

Working paper

Community Involvement in Public Goods Provision

Evidence from a Field
Experiment in Ghana

Thomas F. Walker

June 2011



International
Growth Centre



DIRECTED BY



FUNDED BY



Abstract

This paper presents the results of a field experiment measuring the willingness of individuals in rural communities to contribute to the financing of local public projects. Individuals were asked five times during 2009 to donate to a public good for their community. The experiment tested two commonly used techniques to encourage contributions: a matching grant, and a provision point mechanism. The results offer the first empirical evidence on the effectiveness of these mechanisms in a developing country setting, and the first comparison of the mechanisms in a field experiment. Using detailed survey data on participants and their social networks, I examine what characteristics explain individuals' contribution decisions. Controlling for wealth and other characteristics, I find that individuals who are more trusted by their peers contribute significantly more, but this result is not explained by their status alone. On the contrary, I find that new migrants to the community and individuals from minority ethnic groups donate more than individuals with higher status and a longer history in the community.

Acknowledgements:

I am indebted to Chris Barrett, Robert Osei, Andrew Agyei-Holmes and the AMA-CRSP survey team. I am grateful for financial support from the International Growth Centre, LSE (RA-2009-06-010), the National Science Foundation (Doctoral Dissertation Improvement Grant No. SES-0851586), and USAID's AMA CRSP Program (Grant No. P686140). Harry Kaiser, Jim Berry, Ralf Steinhauser, Eeshani Kandpal, participants at ISSER's 40th Anniversary Conference on Domestic Resource Mobilisation for Development, the July 2010 IGC Conference in Ghana, the 2010 NEUDC Conference at MIT, the 2011 CSAE Conference at Oxford University, and seminars at Cornell University and the Australian National University have provided helpful feedback.

JEL Codes:

H41, D64, D78.

Keywords:

public goods; provision point mechanism; field experiment; social networks.

1. Introduction

During the past two decades, economists have increasingly embraced the concept of community-driven development, a process by which public goods in developing countries are provided in consultation and collaboration with members of the recipient communities.¹ Relative to centralized provision by a government or foreign agency, community-driven development promises greater accountability, increased involvement by minorities, better targeting and quality of projects, and diminished potential for corruption and waste. Community involvement in the development of local infrastructure has become popular in the form of 'social funds', which have been set up and supported by external agencies such as the World Bank. Mansuri and Rao (2004: 15-17) cite evidence from a range of studies suggesting that while community involvement in development projects can be beneficial, it does not always improve their success.

This study is concerned with the process of community fundraising for local infrastructure projects. Evaluative studies have found that infrastructure is better targeted, lasts longer and works better if community members are required to contribute to its cost (Jimenez and Paqueo, 1996; Kleemeier, 2000). There are a number of arguments in favor of seeking financial contributions from community members. First, community members should be willing to pay something for facilities that they use and value. Provided private contributions approximately reflect individuals' true valuations, a community fund-raising initiative serves as an ex-ante test of the community's need for the proposed infrastructure.² This should improve targeting and reduce wastage of funds on facilities that are not wanted by community members. Second, making a financial contribution to infrastructure encourages community members to become involved in other aspects of the project, and supports maintenance of the facility once built.³ Third, funds raised from community contributions augment those provided by central government and donors, increasing the number of projects that can be completed with a given government or external donor budget. Community contributions thus reinforce the objectives of decentralized public goods provision: promoting local ownership and improving the targeting and mobilization of resources.

In this paper I report the results of a field experiment in four small communities in southern Ghana that tests the willingness of individuals to contribute to local public goods. The experiment was conducted in five sequential rounds during 2009, in conjunction with a household survey. Before the study began, we held public meetings in each community and asked residents to nominate a small infrastructure project. We then visited participants five times during 2009, gave them a small endowment and invited them to donate to the project. In this paper I focus on two aspects of the contributions behavior of these individuals: the effectiveness of two commonly used mechanisms to encourage greater donations; and the effect of individual and social network characteristics on the amount contributed.

If individuals were expected to contribute towards the cost of local infrastructure, it would be useful to elicit contributions in a way that reflects their valuation of the project. Projects that are not sufficiently valued by the community might thereby be reconsidered or redesigned. However, because of the free-rider problem, private contributions may understate private demand. Individuals will tend to contribute less to a public good than their expected private benefit, expecting their neighbors to contribute the difference. This implies that the funds raised will fall short of the socially optimal level, leading to underprovision of public goods. Various mechanisms have been proposed which to some extent alleviate the free-rider problem. In the experiment, I test the effectiveness of two of these mechanisms: the matching grant and the

1 For a comprehensive discussion of the history of community-driven development and its outcomes, see Mansuri and Rao (2004).

2 The notion of seeking community views on which projects to pursue is referred to in the literature as *preference targeting*. Evidence on its effectiveness is scarce. In a study of Jamaican Social Funds, Rao and Ibanez (2005) find that better-networked and elite members of the community tended to dominate the choice of project, though in the long run there were high degrees of satisfaction with the projects among all community members.

3 For instance, in her study of piped water schemes in Malawi, Kleemeier (2000) concludes that the infrastructure might have lasted longer had community members been charged user fees to fund maintenance.

provision point mechanism. These mechanisms have been tested experimentally in developed country contexts, but to my knowledge there have been no field experiments testing their performance in a developing country. It is therefore an open question whether they would be as effective in raising funds for community public goods.

Since all of the respondents in the household survey were participants in the experiment, I have detailed data on their individual and household characteristics and their social network. I use these data to describe who in the community donates the most, and whether high-status individuals can be relied on to contribute more. Previous studies have identified social capital as crucial to the success of community-driven development projects (Isham and Kähkönen, 2002). The theoretical literature on social networks and trust suggests that in the confined social setting of a small village, individuals' economic interdependence and susceptibility to social sanction should make them more willing to contribute to public goods (Fehr and Gächter, 2000). Since this interdependence is greater the smaller and more ethnically concentrated the community, we would expect contributions to be greater in such communities. There is suggestive empirical evidence that this is so. In their study of western Kenyan villages, Miguel and Gugerty (2005) found that the quality of public goods was worse in villages with greater ethnic diversity. Akramov and Asante (2009) reach similar conclusions using data from Ghana. In a study of water and sanitation projects in Ghana, Sun et al. (2010) find that ethnically diverse communities are less likely to have functioning committees to manage provision at the local level, and accordingly a lower standard of water and sanitation facilities. This suggests the link between ethnic heterogeneity and the success of community-driven development projects may be the effectiveness of the political system. With a sample of four villages I cannot draw conclusions about the effects of ethnic heterogeneity or village size on aggregate behavior. However, using a unique dataset on the social networks of the study communities I focus on how social attitudes, position in the social network, ethnicity and social status affect individual behavior.

This paper makes a number of novel contributions. To my knowledge it is the first field experiment to assess the public goods contributions behavior of individuals in a developing country, and the first to test the match ratio and provision point mechanism in this context. Furthermore, it is the first experiment to compare the two mechanisms, yielding valuable information on their relative effectiveness. This study provides the first experimental evidence on which individuals contribute the most to public goods for their communities, an important factor in understanding the relationship between status, the social network and development in rural communities. More broadly, the results of this study have implications for the design of effective development policy, and our understanding of economic behavior in general.

The paper is structured as follows. In Section 2, I describe the existing literature on the matching grant and provision point mechanism. I introduce the study communities and discuss their economic circumstances in Section 3. In Section 4, I describe the sampling procedure used to select participants, and the household survey in which they took part. Section 5 presents the design of the public goods experiment, describing the process by which public projects were selected in each community and how individuals were invited to contribute to the projects. In Section 6, I discuss the qualitative results of the experiment. In Section 7, I then look more closely at the results using econometric models. Section 8 presents a discussion of the policy implications stemming from my findings, and Section 9 offers concluding remarks.

2. Previous Research on Incentive Mechanisms

It is well known that public goods provision is hampered by the free-rider problem. Where individuals bear the cost of funding public projects through individual voluntary contributions (a scheme hereafter referred to as a voluntary contributions mechanism, or VCM), individuals' donations typically fall short of their true private valuation of the project (Bagnoli et al., 1992; Fischbacher et al., 2001). Various mechanisms have been proposed in which the Nash equilibrium is for individuals to reveal their true private valuations (Clarke, 1971; Groves and Ledyard, 1977; Smith, 1979). But these mechanisms are too complex to be employed in most real-world applications. Accordingly, a number of second-best mechanisms have been tested experimentally in the laboratory and in the field.⁴ The two mechanisms I test in this paper are the matching grant and the provision point mechanism.

