A Theory of Leadership Selection in Small Groups - With Evidence from Ugandan Farmer Associations*

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Abstract

Small groups, such as farmer associations, micro-lending groups, or civic organizations, play an important role in economic, political and social life in all manner of countries and circumstances. This paper studies factors that affect the ability and effort exerted by leaders of these groups, and hence the effectiveness of the groups in providing public goods to their members. We argue that small groups differ from larger political units in a number of important ways, and offer a model adapted to the small group setting. The model suggests that, under certain conditions, groups face a tension when choosing the level of effort to demand from their leaders. If groups demand too little effort, they obtain high ability leaders, but these leaders exert little effort. Increasing effort demands increases the effort exerted by leaders, but may cause high ability members to self-select out of the candidate pool. The overall result is an inverted U-shaped relationship between groups' effort demands and the value of the public good that their leaders produce. Whether this trade-off exists depends crucially on the level of private income opportunities available to group members. These predictions are tested using data gathered for the purpose from a sample of Ugandan farmer associations. The data support the predictions of the model and suggest that variation in the value of the group public good produced by the leader can have a meaningful impact on group member's welfare.

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1 Introduction

Small groups come in many varieties, from farmer associations in Uganda and micro-credit groups in Bangladesh to parent teacher associations in Oklahoma, artisan cooperatives in New York, or the Chambers of Commerce found in towns throughout the world. The importance of these groups, especially in developing countries, has increased as larger political units have sought to democratize, decentralize and liberalize their economies[1]. As these few examples suggest, small groups are present in many facets of economic and social life, and in countries of all income levels. The ubiquity and growing importance of small groups calls for a better understanding of the factors that determine their effectiveness. This project studies one facet of small groups, the quality of their leaders, which is likely to play an important role in their overall effectiveness[2]. Specifically, we will study the factors that determine the ability and effort exerted by leaders in small groups in which a leader is chosen democratically from the set of available group members.

There has been a recent increase in the literature studying the determinants of leadership quality in large political units[3]. An important contribution is Caselli & Morelli (2004), who suggested that high quality citizens (more able or honest) may opt out of becoming a candidate if the rewards of the leadership position do not provide sufficient incentives, leaving voters with only low quality candidates. This occurs because high quality citizens have more rewarding options outside politics and so face a higher opportunity cost on their time. Messner & Polborn (2004) extend Caselli & Morelli (2004) to allow leaders to benefit from the public good that they produce. Internalizing the value of the public good has the effect of increasing the attractiveness of holding public office for high-ability types. Gagliarducci *et al.* (2010) extend the basic model in a different direction, by allowing candidates to split their time between public tasks and generating private income. This may result in higher quality citizens becoming candidates, but this also generates a moral hazard problem. This is because, once elected, leaders will prefer, under some conditions, to devote more time to generating private income[4].

The theoretical portion of this project defines small groups, shows that these issues identified by previous researchers are particularly important in the small groups setting, and derives new results on the determinants of leader quality in small groups. The starting point of this study is that small groups differ from larger political units in a number of important ways. Most obviously, small groups are small. Unlike large political units (regions, nations, etc.) where each citizen knows only a few of her fellows, in small groups members generally know each other well. This means that incomplete information plays a smaller role in determining outcomes in small group settings. Another feature of small groups is that they are often formed with a specific purpose in mind. Farmer associations, for example, are made up of producers who become members in order to secure higher prices for their outputs, lower prices for their inputs, and better access to

[1] For example, in Senegal 10% of sampled villages reported to have, at least, one self-help group in 1982; by 2002 this figure was 65%. In Burkina Faso the figures were 22% for 1982 and 91% in 2002 (Bernard *et al.* , 2008).

[2] The empirical results that we present later in this paper suggest that leaders' effort and ability are closely related to the value of the public good produced by the group, which in turn is related to member's welfare outcomes.

[3] See, among others, Besley (2004); Diermeier *et al.* (2005); Poutvaara & Takalo (2007); Ferraz & Finan (2009).

