) Luo
	( ) Kalenjin
	( ) Kisii
	( ) Kamba
	( ) Others
Harambee sub-game	
Each member of your group has an initial endowment of 100 tokens from which each one will be asked to individually and independently make a contribution to contribute to a common kitty. Each one's contribution can range between 0 and 100 tokens	
The experimenter will multiply the total sum of what your group contribute by 5 and then share the product equally among the group members regardless of individual member's contribution.	
Indicate the amount you would like to contribute	……………. tokens
Common Pool Resource sub-game	
Your group has 1000 tokens and each of you will be given a chance to independently and anonymously draw any amount from the pool. Anyone is free to draw any amount between 0 and 1000 tokens.	
The experimenter will multiply whatever remains in the pool after each of you has drawn by 5 and then share the product equally among the members of the group regardless of the amount that an individual member drew out.	
Indicate the amount you would like to draw out from the common pool for yourself	……………… tokens
You will get to know your final payoff once every member of your group has had a chance to play the game. Kindly proceed to the questionnaire. Note that all questions must be answered. We pledge strict confidentiality.	

Appendix B: Subject pool

Table 11: Mean contributions and withdrawals by ethnic groups

Ethnic group	Mean contribution to PG	Mean withdrawal from CPR
Kikuyu	63.96	191.5
Luo	61.31	243.88
Luhya	54.49	246.96
Kalenjin	62.87	264.5
Kisii	59.3	259.6
Kamba	55.9	220
Others	63.8	192.12

Table 12: Mean contributions and extractions by centres

University	No. of subjects	Mean PG contribution	Mean CPR extraction
Kimathi	59	67.8	54.1
KEMU	78	52.8	57.7
Lower Kabete	47	71.4	455.4
Eldoret Polytechnic	69	52.2	305.9
Daystar Nairobi	57	53.2	126.3
Masinde Muliro	53	48.5	295.3
Daystar Athi River	37	79.9	286.5
Maseno	58	31	283.6
Mombasa Polytechnic	65	48.9	129.1
Garisa Institute	72	58.7	253
Egerton	73	91.2	300.6
Moi	93	64.9	336.5
MKU	94	72.5	156.2
Kabarak	86	62	167.4

Appendix C: Basic concept behind Hierarchical Linear Model (HLM)

The within-group model specifies the relationship among subject-level characteristics and the variable of interest such as PG contribution. For each group, the estimated PG contribution model is as follows:

$$pgcont_{ij} = \propto_{jo} + \propto_{j1} X_{ij1} + \propto_{j2} X_{ij2} + \ldots\ldots$$
$$+ \propto_{jk-1} X_{ijk-1} + n_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

for $i = 1\ldots\ldots n$ subjects in group j; $j = 1\ldots.J$ groups; and $k = 0\ldots.K - 1$ independent variables. $pgcont_{ij}$ is the PG contribution for subject i in group j, X_{ijk} are the values on the subject-level characteristics for subject i in group j, n_{ij} is the random error term and $\propto_{jk}$ are the regression coefficients that characterize the structural relationship of the subjects within group j. The regression coefficients $\propto_{jk}$ are allowed to vary across groups.

The variability in the regression parameters are a function of the decisions that were reached in individual groups given that each group was given time to interact and lay common strategies. Allowing this variability yields a between-group model. For each of the K regression coefficients in equation 10, it is assumed that:

$$\propto_{jk} = \varphi_{0k} + \varphi_{1k} Z_{1j} + \varphi_{2k} Z_{2j} + \ldots\ldots + \varphi_{p-1k} Z_{p-1j} + v_{jk} \ldots\ldots\ldots\ldots\ldots (11)$$

for $p = 0\ldots\ldots.P - 1$ independent variables in the between-group model, where the φ_{pk} are regression coefficients that capture the effects group-level variables on the within-group structural relationships ($\propto_{jk}$), v_{jk} is the random error in this group-level equation and the Z_{pj} are values on the group-level variables for group j.

Substituting equation 11 into 10 yields:

$$pgcont_{ij} = \propto_{00} + \sum_{k=1} \varphi_{0k} X_{ijk} + \sum_{p=1} \varphi_{pk} Z_{pj} + \sum_{k=1} \sum_{p=1} \varphi_{pk} X_{ijk} Z_{pj} + v_{j0} +$$
$$\sum_{k=1} v_{jk} + n_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Equation 12 is the HLM where the last term $(v_{j0} + \sum_{k=1} v_{jk} + n_{ij})$ represent the error term. When there are no random effects in the between-group model ($v_{jk} = 0$ for all j,k), the HLM becomes equivalent to an OLS model that includes subject-level variables X_{ijk}, group-level variables Z_{pj} and their interaction terms $X_{ijk}Z_{pj}$. When the random effects remain (when one or more of the v_{jk} are not equal to zero), the application of OLS to equation 12 is inefficient and the estimated standard errors are too small. In our analysis, we report both OLS and HLM regression results.