A matching grant is a promise made by some authority or significant donor to match private contributions in some fixed proportion. For instance, a philanthropic benefactor might pledge to match public contributions, or the government might offer an income tax deduction for donations to registered charities. Matching grants should in theory boost contributions relative to the VCM, since they effectively reduce the 'price' of a given contribution to a public good. Laboratory experiments have confirmed this hypothesis (Baker et al., 2009; Eckel and Grossman, 2003). However, evidence from field experiments suggests the effect of the match ratio is not large. Rondeau and List (2008) found that the matching donation did not have a positive effect at all, while Meier (2007) found that while a matching grant boosted contributions initially, its subsequent removal actually caused contributions to fall. Using data from a fund-raising campaign in the U.S., Karlan and List (2007) found that a match offer boosted response rates and the average amount donated, but changing the match ratio had little effect on the amount donated. In other words, to the extent that the matching ratio has any effect at all, the price elasticity of donations appears to decay rapidly as the match offer increases.

A provision point mechanism (PPM) consists of a fund-raising target and a money-back guarantee. The planner announces the fund-raising target to the community, and guarantees to refund all contributions if the target is not met. The PPM is well suited to the provision of lumpy goods, where the target is binding as the minimum amount of money for which the good can plausibly be delivered. It is also simple to explain and implement. Bagnoli and Lipman (1989) showed that, given full information, all perfect equilibria from such a game are Pareto optimal (that is, individual contributions reflect true private valuations).⁵ This hypothesis has been tested in the laboratory using an induced value framework, with varying results. Rondeau et al. (1999) found that the PPM elicited contributions equal to private valuations. In similar studies by Isaac et al. (1989), Bagnoli and McKee (1991) and Poe et al. (2002), contributions under the PPM were higher than under the VCM – and provision of the public good more likely – but the mechanism fell short of being fully demand revealing. Rondeau et al. (2005) compared the VCM with the PPM in the laboratory and in a small field experiment, and found that the PPM induced generally higher contributions. However, the main effect of the PPM was felt at the top of the distribution (increasing the largest donations). One constraint on the real-world effectiveness of the PPM, relative to the theoretical predictions, might be that Bagnoli and Lipman's (1989) assumption of full information does not hold in practice. However, Marks and Croson (1999) conducted experiments to test the effect of limited information and found that it did not substantially change the impact of the PPM relative to a full-information treatment. There is only limited evidence on the effectiveness of the PPM in real-world applications. Rose et al. (2002) found that the PPM increased the rate of participation in a green energy program substantially above that of a treatment group.

⁴ There are many such mechanisms, the discussion of which is beyond the scope of this paper. List (2007) provides a recent summary of the experimental evidence on the effectiveness of these mechanisms.

⁵ During 2009, one Ghana cedi (GHe) averaged about 69 US cents. Converting without PPP adjustment, this equates to a mean per capita consumption level of between \$1.24 and \$1.72 per day.

There are various methods for dealing with contributions above the threshold. The nature of this rebate rule matters to the optimality of equilibria. Marks and Croson (1998) tested three such methods in the laboratory: a no-rebate policy, where excess donations are discarded; a proportional rebate, in which the excess funds are divided among the donors in proportion to their contributions; and a utilization policy, in which excess funds are spent on the public good. They found that average contributions were significantly higher under the utilization policy than under the no-rebate and proportional rebate policies. In this study I adopt the utilization policy.

This is to my knowledge the first field experiment to test the effectiveness of the matching grant and PPM in a developing country. Moreover, these two mechanisms are tested in such a way that I can assess not only their effectiveness relative to a simple voluntary contributions mechanism (VCM), but also relative to each other. Such a comparison has not hitherto been performed in the literature.

3. Introducing the Study Area

The field experiments were conducted between March and December 2009 in conjunction with a year-long household survey in four communities in Akwapim South district, Eastern Region. The survey was part of a three-wave panel, the first two waves having been conducted in 1997-98 (Udry and Goldstein, 1999) and 2004 (Vanderpuye-Orgle, 2008). The original 1997-98 study was concerned with the welfare of farmers in Ghana's export pineapple industry, and the survey area was chosen because of that district's significant involvement in the industry.

The Akwapim South district has historically been a centre of fruit farming – initially cocoa, and more recently pineapple and pawpaw. The district lies immediately to the north of Accra, the country's capital. The growth of the commercial centers of Aburi and Nsawam, which lie on the two main roads heading north from Accra, has changed the pattern of employment in the survey communities (Owen, 2009). Two of the communities (Konkonuru and Darmang) lie close to these towns, and a significant number of the respondents in these communities derive their primary income from non-farm business or waged work. In the other two communities (Oboadaka and Pokrom), which lie in a valley a long way from Aburi and Nsawam, the majority of the respondents are still primarily farmers who travel to the towns weekly to trade. All four communities are quite poor. During 2009, mean per capita consumption (averaged over all five rounds) ranged from GH¢54.42 to GH¢75.58 per month across the four communities.⁶

All of the communities lack some basic public services. None has piped water, all relying primarily on boreholes for water. Each has at least one primary school and one junior secondary school, but some are in states of disrepair or were never completed. Less than half of households have their own toilet, and none of the communities has sufficient public toilets given its population. Each community has a health clinic and there is a major hospital at Nsawam. Konkonuru and Darmang are accessible by a paved road, while Oboadaka and Pokrom are only reachable by dirt road. All of the communities except Oboadaka have electricity. Public goods are provided by a number of entities: the national government, the district assembly (the local government body), private donors, NGOs and foreign governments. In 2009 the Government of Ghana's Millennium Development Agency (MiDA) commenced an extensive support program throughout the country, which so far has resulted in the refurbishment of a primary school in one of the survey communities, the training and equipping of farmers, and will soon fund the rehabilitation of a feeder road connecting the two more remote communities to Nsawam. Usually, however, projects are not well coordinated and sometimes left incomplete, resulting in infrastructure which is defective or unusable, and which often decays faster than intended. In one community, the junior

⁶ During 2009, one Ghana cedi (GH¢) averaged about 69 US cents. Converting without PPP adjustment, this equates to a mean per capita consumption level of between \$1.24 and \$1.72 per day.

secondary school had no doors or windows for one classroom; in another, the school's toilets were not connected to running water and could therefore not be used. In informal discussions community members stated that the poor state of public infrastructure in part reflects a lack of accountability of the providers and a lack of ownership of the projects by the local community. Contractors have an incentive to cut costs in order to boost profits, especially where there is little auditing or follow-up of projects by government to assess quality and durability. If community members were responsible for part of the cost of these projects, they might be more inclined to report defects in the work and take responsibility for the maintenance of the facilities.

4. Sample and Household Survey

The sample consisted of approximately 70 households in each of the four communities. According to our initial listing in January 2009, the four communities had between 180 and 580 households, so that our sample covered between 12 and 40 per cent of households.⁷ Around half of these households were part of the initial 1997-98 sample, and the rest were recruited in January 2009 using stratified random sampling.⁸ In the original sample, and in the 2009 re-sampling, we selected only from the pool of households headed by a resident married couple.⁹ However, we retained households from the 1997-98 sample even if only one of the spouses remained. These 'single-headed households' account for between 7 and 15 of the sample households in each community. Thus around 150 individuals participated in the experiment in each of the four communities (Table 1).

[Table 1: Sample summary]

The household survey covered a wide range of subjects, including personal income, farming and non-farm business activities, gifts, transfers and loans, and household consumption expenditures. Each individual was interviewed five times during 2009, once every two months. In addition, we conducted a detailed survey of respondents' in-sample social networks. The social network survey was conducted in the first round. Each respondent was asked in turn about every other respondent in the sample from his or her community. We asked whether they knew the person, by name or personally, how often they saw them, whether they were related, how strong they perceived the friendship to be, whether they had given or received anything of value from the person, and whether they would trust the person to look after a valuable item for them. Summary statistics of the variables used in this study are given in Table 2.

[Table 2: Summary statistics]

5. Experimental Design

Two weeks prior to the start of each survey round, we visited each community and conducted one round of the public goods experiment. In all, we conducted five rounds of the experiment. The first round was conducted prior to the second round of the survey, and the fifth followed the final round of the survey.

⁷ Including children, my rough estimates of the populations are 706 in Oboadaka, 1,270 in Konkonuru, 1,768 in Darmang and 2,283 in Pokrom.

⁸ New sample members were selected randomly from the subset of households in the community headed by a married couple. The sample was stratified by age of the head into three categories: 18-29, 30-64 and 65+, so that the shares of households whose head was in each of these age categories corresponded to the population shares. The stratification was designed to reinstate representativeness given that households with heads under 30 did not exist in 1997-98, and those with heads over 65 had suffered greater natural attrition.

⁹ Some men in the sample have two or three wives, all of whom were included in the sample.

Before the experiments began, we held an open meeting in each community. We did not give details of the experiment, but explained that participants would be given money for their time in the survey, and would be invited to donate to a public good. Supposing the community could raise around GH¢1,000, what would they most like to spend that money on? We gave only a few guidelines: it had to be a self-contained project, affordable with that amount of money. A number of projects were proposed by the community members, which were then categorized as feasible or infeasible depending on their cost. Those at the meeting then voted on which of the feasible projects to pursue.¹⁰ The final choices were: renovation of primary school toilets in Konkonuru; construction of a maternity ward for an existing health clinic in Oboadaka; a second public toilet block in Pokrom; and renovation of the junior secondary school (JSS) in Darmang. We informed the community members that their choice could be changed later on, provided there was majority community support for the change.