[4] In Gagliarducci *et al.* (2010), politicians will devote more time to generating private income, so long as this activity pays higher rewards given their ability compared to the rewards they derive from their public activity.

technology. Thus, the goals of members of small groups are often much more closely aligned than in large groups[5]. A third feature of small groups is that participating in them, even as the leader, is generally a part-time affair. Rarely do small groups have the resources to employ full time or professional leaders, as is common in larger political units. A fourth important feature of small groups is that the leader receives significant benefits from the public good that she produces, which has an important effect on members' incentives to seek leadership positions[6]. In contrast, in larger political units, the value that leaders derive from the public good they produce is often very small relative to the amount of effort they exert or the overall value of the public good. A fifth feature of small groups is that their set of options for incentivizing and monitoring leaders is often constrained by institutional factors outside of their control. These constraints are likely to be more important for small groups, since they are often subject to regulations imposed by larger political or economical units[7].

We offer a model built on the citizen-candidate framework pioneered by Osborne & Slivinski (1996) and Besley & Coate (1997), but designed to reflect the features of small groups that we have described. There is perfect information in the model, group member's preferences are perfectly aligned, the group leader divides her effort between public goods production and generating private income, and she receive significant benefits from the public good that she produces[8]. In this setting, the process of electing the best leader from the available candidate pool is straightforward. Instead, the importance of individuals' candidacy decisions, and the elected leaders allocation of effort between public and private tasks, is magnified. This contrasts with the case of larger political units, where outcomes are largely driven through the election of a leader from a set of available candidates (see, e.g., Besley (2006)). This suggests that political economy models written with larger political units in mind may not be appropriate for understanding small groups[9].

Using this framework, we investigate the implications of variation in the costs and benefits of holding the leadership position. In particular, we focus on how variation in the amount of effort that groups demand from their leader affects the value of the public good produced by the leader, where public goods production depends on both the leader's effort and ability. When group's demand little effort from their leaders, the model suggests that high ability individuals are more willing to be candidates, but that once elected, they devote less effort to public goods production than group members would like, resulting a low public good value. As group effort demands increase, the elected leader exerts more effort and the value of the public good rises. We refer to this as the "discipline effect"[10]. However, increasing effort demands also reduces group

[5]Note that the assumption that society is comprised of citizens that have competing interests, together with incomplete information about candidates who cannot credibly commit to voters, underline the entire class of citizens-candidates models. See, among others, Besley & Coate (1997).

[6]In contrast, the benefits of holding office in larger groups often comes through private, rather than public, goods.

[7]For example, academic departments' ability to tailor remuneration and effort demands to incentivize faculty to propose themselves as Chairs, is usually constrained by their university's administration.

[8]The assumption of complete information sets our model apart from a large pool of models that deal with similar issues in the context of large political units. Important contributions to this literature include Barro (1973), Ferejohn (1986) and Persson *et al.* (1997). For a comprehensive survey of the recent literature, see Besley (2005).

[9]This is reminiscent of the warning in Keohane & Nye (2001) against the tendency of making "domestic analogies" in the field of International Relations: applying models to International institutions–clubs of up to 200 members– as if they were national institutions writ large.

[10]This terminology follows Besley (2006).

member's incentives to become candidates, which may cause some members to self-select out of the candidacy pool. We refer to this as the "self-selection effect". High ability members are particularly likely to self-select out of the candidate pool, since they face higher opportunity costs on their time. Thus, increasing effort demands may reduce the value of the public good produced, if it drives better members out of the candidate pool. The tension between the discipline and self-selection effects is the key feature of the model.

The theory offers two new results. First, we show that when the discipline and self-selection effects both operate, there is a trade-off between leader ability and the amount of effort they exert. This generates an inverted U-shaped relationship between the amount of effort demanded by the group and the value of the public good that is ultimately produced. This implies that there exists a welfare-maximizing level of effort demand for each small group. Allowing both group effort demand and ability to be continuous variables is crucial to obtaining this result. In contrast, Gagliarducci *et al.* (2010) predicts that groups will elect either high ability leaders who do not work towards generating group goods, or low ability leaders who do, but cannot assess which of these two corner solutions is preferable.