The author and an assistant conducted the experiments with support from the survey enumerators. Respondents were called on a given day to report to the local primary school, where they signed in and took a ticket with their individual ID number written on it. One by one, they were invited into a closed classroom to receive their endowment and make a donation if they wished. Care was taken to keep these solicitations private, and the amounts each individual donated were not disclosed to any other community member or participant. Only an interviewer and a record keeper (who took a written note of the donation) were witness to the respondent's decision.¹¹

Upon entering the room, the respondent was seated at a desk facing the interviewer and record keeper. The interviewer explained (in Twi, the local language, as most of the respondents did not speak English) that the respondent was to receive a small amount of money (endowment) for their time and co-operation in the previous round's survey.¹² Since most respondents were poor and often short of cash, the endowment was designed to 'even the playing field' of cash-on-hand across respondents, removing potentially contaminating differences in ability to contribute. The endowment varied by round. In round 1, we gave GH¢1 to each respondent; in rounds 2 and 3 we gave GH¢2, in round 4 we gave GH¢4, and in round 5 we gave GH¢6. This variation allows me to measure the income elasticity of demand for donations, and test whether the size of the endowment is a binding constraint on larger donations.

The interviewer then explained that we were raising money for a public project, and briefly described the project chosen by that community. The respondent was invited to donate to the project, but was not compelled to. Any donation they made would be kept confidential, and their choice would not affect their ongoing participation in the survey.

The respondent was then invited to draw a token from a bag to determine the matching ratio. There were five tokens in the bag, each a different color, representing matching ratios of 0, $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2. We took great care to ensure the draw was blind and random. A table relating the colors to the matching ratios was displayed on a sheet in front of the respondent. The interviewer explained what matching ratio the respondent had drawn, and what that meant. For any matching ratio m , we would add m times the respondent's donation to the total funds raised. If the token representing zero were drawn, no matching grant would be given. We gave the respondent various examples, and quizzed them to check they understood the concept. The

10 A number of studies have considered the effect of voting itself as a contextual mechanism for enhancing contributions (see, for example, Messer et al. 2007). In a study of four communities I could not test this claim, but considered voting the fairest way of establishing community consensus on a single project.

11 It was impossible in this context for donations to be anonymous to the researchers and still be individually matched and linked to individual characteristics. The key objective was to remove the effect of coercion, common knowledge and peer pressure on participants' donation decisions.

12 The endowment was deliberately framed as payment for the survey to reduce any 'endowment effect' in the experiment. To this end, respondents were told during the survey rounds how much they would be paid for their interview, and given a small ticket to 'redeem' their payment.

respondent was then given their endowment in cash and invited to make a donation if desired. To minimize rounding issues, we gave the first GH¢2 of the endowment in 20p coins and the remainder in GH¢1 notes.¹³ Respondents were able to ask for change, so that any donation was feasible. Once they had made their donation, the match was added. We checked that the respondent was satisfied with their choice, and then the total amount was put in the donation box. Once the respondent had left the room, the match ratio and donation were recorded on a sheet against their name.

In the final two rounds, the procedure was modified slightly to include a provision point mechanism (PPM).¹⁴ After mentioning the project, the interviewer pointed to a sheet in front of the respondent that showed the amount raised and a fund-raising target (including a graphical depiction of the proportion of funds raised). Based on donations from the first three rounds and the realistic minimum cost of the projects, we set targets of GH¢750 in three communities and GH¢1,000 in Pokrom (which had at that point raised substantially more than the other three). The interviewer explained that the project could not go ahead unless the target was reached, and that if the target was not reached, all donations from the fourth and fifth rounds would be refunded. The funds raised in the first three rounds would be spent on maintenance of existing public buildings. The interviewer explained that the respondent would receive a receipt for their donation, and that they could use this receipt to claim reimbursement if the project did not go ahead. The rest of the experiment proceeded as in the first three rounds, except that at the end a receipt was given to the respondent for the amount donated.

Once all respondents present had been interviewed, we counted the amount raised and crosschecked against the total from the record sheets. The amount was announced to the assemblyman, who in turn informed the community members.¹⁵ We also announced the progressive total amount raised at subsequent meetings with the respondents. At the end of the five rounds, the amounts raised were to be spent on the designated project, provided the target had been reached. Respondents who did not attend the experiment for a given round could claim their endowment in the next round in addition to that round's endowment; therefore, some respondents received larger endowments in later rounds.¹⁶ Funds not claimed at the end of the fifth round were counted as full donations and added (without a matching grant) to the funds raised for the community. Those amounts are excluded from the analysis.

6. Initial Observations

All four communities reached their targets, though Konkonuru did so by only a small margin. Overall, only 5 per cent of respondents did not donate (Table 3). The incidence of non-contribution was much higher in Konkonuru, where 32 per cent of respondents made no contribution in round 1. In the other three communities non-contribution rates ranged from zero to 6 per cent. In all communities, non-contribution dropped off sharply in rounds 4 and 5 with the increase in endowments and the introduction of the provision point mechanism.

[Table 3: Non-contribution rates]

¹³ There are 100 pesewas (p) in a Ghana cedi.

¹⁴ We continued to give respondents a matching grant, in exactly the same manner as described above.

¹⁵ The assemblyman is the community organizer and 'secretary'.

¹⁶ About 10 per cent of the sample received 'extra endowments' in this manner.

Even in Konkonuru, however, the rate of non-contribution was much lower than in similar studies in Western countries, where it is common for more than half of the sample to refuse to donate.¹⁷ In part, this may have been due to the presence of the interviewers. Since Ghanaian social norms dictate that people should not refuse a request for money from a friend in need, they may have felt obliged to give something in response to a request from researchers. For example, in the first round a donation of 20p was the mode in some communities; since the endowment was given in 20p coins, this might have been a ‘token donation’ by individuals reluctant to give. It could also be due to the fact that the individuals were given an endowment, and could not use the excuse ‘I don’t have any money’. These considerations were unavoidable given the experimental design, but should be borne in mind when interpreting the results. However, their presence was constant throughout the year, and should not affect comparisons between individuals or across rounds.

Table 4 presents the mean donations in each round. It is apparent that some communities donated substantially more than others. In part this reflects different characteristics of the respondents (such as differences in wealth), which I will explore in the regression analysis. Even after taking those factors into account, however, there is a residual difference which reflects characteristics of the community and of the project. First, comments by some respondents in the interviews made it clear that the renovation of the school toilet and JSS buildings were markedly less popular for a number of reasons. Some respondents said they were reluctant to donate because their children didn’t attend that school, or because they didn’t have school-age children. In Konkonuru (raising money for a school toilet), respondents argued that the teachers locked the toilet even when it was working, and that their children therefore would not benefit from it. Second, there was a distinct difference in the degree of support provided by the community leaders. In Darmang and Oboadaka the leaders tried significantly harder to garner support and attendance from respondents. However, this appears to have affected attendance more than donations, since Darmang raised the least money despite being the wealthiest of the four communities.

[Table 4: Mean donations by round and community]

The matching ratio varied randomly across individuals and rounds. Table 5 provides a summary of the mean ratios in each village and round, along with standard errors and t-statistics. These are generally around 1 on average, and not significantly larger than 1 at the 10 per cent level in any one experimental session.¹⁸ Looking at a simple bubble graph (Figure 1), the matching ratio appears to have had a slightly positive impact on donations, primarily by lifting donations at the top of the distribution.

[Table 5: Summary statistics on matching ratios]

[Figure 1: Effect of matching ratio on donations]

17 For example, Karlan and List (2007) reported response rates of around 2 per cent in their study, and List and Lucking-Reiley (2002) reported response rates of 3.4 to 8.4 per cent. Both studies relied on mail-out solicitations, so there are clearly other explanations for these low figures (such as wrong addresses, absenteeism and the lack of face-to-face interaction). However, they illustrate how difficult it can be to solicit donations from individuals.

18 In aggregate the ratios offered in round 2 and in village 4, and thereby overall, are statistically different from 1 at the 5 per cent level. This should not be of concern as long as the ratio offers are random across individuals. I tested whether this affected the results by excluding round 2 and village 4, but there were no substantial differences. Results of these tests are available on request.

Figure 2 presents the cumulative distribution function (CDF) of donations for each community. Since donations were almost all in multiples of 10p, the CDFs in Figure 2 are smoothed: uniform random variation of up to 5p was added to each donation in order to separate the lines and make them easier to read. The CDFs show significant clustering of donations at points like 20p, 50p and GH¢1, perhaps reflecting people's reluctance to ask for change and donate their true valuation. It might even be a manifestation of 'coherent arbitrariness' due to uncertainty over the true valuation.¹⁹ The 20p mode is apparent in Figure 1, but a number of individuals donated substantially more, a few even adding to the endowment with their own money. It is also notable that the distribution of donations in rounds 2 and 3, when an endowment of GH¢2 was given, is very similar to the distribution for round 1. For the majority of individuals, therefore, doubling the endowment had no effect on the amount donated. The only visible difference is in the second-top decile of donors, whose donations rose from around 50p to around 80p. Only a handful of people gave more than GH¢1 in rounds 2 and 3, suggesting that the GH¢1 endowment in round 1 was not a significant constraint on donations.

[Figure 2: Cumulative distribution of donations]

The effect of the provision point mechanism (PPM) in rounds 4 and 5 is readily apparent. As discussed in Section 2, this mechanism is designed to alleviate the free-rider problem by providing prospective donors with a guarantee that, should the project be underfunded, it will not go ahead and they will get their money back. This assuages concerns that few funds will be raised and the project will be of poor quality, and encourages those who are hesitant to donate. One would therefore expect the PPM to increase contributions, pushing each person's donation closer to their true valuation of the project. The size of contributions indeed rose in the last two rounds, both in absolute terms and in proportion to the endowment (Table 4). The increase was substantial and affected the entire distribution.

After including uncollected monies, all four communities passed their targets. We met with each community and, in consultation with experts from the Akwapim South District Assembly, costed each of the projects. The community that had chosen to build a public toilet changed their minds, because the money raised would only build a small toilet which was considered inadequate for their population. Instead, they resolved to spend the money on building a kindergarten. Each community elected a committee to oversee the project work, and also volunteered resources like sand, water, stones and artisanal labor. All four of the projects have now been completed.

¹⁹ 'Coherent arbitrariness' describes the tendency of individuals to be influenced by arbitrary anchors in determining their willingness to pay for goods without a well-defined reference price (Ariely et al., 2003).

7. Regression Analysis

One strength of the experiment's design is the wealth of survey data available on each respondent, which allows me to relate donation decisions to individual characteristics. We collected data on wealth and consumption five times during the year, giving a dynamic picture of the respondents' financial situation over the course of the experiment. In order to measure the effect of characteristics on contributions, I estimate a regression model of the amount donated by each respondent in each round. Because of the likelihood of individual heterogeneity in contributions over the five rounds, I tested an individual-level random effects specification. A Hausman test rejected the random effects model in favor of fixed effects, therefore I focus on the OLS results in the following discussion. This permits inference about key time-invariant characteristics of respondents that are washed out by the fixed effects estimator. I include the random effects and fixed effects results in Table 6 for comparison.

The first objective of this analysis is to measure the impact of the matching grant and provision point mechanism (PPM) on donations. The theoretical models of these mechanisms do not provide much guidance on specification. If the matching ratio has an influence on donations by varying the price of contribution, the relationship between the ratio and donations may be nonlinear depending on the functional form of preferences for the public good. Furthermore, we might expect to see threshold effects moving from the no-match treatment (ratio is zero) to a match treatment (where the ratio is nonzero). I present a specification in which the match ratio is included as a set of dummies for the five possible ratios. A linear specification yielded equivalent results; the coefficient estimate is reported in Footnote 23. The PPM was introduced in the last two rounds, therefore its impact can be observed by including a set of round effects. Figure 3 suggests the effect of the PPM on donations should be substantial. However, the round effects will also pick up other seasonal effects and the variation in the endowment. I control for seasonality in individual income using log household wealth.²⁰ I estimate the effect of the endowment by looking at the marginal increase in donations among those individuals who were absent in a round and subsequently collected a larger endowment. By subtracting this from the round effect estimate, I get an indirect measure of the impact of the PPM. An alternative approach I then consider is to drop the round effects and make use of the variation in endowment among absentees to measure its effect directly. This isolates the effect of the PPM on contributions in the last two rounds.

The second objective of the regression analysis is to measure the effect of individual characteristics on donations. In addition to log wealth, which is a household-level variable, I add controls for the respondent's age and sex. I also include a measure of trust, since individuals might be concerned about the likelihood of their donations being misappropriated by community leaders (or the survey team) and about the way the public good will be managed once built. To account for this, I use information from a survey module on social attitudes. The module obtained Likert scale responses measuring the respondent's agreement with five statements about trust in neighbors, government and officials. I tested each in the specification; the only one which was significant was 'I feel I could trust my neighbors to look after my house while I am away'. This was measured on a scale of 1 to 5, with 1 representing 'strongly agree' and 5 'strongly disagree'. I include this variable as a set of four dummies called *social* (excluding 'strongly disagree').

The social networks survey collected detailed data on the nature of relationships between the respondent and every other sample member from their community. I test various measures of the size and quality of an individual's social network, including the number of sample members known by the respondent, the number of these the respondent trusts, the number of respondents who report knowing the individual, and the number of these who trust the individual. These variables are represented generically in the specification below by the variable *socnetwork*.

20 I also tried log per capita consumption, which is a more effective indicator of seasonality; its coefficient was small and insignificant. In any case, wealth gives a better sense of an individual's means and therefore willingness to contribute. Income would have been a better measure theoretically, but was too volatile to be significant.

I first estimate the OLS model:

$$donation_{it} = \alpha + \sum_{j=2}^5 \beta_j ratio_{it}^j + \gamma \cdot extracash_{it} + \delta_1 logwealth_{it} + \delta_2 age_i + \delta_3 sex_i + \delta_4 socnetwork_i + \sum_{k=2}^5 \theta_k social_i^k + \sum_{l=2}^4 v_i^l + \sum_{m=2}^5 \rho_t^m + \varepsilon_{it}$$

where ε_{it} is a white noise disturbance. The dependent variable, *donation*, is individual i 's donation in Ghana cedis in round t . The parameters v^l are community fixed effects for the four communities l , with Darmang ($l = 1$) excluded, and ρ^m are round fixed effects.²¹ The variable *ratio* represents a set of four dummies for the match ratio offered (0.5, 1, 1.5 or 2), excluding zero. The variable *extracash* is the *additional* endowment given to those respondents not collecting money in previous rounds; the remainder is captured by the round fixed effect. The household's wealth in the month just prior to the round is captured by *logwealth*, specified in logs because the variable is approximately lognormal across the population. This measure varies across rounds, capturing seasonal effects and economic shocks to individuals during the year that might affect donations. The respondent's *age* is measured in years, and *sex* takes the value one if the respondent is male, zero otherwise.

The estimates for Equation 1 are presented in Table 6. The results are presented with robust standard errors to control for heteroskedasticity. Household wealth has a positive impact on donations, but the effect is small in relative terms. Using the coefficient on wealth, I calculated the wealth elasticity of donations for each individual. Across the entire population, this averaged 0.05. Individual wealth and consumption were not available in the survey data, so I use household wealth as the measure of welfare.²² Consequently, any differences in the spending power of men relative to women in the same household are captured only by the gender variable. The coefficient on gender is significant and positive, indicating that males donated around 10p more than females on average. It is common in Ghana for the husband to earn a large share of the household's cash income, so this may explain the gender difference in donations. Older individuals also donated more. The greater an individual's reported trust of their neighbors, the higher their contribution. This might reflect the importance of an individual's confidence about the way in which the public good would be built or managed by their community, and potentially also about whether the survey team would act as promised in spending the raised funds.

[Table 6: Main regression results]

²¹ Since *extracash* is zero for all individuals in round 1, I omit the round 1 fixed effect.

²² Household wealth includes stocks of food, farm output, livestock, business assets, goods for sale, durables, net balances owed by others, bank balances, and the value of jewelry and investments. It does not include land or building wealth.

Effect of the Match Ratio

The coefficients relating to match ratios of 1.5 and 2 are statistically significant at the 5 per cent level, adding an estimated 8-10p to donations relative to the no-match case. This effect compares to a mean donation of 37.6p in round 1 and 69.5p over all five rounds, thus it is quite significant in economic terms. The implied price elasticity of donations is -0.26, therefore inelastic, and not substantially different from the elasticity of -0.38 implied by the results of Karlan and List's (2007) study.^{23,24} However, in Karlan and List's study the response rate was very low, so that there was a large difference between the mean overall donation and the mean donation by existing contributors. In contrast, in this experiment there was a small difference between the two due to very high rates of participation. The implied price elasticity for *existing* contributors in Karlan and List's study is effectively zero.²⁵

Receiving additional endowment money (from previous rounds) raises donations by around 16p per additional cedi, which is substantially lower than the overall mean donation. It is difficult to infer what donations would have been had the endowment been zero. However, one can use the additional endowment variable to construct an estimate of the income elasticity of donations with respect to the endowment. The mean estimate across all communities and rounds is 0.53, implying that increases in the endowment induce roughly a one-to-two proportional increase in the donation. This is about 10 times larger than the elasticity of donations with respect to wealth, suggesting that the propensity to give out of cash-in-hand is much higher than the propensity to give out of overall wealth.