Our second theoretical contribution is to show the important role that private income opportunities can play in determining the quality of leadership. Previous studies, including Caselli & Morelli (2004) and Messner & Polborn (2004), have assumed that high ability candidates, by definition, face a higher opportunity cost of being the leader. However, this need not hold when leaders benefit from the public good that they produce. We show that only when private income opportunities are sufficiently high, will high ability members have a greater opportunity cost of holding public office. Thus, the trade-off between leader effort and ability resulting from the discipline and self-selection effects exists *only when there are sufficient private income opportunities*. In cases where there are few private income opportunities, the model predicts that high ability members will choose to become candidates, and once elected, will work hard to produce the public good, which they benefit from directly.

To test these results, we use original data collected through an extensive survey of associations of coffee farmers in rural Uganda. These associations, recently established through a USAID funded development intervention, provide a good context for testing the model because we are able to look across a large number of associations, all with relatively similar structures, and all formed around the same time for the same purpose. However, while all of these associations have similar governance structures, we observe a significant amount of variation across associations in the level of private income opportunities available and the amount of effort that each group demands from its leaders. This variation results from a number of factors, including the identity of the facilitator who helped the farmers set up their associations, local economic conditions, and variation in the cohesiveness of different localities, as manifested in the strength of their social networks. Exploiting this variation in group effort demands and in local private income opportunities, allows us to assess the capacity of the model to explain the determinants of leader quality in these farmer associations.

There has been surprisingly little empirical work on the topic of candidate-selection. An exception is Gagliarducci *et al.* (2010), who test their model using data from the Italian parliament,

where many representatives work in the private sector while holding public office. They find that politicians with higher income before being elected perform worse in terms of voting attendance, which supports the discipline effect. However, they also find that citizens who became politicians belonged to the upper tail of the income distribution before running, which they interpret as evidence against an adverse-selection (or self-selection) effect[11]. By contrast, empirical evidence in support of the self-selection effect is provided by Gehlbach *et al.* (2010), who study the decision of businessmen to become candidates in Russia. They find that businessmen are less likely to become candidates in regions with greater media freedom and government transparency, which reduce the private benefits of holding office. Similarly, using data from Brazilian local elections, Ferraz & Finan (2009) show that increasing the rewards of holding office increases the number and quality of candidates.

Our empirical setting allows us test the new predictions of our model, as well as predictions from existing theories, using data on a broader set of factors than was available to previous researchers. One advantage of our setting is that the value of the main group public good produced by the associations is reasonably easy to observe in our data because the main purpose of the groups is to convince farmers to pool their output (bulk) in order to obtain higher prices. The survey responses allow us to construct measures of the other important variables in the model, including group effort demands, leader's effort, and group members' and leader's abilities. The structure of these groups also allows us to identify a realistic pool of potential candidates for the leadership position, since candidates must come from a set of representatives chosen in each of the several village sub-groups that comprise the association[12].

The Ugandan farmer associations that we study fit the features of small groups, described in the theoretical portion of the model, well. The associations are made up of farmers from several nearby villages. All group members share a common main goal, obtaining higher prices for their outputs, with secondary goals including obtaining lower input prices and learning about better farming practices. The group leaders spend only part of their time working for the group, with the rest devoted to farming their land or working at other jobs. When leaders negotiate higher prices for their crops, they benefit directly and significantly from the group public good through the higher price that they receive for their own crops. Finally, the groups we study are constrained in their ability to incentivize their leaders due to factors such as the institutional structures introduced when the groups were initially organized.

We begin our empirical exploration by considering the experiences of associations from two districts within our sample, Iganga and Masaka. Farmers in Masaka, which lies closer to the economic center of the country, are, on average, wealthier, farm larger plots, and are better educated than the farmers we survey in Iganga. We observe that associations appear to be more effective, in terms of the share of farm output being sold collectively through the group, in Iganga than in Masaka. The model sheds light on this counter-intuitive finding by directing our attention to-

[11]The authors find that politicians with high initial income– a measure which they use as a proxy for ability– receive a larger boost in private income after they leave office. They argue that this boost incetivizes high ability citizens to become politicians, eliminating the self-selection effect.