Provision Point Mechanism

The introduction of the PPM in round 4 had a dramatic positive effect on donations. The round coefficients jumped from between 0.05 and 0 in the second and third rounds respectively (relative to round 1) to 0.56 and 0.66 in rounds 4 and 5. It appears that the PPM was much more effective than the matching ratio in eliciting contributions from community members. The increase in donations in rounds 4 and 5 cannot be explained solely by the increase in the endowment, which doubled from round 1 to 2 with little effect on donations. The estimated coefficient for *extracash* suggests that only part of the increase from round 3 to round 4 (roughly 33 pesewas) could have been due to the additional endowment, leaving a net increase in donations of about 23p attributable to the PPM. This estimate is supported by the CDFs in Figure 3; whereas there was almost no change in the distribution of donations over the first three rounds of the experiment, donations in the last two rounds are stochastically dominant and significantly larger across the distribution. Increasing the endowment by 50 per cent from round 4 to round 5 had only a small positive impact on donations.

As a robustness check, and in order to better isolate the impact of the PPM itself, I re-estimated the model without round effects, including the full endowment (which varied across rounds and within rounds, for those who missed an earlier payment) and a dummy for the PPM rounds. I experimented with first-, second- and third-order polynomials for the endowment, and found a quadratic specification worked best. This modified specification is as follows:

$$\begin{aligned} donation_{it} = & \alpha + \sum_{j=2}^5 \beta_j ratio_{it}^j + \gamma_1 endowment_{it} + \gamma_2 endowment_{it}^2 + \delta_1 logwealth_{it} \\ & + \delta_2 age_i + \delta_3 sex_i + \delta_4 socnetwork_i + \sum_{k=2}^5 \theta_k social_i^k + \sum_{l=2}^4 v_l^l + ppm_t + \varepsilon_{it} \end{aligned}$$

23 In order to calculate this elasticity, I re-estimated the model with ratio included as a linear term. The coefficient estimate was 0.054 (standard error 0.014).

24 This figure is not drawn from Karlan and List's paper, but rather from my calculations based on their reported results and summary statistics. The two estimates are not perfectly comparable, since the elasticity from Karlan and List's study is a single elasticity at the mean donation, while the elasticity for my results is the mean of the individual elasticity estimates.

25 Specifically, my calculations make it +0.07, but the coefficient estimate is not significantly different from zero.

where *endowment* is the full endowment in Ghana cedis, and *ppm* is a dummy variable taking the value one in rounds 4 and 5 and zero otherwise. The results are presented in Table 7. Donations are increasing in the square of the endowment, which suggests the marginal propensity to consume out of the endowment is *increasing*. The introduction of the PPM leads to an estimated 33p increase in contributions, roughly 50 per cent of the mean overall contribution and almost 100 per cent of the mean contribution in rounds 2 and 3. The effect of the PPM is about three times that of the matching grant with a ratio of 2.²⁶ In the second column of Table 7, I report results from Equation 2 where the endowment is specified linearly. In this case, the estimated effect of the PPM is 0.22, which is lower but still more than twice the effect of the match ratio.

[Table 7: Estimated effect of the PPM]

Social Network Characteristics

Table 8 reports the coefficient estimates for a range of different social network measures, each included individually in an estimation of Equation 1. The measures considered are the number of individuals in the sample whom the respondent knows personally, the number who report knowing the respondent personally, the number of the respondent's contacts she reports being able to trust with a valuable item, and the number of contacts who report being able to trust the respondent. Finally, I try the share of the respondent's contacts she trusts, and the share who trust her. This last variable is by far the most significant, and is therefore the one included in the other regressions in this paper.

[Table 8: Coefficient estimates for social network variables]

It is interesting that *trustworthiness* is the most significant predictor of an individual's contribution. An individual in the top decile in terms of trustworthiness (trusted by 45 per cent of those who know her) would donate around 23p more than an individual in the bottom decile (trusted by only 11 per cent of those who know her). This is roughly one third of the mean overall donation. The other measures are much less significant, suggesting that it is not an individual's popularity alone that determines her contribution.²⁷ It is unclear which way the causality might run – whether the result can be explained by more trustworthy people tending to be leaders, and therefore donating more because of their position, or whether those individuals' donations reflect a more generous spirit which has already earned them the trust of others. This is an interesting question for future research, if indeed an experiment could distinguish the channel of influence. What is clear, however, is the crucial role of these trusted individuals in public fund-raising efforts.

Is trustworthiness related to higher status in the village? Such individuals might have expected to lead the construction and management of the facilities, or felt responsible for the 'success' of their community's project, and therefore had the greatest interest in seeing it completed. To test these hypotheses, I include a number of measures of status in the regression: dummy variables for holding a village or family office, coming from the local ethnic group, having been fostered as a child, being a new migrant (defined as having lived in the community for five years or less), and the share of the individual's life spent in the community. If it is true that the effect of trustworthiness simply reflects the contributions behavior of higher-status individuals, one would expect village office-bearers to contribute significantly more. Ethnicity is a significant theme in research on community-driven development, thus we might expect people from the local ethnic group (Akwapim) to have a greater say (and possibly stake) in public projects and thereby contribute more. Conversely, new migrants to the community are likely to have less

26 As discussed earlier, the true effect of the match ratio may be greater than that estimated here if the act of offering a match is itself an incentive to contribute. All participants were aware that we were matching at least some contributions.

27 This is true even if I use an intensity-weighted measure of friendship.

status. Previous research in these communities also suggests that individuals who were fostered (that is, lived a substantial part of their childhood with individuals other than their parents) are more likely to be socially isolated within the community (Vanderpuye-Orgle and Barrett, 2009) and therefore of lower status. These hypotheses are supported by simple regressions of trust on indicator variables of these three characteristics: office-bearers and Akwapim individuals are significantly more trusted, while new migrants and fostered individuals are significantly less trusted (as a share of those who know them). Both the number of individuals who know the respondent, and the number who trust the respondent, are higher the longer the respondent has lived in the community.²⁸

Coefficient estimates for these status variables are reported in Table 9. Office-bearers seem to donate more, but the coefficient is not significant. Those who were fostered as children (presumably therefore of lower status) did not contribute significantly less. Individuals from the local ethnic group actually donated 7-8p less on average than others. New migrants donated around 7p more than others, though this is only significant at the 10 per cent level. Another measure of migrant status, the share of life spent in the village, also suggests that newer arrivals are more willing to contribute. These are counterintuitive results. Perhaps they reflect a desire among new migrants to build their new community, or to gain acceptance by other residents.²⁹ It is also possible that new migrants donate more because they have greater spending power; indeed, new migrants have higher per capita consumption on average. However, when I replace log wealth with log per capita consumption, the above results are unchanged. In conclusion, it appears that contributions to community-level public goods are strongly related to the social network, with more trusted individuals donating more. However, this does not appear to be due to status per se. The results from this analysis suggest that the relationship between ethnicity and community-level altruism is far from clear, and needs to be explored further in future work.

[Table 9: Estimated effects of status variables]

8. Policy Implications

The mechanisms tested here – the matching grant and PPM – both helped to encourage donations and could be used in a full-scale local fund-raising initiative. With a PPM, unpopular projects that do not garner enough support to reach the fund-raising threshold would not go ahead, saving money and ensuring that scarce funds flow instead toward more desirable projects. I found that the PPM was between two and three times more effective than the matching grant in boosting donations, and has the added benefit of being easy to understand. However, the PPM requires fund-raisers to set a realistic target, which may be difficult in a situation where potential demand cannot be estimated *ex ante*. Setting too high a target and consequently aborting a project because the target is not reached could diminish goodwill within a community. One would also need to take into account the administrative costs associated with recording donations and returning funds if the target is not met. In a developed-country setting, a fund-raiser can take credit card pledges and deduct the funds only if the target is met, but that is not feasible in poor rural communities.

The matching grant could be implemented indirectly if communities were required to contribute only a fraction – perhaps one-fifth – of the cost of a project. This would have the same effect as a matching ratio of 4, reducing the effective price of donation but without needing to explain and co-ordinate the matching offer. The amount a community is required to raise could be varied depending on the standard of living of the community, with poorer communities required to raise a smaller fraction of the full project cost.

²⁸ Results are available from the author on request.

²⁹ Around one quarter of respondents are first in their family to live in the community, reflecting quite high levels of geographic mobility.

The practice of raising additional funds for local development from community members has a number of advantages. First, these individuals are rarely subject to income tax and therefore shoulder a very small tax burden. Some form of voluntary co-payment seems justified for public projects that offer direct benefits to the local community. The additional funds raised would allow district assemblies to do more with existing funds, and reduce their reliance on central government disbursements and irregular NGO and donor initiatives. Requiring local community members to bear part of the project cost could also increase their sense of ownership of the project and encourage them to take responsibility for its care and maintenance.

Some caveats apply to this analysis. The field experiment was designed to measure individuals' willingness to contribute to a public project. The focus on individual behavior, and the particular requirements of an experimental setting, means the design of the experiment is somewhat different from the process a district assembly might use to raise funds for a larger public project.

First, donations might have been lower had we not presented respondents with a cash endowment before soliciting contributions. Absent these endowments, more individuals may have refused to contribute because they were short of cash. They may also have been more inclined to contribute because of an 'endowment effect', feeling richer because of their endowment. We tried to offset this by framing the endowment as compensation for their participation in the household survey, and mentioning the payment again during the survey interviews.

Second, the importance of status and social norms in these communities suggests that donations may have been significantly higher had the solicitations been public, subject to the influence of community leaders. Indeed, fundraising efforts in Ghanaian communities (such as church harvests) frequently raise amounts of money many times higher than those raised in this experiment. One important factor in such efforts is the involvement of outsiders connected to the community, such as family members overseas. If these sources could be harnessed, much more money could likely be raised.

Third, from our interactions with the respondents it was clear that contributions were strongly related to the popularity of the projects. We were limited by our budget and sample size to offering small projects. It is likely that contributions would have been much higher for more desirable and broadly beneficial projects like electrification and road building. However, it is hard to know whether one could raise a similar proportion of the total cost for such a project.

Finally, the results of this study relate to only four communities in one district of Ghana. It is possible that behavior might be qualitatively different in other parts of the country, let alone in other countries. Further research or trials would need to be conducted before broadly implementing such a scheme as policy.

9. Conclusions

This paper presented the results of an experiment designed to measure individuals' willingness to contribute to a local public good. I explored the factors that cause some individuals to give more than others, and tested two incentive mechanisms often used in fundraising activities. The paper makes a number of novel contributions to the literature. It offers evidence on the actual public goods contributions of individuals in a real-world developing country setting, relating to the financing of an actual public project. This is to my knowledge the first evidence on the effectiveness of the matching grant and PPM in a developing country, and the first comparison of the relative strengths of the two mechanisms in the field. By relating the results of the experiment to a rich dataset on individual characteristics and social networks, the study also sheds light on which individuals in the community are willing to contribute the most to public goods.

In these communities, the rate of contribution was high, but the size of the donations was small relative to the endowment. Older and male respondents donated more, but household wealth had only a small effect on donations. A striking finding was the strong effect of trustworthiness. The more trusted members of the community were more inclined to give, even after controlling

for wealth. But somewhat surprisingly, this result was not driven by status alone. Indeed, I found that new migrants to the community donated significantly more, while community leaders did not. Individuals from the dominant ethnic group actually contributed less than others. These results highlight the importance of the social network in determining individuals' willingness to contribute to their communities, reinforcing findings from previous research that social cohesion within communities is conducive to the success of community-led development projects. However, they also bring into question the notion that elites in the community have the most to gain (or capture) from public projects, and the assumption that ethnic homogeneity implies greater participation and success in such endeavors. Perhaps the answer lies somewhere in between: that there is a willingness on the part of minority ethnic groups to contribute to public goods, but generally poorer outcomes in the management of projects resulting from the effect of ethnic fractionalization on local political co-ordination.

I found that the provision point mechanism (PPM) had a significant impact on the size of donations, while the matching grant had a smaller but also significant effect. That these mechanisms are effective in boosting donations reinforces results from developed country field and laboratory experiments. However, I find that the match ratio has a greater effect in Ghanaian rural communities than has been measured in other places. The broad willingness of individuals to contribute to community projects suggests policy makers may be able to use such contributions to augment funding for community construction projects. The results from the experiment indicate that the PPM and matching ratio could both be very effective in encouraging donations for such a program.

References

- Akramov, K. T. and F. Asante (2009), 'Decentralization and Local Public Services in Ghana: Do Geography and Ethnic Diversity Matter?' IFPRI Discussion Paper 00872, June 2009.
- Ariely, D., G. Loewenstein and D. Prelec (2003), "Coherent arbitrariness": Stable demand curves without stable preferences.' *Quarterly Journal of Economics*, Vol. 118, No. 1, pp. 73-105.
- Bagnoli, M. and B. L. Lipman (1989), 'Provision of public goods: Fully implementing the core through private contributions.' *The Review of Economic Studies*, Vol. 56, No. 4, pp. 583-601.
- Bagnoli, M. and M. McKee (1991), 'Voluntary contribution games: Efficient private provision of public goods.' *Economic Inquiry*, Vol. 29, No. 2, pp. 351-366.
- Bagnoli, M., S. Ben-David, and M. McKee (1992), 'Voluntary provision of public goods: The multiple unit case.' *Journal of Public Economics*, Vol. 47, No. 1, pp. 85-106.
- Baker, R. J., J. M. Walker, and A. W. Williams (2009), 'Matching contributions and the voluntary provision of a pure public good: Experimental evidence.' *Journal of Economic Behavior & Organization*, Vol. 70, No. 1-2, pp. 122-134.
- Clarke, E. (1971), 'Multipart pricing of public goods.' *Public Choice*, Vol. 11, No. 1, pp. 17-33.
- Eckel, C. C. and P. J. Grossman (2003), 'Rebate versus matching: Does how we subsidize charitable contributions matter?' *Journal of Public Economics*, Vol. 87, No. 3-4, pp. 681-701.
- Fehr, E. and S. Gächter (2000), 'Fairness and retaliation: the economics of reciprocity.' *Journal of Economic Perspectives*, Vol. 14, No. 3, pp. 159-181.
- Fischbacher, U., S. Gächter, and E. Fehr (2001), 'Are people conditionally cooperative? Evidence from a public goods experiment.' *Economics Letters*, Vol. 71, No. 3, pp. 397-404.
- Groves, T. and J. Ledyard (1977), 'Optimal allocation of public goods: a solution to the "free rider" problem.' *Econometrica*, Vol. 45, pp. 783-809.
- Isaac, R., D. Schmitz, and J. Walker (1989), 'The assurance problem in a laboratory market.'

Public Choice, Vol. 62, pp. 217-236.

Isham, J. and S. Kähkönen (2002), 'Institutional determinants of the impact of community-based water services: Evidence from Sri Lanka and India.' *Economic Development and Cultural Change*, Vol. 50, pp. 667-691.

Jimenez, E. and V. Paqueo (1996), 'Do local contributions affect the efficiency of public primary schools?' *Economics of Education Review*, Vol. 15, No. 4, pp. 377-386.

Karlan, D. and J. A. List (2007), 'Does price matter in charitable giving? Evidence from a large-scale natural field experiment.' *American Economic Review*, Vol. 97, Issue 5, pp. 1774-1793.

Kleemeier, E. (2000), 'The impact of participation on sustainability: An analysis of the Malawi rural piped scheme program.' *World Development*, Vol. 28, No. 5, pp. 929-944.

List, J. A. (2007), 'Field experiments: A bridge between lab and naturally-occurring data.' NBER Working Paper 12992, March.

List, J. A. and D. Lucking-Reiley (2002), 'The effects of seed money and refunds on charitable giving: Experimental evidence from a university capital campaign.' *Journal of Political Economy*, Vol. 110, No. 1, pp. 215-233.

Mansuri, G. and V. Rao (2004), 'Community-based and -driven development: A critical review.' *World Bank Research Observer*, Vol. 19, Spring, 1-39.

Marks, M. and R. Croson (1998), 'Alternative rebate rules in the provision of a threshold public good: An experimental investigation.' *Journal of Public Economics* 67, pp. 195-220.

Marks, M. and R. Croson (1999), 'The effect of incomplete information in a threshold public goods experiment.' *Public Choice*, Vol. 99, No. 1, pp. 103-118.

Meier, S. (2007), 'Do subsidies increase charitable giving in the long run? Matching donations in a field experiment.' *Journal of the European Economic Association*, Vol. 5, No. 6, pp. 1203-1222.

Messer, K., H. Zarghamee, H. M. Kaiser and W. D. Schulze (2007), 'New hope for the voluntary contributions mechanism: The effects of framing and context.' *Journal of Public Economics* 91, pp. 1783-1799.

Miguel, E. and M. K. Gugerty (2005), 'Ethnic diversity, social sanctions, and public goods in Kenya.' *Journal of Public Economics* 89, pp. 2325-2368.

Owen, M. (2009), 'How does proximity to tarred roads impact the pattern of employment and compensation in rural Ghana?' Mimeo, Fenner School of Environment and Society, Australian National University, October.

Palfrey, T. R. and H. Rosenthal (1984), 'Participation and the provision of discrete public goods: A strategic analysis.' *Journal of Public Economics*, Vol. 24, No. 2, pp. 171-193.

Poe, G., J. Clark, D. Rondeau, and W. Schulze (2002), 'Provision point mechanisms and field validity tests of contingent valuation.' *Environmental and Resource Economics*, Vol. 23, No. 1, pp. 105-131.

Rao, V. and A. M. Ibanez (2005), 'The social impact of social funds in Jamaica: A participatory econometric analysis of targeting, collective action, and participation in community-driven development.' *Journal of Development Studies*, Vol. 41, No. 5, pp. 788-838.

Rondeau, D. and J. List (2008), 'Matching and challenge gifts to charity: evidence from laboratory and natural field experiments.' *Experimental Economics*, Vol. 11, No. 3, pp. 253-267.