[12]In contrast, Gagliarducci *et al.* (2010) consider the entire Italian adult population as the pool of potential candidates. They then take the fact that MPs' pre-election income is higher than the population's median income as evidence of no self -selection effect.

wards the level of private income opportunities available in each location, which are much higher in Masaka than in Iganga. The model predicts that if Iganga has few private income opportunities, groups are not forced to trade-off between leader ability and effort. In fact, we find that Igangan groups are able to obtain high ability leaders who also exert a high level of effort, resulting in a high level of public goods production. In contrast, the model predicts that in an area with high private income opportunities, such as Masaka, groups must trade-off between leader ability and effort. We see evidence in the data that groups in Masaka are facing this trade-off, with the result that public goods production is much lower than in Iganga. Thus, the model helps us make sense of why, despite Masaka's advantages, its farmer associations are less effective than those in Iganga.

When we analyze the data for all districts, we find that effort demands are associated with an increase in the amount of effort exerted by group leaders, which supports the discipline effect. We also show that an increase in effort demands is associated with a reduced probability that high ability members will be the group leader, but only when private income opportunities are sufficiently large. This suggests that the self-selection effect is also operating, at least in groups that are located where private income opportunities can be found for high-ability individuals. The data also offer some support for the predicted inverted U-shaped relationship between effort demands and the value of the public good produced. Finally, we find evidence that a higher public good value is associated with positive welfare effects. This finding contributes to the growing literature on the impact of leaders' characteristics on welfare outcomes[13].

This paper also contributes to the study of farmer organizations as engines of growth. This literature suggests that farmer associations can play an important role in generating development and reducing poverty[14], yet the success of interventions of this type have been mixed[15]. The impact of leadership has been identified as one factor that could be important in determining the success of these programs[16]. We contribute to this literature by showing how the governance structure of these associations, and the economic environment in which they are embedded, can affect the quality of leadership that they obtain and, thus, their effectiveness.

In the next section of the paper we present our theoretical model and derive several testable predictions. Section 3 describes the Ugandan farmer associations that we use to test the model, while Section 4 describes our data collection procedure. Section 5 presents a breif study of associations from two districts, Iganga and Masaka. Our empirical analysis is contained in Section 6, while Section 7 concludes.

[13]Work in this area include, among others, the study by Chattopadhyay & Duflo (2004) on the effect of political reservations for women on the type of public goods provided by Indian Village Councils, and the study by Jones & Olken (2005) on the effect of leaders' quality on growth.

[14]In the context of the developing world, see, among others, Narayan-Parker (2002) and (Bosc *et al.* , 2002). In the context of the developed world see Staatz (1987), Sykuta & Cook (2001), and Sexton (1990).

[15]See, e.g., (Hellin *et al.* , 2009) and (Biénabe & Denis, 2005).

[16]See Biénabe & Denis (2005) and Bingen *et al.* (2003). Other factors that have been identified include (i) the legal and policy environment (Hussi *et al.* , 1993), (ii) project-design components (Bingen *et al.* , 2003) and (Shepherd, 2007), (iii) the nature of the links between producers and buyers (Shepherd, 2007), (iv) group-specific factors, such as size, membership homogeneity, internal cohesion and trust (Stringfellow *et al.* , 1997) and (Agrawal & Goyal, 2001), and (v) market conditions (Hellin *et al.* , 2009) and(Berdegué, 2001) .

2 Theory

The model introduced in this section builds on a literature investigating factors that determine the quality of leaders obtained through democratic political institutions utilizing a citizen-candidate framework. Previous models take the costs (or rewards) of holding office as an exogenous parameter and consider how variation in these costs affect the quality of leadership obtained. Variation in the costs and rewards of holding office drives many of the predictions of Caselli & Morelli (2004), who note that in their model, "bad politicians win because the rewards from office are too low to induce potentially good politicians to run"[17]. Similarly, Gagliarducci *et al.* (2010) consider the effect of an exogenously imposed rule that bars politicians from earning private income while holding public office. We follow the literature by taking the rules of the game, i.e., the costs (and rewards) of holding office, as given, and considering how variation in these costs affects the quality of the elected leader. Importantly, we will demonstrate that the approach we take appears to be a reasonably good representation of reality in the farmer associations we investigate, a point that we discuss in detail in Section 3.