Rondeau, D., W. D. Schulze and G. L. Poe (1999), 'Voluntary revelation of the demand for public goods using a provision point mechanism.' *Journal of Public Economics* 72, pp. 455-470.

Rondeau, D., G. L. Poe and W. D. Schulze (2005), 'VCM or PPM? A comparison of the performance of two voluntary public goods mechanisms.' *Journal of Public Economics*, Vol. 89, No. 8, pp. 1581-1592.

Rose, S. K., J. Clark, G. L. Poe, D. Rondeau and W. D. Schulze (2002), 'The private provision of public goods: tests of a provision point mechanism for funding green power programs.' *Resource and Energy Economics* 24, pp. 131-155.

Smith, V. L. (1979), 'An experimental comparison of three public good decision mechanisms.' *Scandinavian Journal of Economics*, Vol. 81, pp. 198-215.

Sun, Y., F. Asante and R. Birner (2010) 'Opportunities and Challenges of Community-Based Rural Drinking Water Supplies: An Analysis of Water and Sanitation Committees in Ghana.' IFPRI Discussion Paper 01026, September 2010.

Udry, C. and M. Goldstein (1999), 'Agricultural innovation and resource management in Ghana.' Unpublished final report to IFPRI under MP17, August.

Vanderpuye-Orgle, J. (2008), 'Essays on risk and social visibility: Insurance, asset poverty and intrahousehold health inequality.' Unpublished Ph.D. dissertation, Cornell University, January.

Vanderpuye-Orgle, J. and C.B. Barrett (2009), 'Risk Management and Social Visibility in Ghana.' *African Development Review*, Vol. 21, No. 1, pp. 5-35.

Tables and Figures

Table 1: Sample size by community and respondent type

	Community				
	Darmang	Pokrom	Oboadaka	Konkonuru	Total
Husbands	70	67	69	68	274
Wives	77	71	73	68	289
Single males	4	3	1	4	12
Single females	7	5	6	11	29
Total	158	146	149	151	604

Table 2: Summary statistics

Variable	Obs	Mean	SD	Min	Max
Donation (GH¢)	2,070	0.70	0.60	0	6
Match ratio	2,070	1.03	0.71	0	2
Household wealth (GH¢)	2,070	2,878.22	14,411.10	8.70	^
Monthly per capita expenditure (GH¢)	2,070	104.99	87.76	4.01	1,481.35
Household size	2,070	5.22	2.22	1	15
Age (years)	2,070	43.61	13.72	19	85
Sex (male=1)	2,070	0.47	0.50	0	1
Could trust neighbor					
Strongly agree	2,070	0.09	0.28	0	1
Agree	2,070	0.40	0.49	0	1
Neutral	2,070	0.17	0.38	0	1
Disagree	2,070	0.26	0.44	0	1
Strongly disagree	2,070	0.07	0.26	0	1
Social network variables *					
Number known by respondent	2,070	99.72	30.92	4	151
Number who know respondent	2,070	92.78	28.45	15	151
Number trusted by respondent	2,070	27.50	29.89	0	145
Number who trust respondent	2,070	26.55	14.17	3	82
Share trusted by respondent	2,070	0.30	0.31	0	1
Share who trust respondent	2,070	0.28	0.10	0.04	0.55
Status and migration variables					
Holds office	2,070	0.08	0.27	0	1
Akwapim	2,070	0.81	0.39	0	1
Fostered as child	2,070	0.60	0.49	0	1
Lived in village less than 5 years	2,070	0.08	0.27	0	1
Years in village	2,070	26.07	16.08	0	75.42
Share of life spent in village	2,070	0.59	0.31	0	1

Notes: ^ Omitted for privacy reasons. Median wealth was GH¢1,099.50. * From census of the in-sample social network. Numbers reported are from the sample of survey respondents in that community.

Table 3: Non-contribution rates (percentage of participants who donated nothing)

Round	Community				
	Darmang	Pokrom	Oboadaka	Konkonuru	Total
1	5.2	3.2	2.6	32.1	10.7
2	3.4	0	2.4	17.1	5.7
3	7.8	0	6.1	17.5	7.9
4	0	0	0	2.4	0.6
5	0	2.3	0	2.8	1.3
Total	3.2	1.1	2.3	13.5	5.1

Table 4: Mean donations by round and community (in Ghana pesewas)

Round	Community				
	Darmang	Pokrom	Oboadaka	Konkonuru	Total
1	29.9	52.8	37.4	34.5	37.6
2	34.7	69.9	36.7	39.7	45.2
3	41.0	65.4	39.8	33.5	44.4
4	76.1	109.7	144.7	66.1	97.8
5	106.4	117.9	145.4	97.2	115.6
Total	58.7	85.1	79.6	56.3	69.5

Table 5: Summary statistics on matching ratios

Round	Community				
	Darmang	Pokrom	Oboadaka	Konkonuru	All communities
1	0.931 (0.717) [-1.096] 131	1.018 (0.683) [0.241] 83	1.010 (0.704) [0.140] 103	0.984 (0.670) [-0.230] 95	0.981 (0.695) [-0.567] 412
2	1.097 (0.707) [1.464] 113	1.082 (0.744) [1.120] 104	1.136 (0.748) [1.874]* 107	1.057 (0.718) [0.778] 97	1.094 (0.727) [2.648]*** 421
3	1.009 (0.691) [0.138] 110	1.005 (0.689) [0.076] 92	1.083 (0.704) [1.264] 114	1.099 (0.724) [1.339] 96	1.050 (0.701) [1.442] 412
4	0.961 (0.741) [-0.566] 115	1.057 (0.707) [0.794] 96	1.062 (0.682) [0.930] 105	1.123 (0.696) [1.813]* 106	1.049 (0.708) [1.410] 422
5	1.035 (0.721) [0.547] 130	1.026 (0.728) [0.384] 115	0.947 (0.703) [-0.771] 103	1.009 (0.669) [0.139] 115	1.006 (0.705) [0.198] 463
All rounds	1.005 (0.716) [0.171] 599	1.039 (0.710) [1.208] 490	1.049 (0.709) [1.590] 532	1.054 (0.694) [1.756]* 509	1.035 (0.707) [2.312]** 2,130

Notes: Table reports mean match ratio offered in each experimental session. Sample standard deviations are reported in parentheses, and t-statistics (against the null that the mean ratio is 1) in square brackets. The last row of numbers is the sample size. In a test of the hypothesis that the mean ratio is 1, *** denotes significance at the 1 per cent level, ** at the 5 per cent level, and * at the 10 per cent level.

Table 6: Main regression results

	OLS		Fixed Effects		Random Effects	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Match ratio (0 omitted)						
0.5	0.018	0.029	0.025	0.032	0.021	0.030
1	0.035	0.030	0.071**	0.032	0.052*	0.030
1.5	0.100***	0.032	0.080**	0.032	0.093***	0.030
2	0.095***	0.031	0.063**	0.031	0.081***	0.029
Extra GH¢	0.156***	0.020	0.160***	0.012	0.160***	0.009
Log household wealth	0.020*	0.010	-0.024	0.025	0.015	0.013
Age (years)	0.002***	0.001	--	--	0.002**	0.001
Male	0.090***	0.020	--	--	0.083***	0.027
Could trust neighbor ('Strongly disagree' omitted)						
Strongly agree	0.165***	0.056	--	--	0.162**	0.067
Agree	0.080*	0.046	--	--	0.081	0.056
Neutral	0.025	0.047	--	--	0.031	0.061
Disagree	0.043	0.046	--	--	0.045	0.058
Share trusting respondent	0.671***	0.142	--	--	0.730***	0.175
Community (Darmang omitted)						
Pokrom	0.322***	0.034	--	--	0.332***	0.045
Oboadaka	0.304***	0.034	--	--	0.314***	0.043
Konkonuru	-0.011	0.028	--	--	-0.010	0.038
Round (1 omitted)						
2	0.052**	0.024	0.062**	0.029	0.055*	0.028
3	0.000	0.023	0.014	0.029	0.005	0.029
4	0.558***	0.029	0.557***	0.029	0.556***	0.028
5	0.661***	0.032	0.661***	0.029	0.660***	0.028
Constant	-0.338***	0.099	0.503***	0.178	-0.338***	0.113
N	2,070		2,070		2,070	
Groups	--		515		515	
R ²	0.444		0.483		0.515	
Breusch-Pagan $\chi^2(1)$	854.4***		--		--	
Hausman $\chi^2(10)$	--		22.00**		--	

Notes: Dependent variable is donation in GH¢. Random and fixed effects are at the individual level.

*** indicates significance at the 1 per cent level, ** at the 5 per cent level and * at the 10 per cent level. Robust standard errors reported for OLS regression. The Hausman specification test rejects the random effects model in favor of the fixed effects model at the 5 per cent level.