The main difference between our model and previous work results from our focus on the small-group case. As noted above, we define small groups as those in which 1) members have a high level of information about each other, 2) member's preferences with respect to the public good are closely aligned, 3) leaders divide their time between public and private tasks, 4) leaders receive significant benefits from the public good that they produce and hence members factor the value of the public good that they would produce into their decisions, and 5) groups are constrained in their ability to incentivize leaders[18]. These factors lead us to specify a model in which, 1) there is perfect information, 2) group members' preferences are perfectly aligned, 3) leaders divide their time between producing a group public good and earning private income, 4) leaders benefit significantly from the public good that they produce, and 5) groups are constrained in their ability to adjust the rewards of holding office to achieve the optimal level of public goods production. Finally, an additional difference between our work and previous models is that we consider individuals with abilities drawn from a continuous distribution. This modification is important in allowing us to make welfare statements.

An important result of the above features is that members' vote becomes relatively less consequential in determining the quality of the elected leader. On the other hand, the importance of *members' decision to enter the candidacy pool* is magnified, as is the leaders decision of how much time to allocate to public goods production. This highlights the importance of individuals' candidacy choices and effort decisions in determining leadership quality in small groups.

[17] Caselli & Morelli (2004) suggest one reason why rewards may not adjust to incentivize high quality citizens to become leaders: that bad incumbent politicians can exert negative externalities on good politicians, for example, by reducing the ego-rents associated with holding office.

[18] Note that small groups are not defined with respect to some particular size. In effect, the size of a "small group" is context-specific. Groups with many members may display these characteristics, though as group size grows it seems increasingly unlikely that all of these characteristics will be sustained. Moreover, not every group with few members will satisfy these criteria. Notwithstanding these caveats, we argue that these features are present in a great many groups with few members.

2.1 Model setup

The model considers a group of N members which are formed in order to produce a group public good. The group members elect a leader who is responsible for producing the public good. The value of the public good produced depends on the effort exerted by the leader and the leader's ability. The utility of a member i who is not the leader is given by Equation 1, where we suppose that the leader is some individual l. The term $I(A_i, 1)$ in this expression represents member's private income from outside sources, which depends on the member's ability, $A_i \in (0, \bar{A})$, which is drawn from a continuous distribution, and her non-leisure effort time, normalized to 1. Thus the share of effort a member devotes to generating the public good will be zero for all members except the leader[19]. A member's private income also depends on the availability of private income opportunities, α. The second term represents the value that a member receives from the public good, which depends on the *leader's* ability A_l and the amount of effort the leader devotes to generating the public good, e_l.

$$U_i = I(A_i, 1)\alpha + P(A_l, e_l) \tag{1}$$

The leader's utility is given by Equation 2. The leader's value from the public good depends on his own ability and the amount of effort she devotes to producing the public good, e_l, where $e_l \in [0, 1]$ and $1 - e_l$ is the amount of effort the leader devotes to generating a private income. The leader also faces the potential of sanctions if she exert less effort than the group demands, or esteem if she exerts more. This is represented by the $C(\bar{e} - e_l)$ term, where $C(\bar{e} - e_l)$ is an increasing and convex function[20].

$$U_l = I(A_l, 1 - e_l)\alpha + P(A_l, e_l) - C(\bar{e} - e_l) \tag{2}$$

We assume that the $I(A_i, 1 - e_i)$ and $P(A_j, e_j)$ functions are increasing in their arguments and are concave in the effort argument. Also, $P(0, 0) = 0$, i.e., a public good is not produced if there is no leader. We also assume that Inada conditions hold in both private income generation and public goods consumption as $e_i \to 0$, and that there is a complementarity between ability and effort in either task:

$$\frac{\partial^2 I(A_i, 1 - e_i)}{\partial A_i \partial(1 - e_i)} > 0 \qquad \frac{\partial^2 P(A_i, e_i)}{\partial A_i \partial e_i} > 0$$

Two parameters play a key role in the model. The first is $\bar{e}$, which represents the level of effort demanded by the group from their leader. Higher $\bar{e}$ values indicate that the group demands

[19] This follows directly from the fact that only leaders produce the public good. Of course, we do not believe that public goods can be produced without any effort by group members. It would be easy to add in a fixed amount of effort that all group members devote to public goods production without changing any of the predictions of the model.

[20] It would be easy to include some fixed monetary remuneration in Equation 2 with some remuneration cost included in Equation 1. Nonetheless, as this complicates the model without adding to the results in any meaningful way, we have chosen to leave remuneration out of the specification of the model.

more effort from the leader, and is more willing *and able* to sanction the leader in order to obtain a minimum level of effort. We will see that this influences both the amount of effort that the leader devotes to public goods production, and group members' candidacy choices. The other important parameter is α, which represents outside income opportunities. A higher α means that members' time is more valuable, particularly for high ability individuals, which affects both effort and candidacy choices.

The model has three stages. In the first stage, members decide whether to offer themselves as a candidate for the leadership position. Candidacy is costless, so members base this decision only on the comparison of payoffs from being the leader to their payoffs from being a regular group member[21]. Next, members vote in order to choose a leader out of the pool of available candidates. In the last stage the chosen leader decides how much effort to devote to producing the public good, knowing that devoting effort to producing the public good reduces the amount of effort that can be put towards generating private income. Once the leader's effort is chosen, the public good is produced, member's payoffs are realized, and the game ends. There is perfect information in all stages of the model. So, at every stage, all members know the level of outside income opportunities α, group effort demands $\bar{e}$, and the ability of all other group members.

To solve the model, we work backwards, starting with determining the effort that each member would give if they are the leader. These expected effort levels are used by members to determine who to elect in the second stage, given each potential set of candidates. Moving back another step, the expected election outcomes are used in individual's candidacy choices.

2.2 Leader effort

If member i is the leader, they will decide how to allocate effort between public goods production and generating private income by solving the following problem.

$$\max_{e_i} I(A_i, 1 - e_i)\alpha + P(A_i, e_i) - C(\bar{e} - e_i) \tag{3}$$

The optimal effort level, denoted e_i^*, is the solution to the first order condition[22].

$$\frac{dI}{de_i^*} + \frac{dP}{de_i^*} - \frac{dC}{e_i^*} = 0 \tag{4}$$

2.3 Election

Given a set of candidates, group members will choose the leader based on the value of the public good that they are expected to produce. Recall that individuals know the ability of all other group

[21] Adding a constant candidacy cost would not affect the predictions of the model. Candidacy costs would enter as a constant term in the CP function, shown in Equation 5. While this would shift individuals' candidacy decisions, it would not impact the overall predictions of the model, as long as the candidacy cost is fixed.

[22] An interior solution is ensured by our functional form assumptions.

members. Using this information, they are able to calculate the effort that each candidate would exert if elected, e_i^*, and the value of the public good that they would produce. Members will then rank their candidates according to $P(A_i, e_i^*)$ and choose accordingly.

Each member has one vote and will always either vote for the candidate delivering the highest public good value. The candidate delivering the highest public good value will be elected.

2.4 Candidacy choice

Each individual's candidacy choice will depend on a comparison between her expected utility from being the leader and her utility from not being the leader and letting someone else produce the public good. The key trade-off is that, as the leader, the individual benefits from the public good they produce, but producing the public good requires substituting effort away from generating private income. Thus, if an individual can produce a better public good than the best alternative candidate, she may benefit from being the leader, but only if producing the public good is not too costly in terms of foregone private income.

The game is solved by utilizing a Trembling-Hand Subgame Perfect solution concept in which we consider only pure strategies[23]. This concept requires that equilibrium strategies must be robust to deviations from the equilibrium path that occur with a very small probability. This requirement allows us to discard a number of strategies that rely on indifference points and obtain unique solutions.

To solve, we order members according to the value of the public good that they would deliver if elected, so i=1 is the individual who would deliver the lowest public good value as leader, and i=N would deliver the highest. We will solve by starting with member i=1 and working our way up, showing that each individual has a dominant strategy that depends only on the strategies of the individuals below them in the ranking.