Table 7: Estimated effect of the PPM

	Quadratic endowment		Linear endowment	
	Coef.	Std. Err.	Coef.	Std. Err.
Match ratio (0 omitted)				
0.5	0.018	0.029	0.018	0.029
1	0.042	0.030	0.040	0.030
1.5	0.102***	0.033	0.098***	0.033
2	0.098***	0.031	0.096***	0.031
Endowment (GH¢)	0.039	0.026	0.116***	0.014
Endowment squared	0.006**	0.002		--
Log household wealth	0.021*	0.010	0.023**	0.011
Age (years)	0.002**	0.001	0.002**	0.001
Male	0.095***	0.020	0.094***	0.020
Could trust neighbor ('Strongly disagree' omitted)				
Strongly agree	0.161***	0.057	0.160***	0.057
Agree	0.075	0.046	0.073	0.046
Neutral	0.020	0.047	0.019	0.047
Disagree	0.036	0.046	0.037	0.046
Share trusting respondent	0.655***	0.143	0.642***	0.144
Community (Darmang omitted)				
Pokrom	0.317***	0.034	0.311***	0.034
Oboadaka	0.295***	0.034	0.293***	0.034
Konkonuru	-0.011	0.028	-0.014	0.028
PPM (Rounds 4 & 5)	0.328***	0.045	0.216***	0.051
Constant	-0.380***	0.097	-0.507***	0.112
N	2,070		2,070	
R ²	0.438		0.433	

Notes: Dependent variable is donation in GH¢. Both equations estimated with OLS. Robust standard errors reported.
*** indicates significance at the 1 per cent level, ** at the 5 per cent level and * at the 10 per cent level.

Table 8: Coefficient estimates for social network variables

Variable	Coef.	Std. Err.
Number of sample members respondent knows	-0.001	0.000
Number of sample members who know respondent	0.000	0.000
Number of sample members respondent trusts	0.000	0.000
Number of sample members who trust respondent	0.003***	0.001
Share of known sample members respondent trusts	0.049	0.035
Sample members who trust respondent, as share of those who know respondent	0.671***	0.142

Notes:

Each row reports the estimated coefficient on the respective social network variable when included individually as the variable socnetwork in an OLS regression of Equation 1.

Dependent variable is donation in GH¢. Other regressors in Table 6 were included, but are omitted here for simplicity. Robust standard errors reported. *** indicates significance at the 1 per cent level, ** at the 5 per cent level and * at the 10 per cent level.

Table 9: Coefficient estimates for status variables

	(1)		(2)		(3)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Share trusting respondent	0.732***	0.145	0.759***	0.147	0.817***	0.149
Status variables						
Holds village/family office	0.070	0.049	0.071	0.049	0.075	0.049
Member of Akwapim group	-0.079***	0.027	-0.079***	0.027	-0.072***	0.026
Fostered as child	0.002	0.023	-0.002	0.023	-0.007	0.023
New migrant (≤ 5 years in village)	--	--	0.068*	0.039	--	--
Share of life spent in village	--	--	--	--	-0.089**	0.036
N	2,016		2,016		2,011	
R ²	0.439		0.440		0.440	

Notes: Dependent variable is donation in GH¢. Other regressors in Table 6 were included, but are omitted here for conciseness. Robust standard errors reported. *** indicates significance at the 1 per cent level, ** at the 5 per cent level and * at the 10 per cent level.

Figure 1: Effect of matching ratio on donations

Note: Bubble area proportional to frequency.

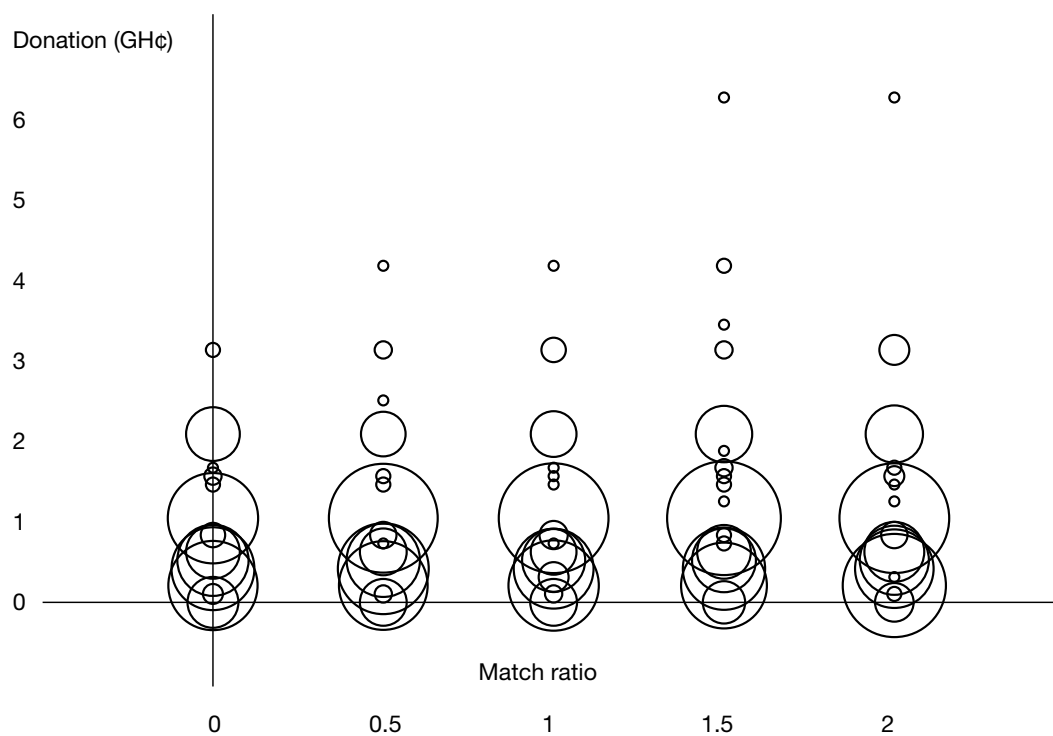
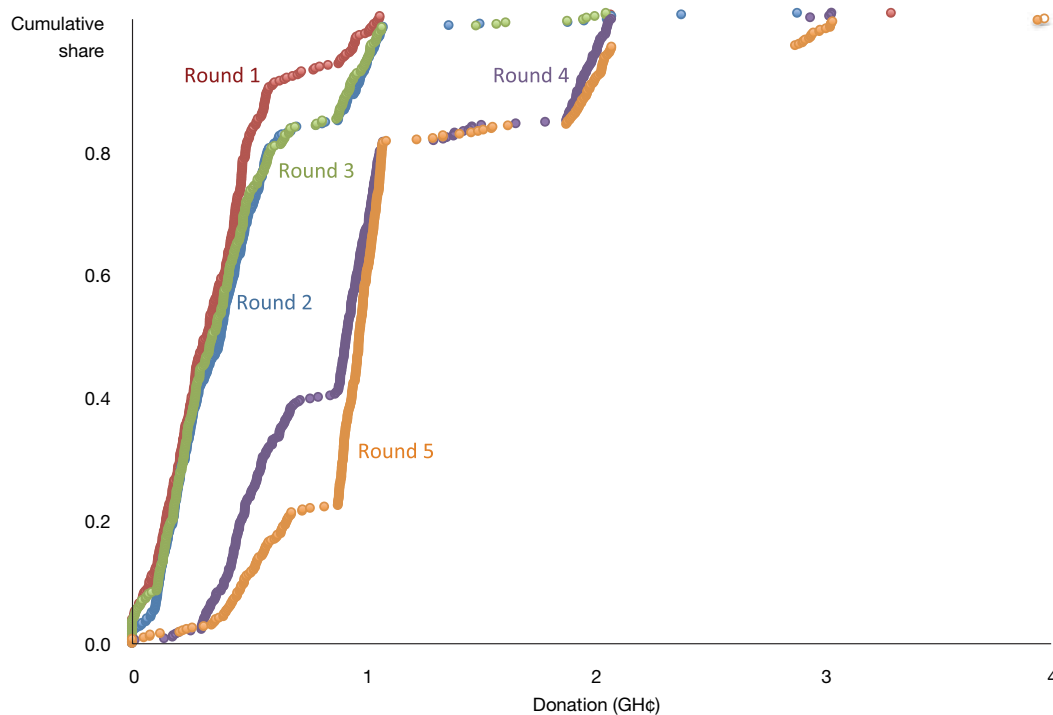


Figure 2: Cumulative distribution of donations (all communities)



The International Growth Centre (IGC) aims to promote sustainable growth in developing countries by providing demand-led policy advice based on frontier research.

Find out more about
our work on our website
www.theigc.org

For media or communications
enquiries, please contact
mail@theigc.org

Subscribe to our newsletter
and topic updates
www.theigc.org/newsletter

Follow us on Twitter
[@the_igc](https://twitter.com/the_igc)

Contact us
International Growth Centre,
London School of Economic
and Political Science,
Houghton Street,
London WC2A 2AE

IGC
International
Growth Centre

DIRECTED BY



FUNDED BY



Designed by soapbox.co.uk