First, consider the candidacy decision of member i=1. If any other member is a candidate, then member i=1 will never be elected, and so is indifferent between being a candidate and not. However, the trembling-hand solution concept breaks this indifference by introducing the slight possibility that players above i=1 accidentally choose not to be candidates. In this case, member i=1 is a candidate if and only if her utility from being the leader is greater than her utility from not being the leader, which is given by CP_1.

$$CP_1 = I(A_1, 1 - e_1^*)\alpha + P(A_1, e_1^*) - C(\bar{e} - e_1^*) - [I(A_1, 1)\alpha]$$

On the other hand, if no other member above i=1 is a candidate, then member i=1 will also run only if $CP_1 > 0$. Thus, the dominant equilibrium strategy for member i=1 is,

[23] In other words, we consider only pure strategy equilibria that are the limit of totally mixed strategies, where these mixed strategies are optimal subject to the constraint that each player must put at least some minimum ϵ weight on each pure strategy.

Candidate if $CP_1 > 0$
Not a candidate if $CP_1 \leq 0$

The candidacy decision of member i=2 now mirrors that for member i=1 except that if the strategy of i=1 is candidate then the candidacy decision of i=2 compares his utility if he is the leader to his utility if i=1 is the leader. Define $\tilde{P}_i$ to be the value of the public good produced by the next member below i who has candidacy as a dominant strategy. So for member i=2,

$$\tilde{P}_2 = \begin{cases} 0 & \text{if} \quad CP_1 \leq 0 \\ P(A_1, e_1^*) & \text{if} \quad CP_1 > 0 \end{cases}$$

The dominant strategy for i=2 is,

Candidate if $CP_2 > 0$
Not a candidate if $CP_2 \leq 0$

where,

$$CP_2 = I(A_2, 1 - e_2^*)\alpha + P(A_2, e_2^*) - C(\bar{e} - e_2^*) - [I(A_2, 1)\alpha + \tilde{P}_2]$$

Member i=2 now also has a dominant strategy. Working upwards, the same procedure can be used to obtain the candidacy decision of all group members. The dominant candidacy strategy of any member i will be,

Candidate if $CP_i > 0$
Not a candidate if $CP_i \leq 0$

where,

$$CP_i = I(A_i, 1 - e_i^*)\alpha + P(A_i, e_i^*) - C(\bar{e} - e_i^*) - [I(A_i, 1)\alpha + \tilde{P}_i] \tag{5}$$

Using this procedure, the candidacy decisions of all group members can be derived. This gives the candidate pool out of which the best leader will be elected. This leader will choose their optimal allocation of effort. The model is complete.

2.5 Trade-offs and key assumptions

Understanding the effect of ability on individual's candidacy choice and effort decisions is key to understanding the model. First, we need to know whether high or low ability individuals make better leaders. We will henceforth refer to more effective leaders as having an "advantage in public goods production". Note that previous models that do not allow leaders to divide their time between private and public tasks, implicitly assume that higher ability members necessarily produce a higher value public good[24]. However, when the leader can substitute effort away from

[24]See Caselli & Morelli (2004), and Messner & Polborn (2004).

producing the public good, a higher ability leader may substitute a sufficient amount of effort away from public goods production such that she delivers a lower public good value than low ability members. In other words, when high ability members face a higher opportunity cost on their time, they may actually produce a lower public good value, if elected.

Second, we need to know whether high or low ability members have stronger incentives to be a candidate for the leadership position. We refer to this property as having "greater candidacy incentives". Candidacy incentives are driven by a trade-off, faced by leaders, between having less time to spend producing private income, and producing and benefiting from a higher value public good. Low ability members will have greater candidacy incentives if benefits of being the leader fall for higher ability members because the higher public good value they produce does not compensate them for the foregone private income. This is more likely to happen when there are more private income opportunities available[25]. Conversely, the more a leader benefits from the public good she produces, the larger are the incentives for high ability members to be a candidate, compared to low ability members. These concepts are defined more formally below.

Def. 1 *High ability members have an* **advantage in public goods production** *relative to low ability members when* $dP/dA_i > 0$*. Low ability members have a relative advantage in public goods production when* $dP/dA_i < 0$*.*

Def. 2 *High ability members have* **greater candidacy incentives** *relative to low ability members when* $dCP_i/dA_i > 0$*. Low ability members have relatively greater candidacy incentives when* $dCP_i/dA_i < 0$*.*

Putting these together we obtain four possible scenarios, which are described in Table 1 below. The primary focus of this study will be Region B in the table, where high ability leaders have an advantage in public goods production, but low ability members have greater incentives to be a candidate. This corresponds to a case in which higher ability individuals will not substitute too much effort away from public goods production as leaders, but the higher opportunity cost on their time makes them less inclined to become candidates. This is the scenario considered by all of the previous literature in this area, and it is also the one suggested by our empirical results.

Under these conditions, groups face a trade-off between leader effort and ability. Region A, where high ability individual have an advantage in both candidacy and public goods production, will also play a role in this study. In Appendix A, we show that groups will be in Region A when there are few private income opportunities available. In this case, groups do not face a trade-off between incentivizing effort and obtaining high ability leaders. We will largely ignore Regions C and D, since our data suggest that there is a positive relationship between ability and public goods production. However, this may be an area for further study in contexts where higher ability leaders face much stronger incentives to substitute effort away from public goods production. Further discussion of these points can be found in Appendix A.

We ensure that high ability members have an advantage in public goods production by making Assumption 1. According to this assumption, the complementarity between ability and effort is

[25]Recall that in Caselli & Morelli (2004), the benefit that leaders derive from the public good they produce is constantly set to zero, so low ability candidates will always have greater candidacy incentives.

		Advantage in public goods production	
		High ability	Low ability
Greater candidacy incentives	High ability	**A:** - High ability are better leaders - High ability more likely to be candidates	**C:** - Low ability are better leaders - High ability more likely to be candidates
	Low ability	**B:** - High ability are better leaders - Low ability more likely to be candidates	**D:** - Low ability are better leaders - Low ability more likely to be candidates

Table 1: Four potential scenarios

the same in public goods production as in generating private income. Under these conditions, high ability members will never substitute so much effort away from public goods production that an increase in ability reduces the value of the public good produced[26].

Assumption 1 *The complementarity between ability and effort in public goods production is the same as in generating private income.*

$$\frac{\partial^2 I(A_i, 1-e_i)}{\partial(1-e_i)\partial A_i} = \frac{\partial^2 P(A_i, e_i)}{\partial e_i \partial A_i}$$

Some of our results will be derived by assuming that low ability individuals have an advantage in candidacy, guaranteeing that we are working in Region B. When deriving these results we will call on Assumption 2, which stipulates that members' incentives for being the leader are decreasing in ability.

Assumption 2 *High ability members have less incentive to be the leader than low ability members, i.e.,*

$$\frac{dCP_i}{dA_i} < 0$$

This will hold whenever the opportunity costs paid by high ability members for being the leader outweigh the benefits from the increased value of the public good that they produce. We will show that in order for Assumption 2 to hold, there must be sufficient private income opportunities.

2.6 Predictions

In this section we derive some predictions of the model which will later be taken to the data. We first consider how the leader's effort is affected by the parameters of the model, then consider how the parameters work through member's candidacy decision to affect the ability of the elected leader. Lastly, we consider how the sum of the effort and ability effects determines the value of the public good produced and group member's welfare.

[26]This assumption is slightly stronger than is absolutely necessary, but it will simplify some of our later calculations without significant loss of generality.

2.6.1 Discipline effect

We begin by showing the discipline effect, i.e., that holding the identity of the leader constant, an increase in the group's effort demands increases the leader's optimal effort level and therefore the value of the public good. It can also be shown that an increase in private income opportunities reduces the leader's optimal effort level.

Proposition 1 *Holding the identity of the leader constant, the amount of effort allocated to producing the public good is increasing in the amount of effort demanded by the group, $\bar{e}$, and decreasing in the level of private income opportunities, α.*

Proof: Applying the implicit function theorem to Equation 4, it can be shown that

$$\frac{de_i^*}{d\bar{e}} > 0 \qquad \frac{de_i^*}{d\alpha} < 0$$

2.6.2 Self-selection effect

Here we present results that describe how high private income opportunities and high effort demands can work together to cause high ability individuals to self-select out of candidacy.

Proposition 2 *Under Assumptions 1 and 2, given that a member would initially choose to be a candidate, an increase in effort demands will reduce the member's incentives to be a candidate and may cause them to opt out of the candidate pool.*

$$\frac{dCP_i}{d\bar{e}} < 0 \quad \textit{if} \quad CP_i > 0$$

Proof: The basic intuition here is that an increase in effort demands pushes each member, if they are the leader, away from their unconstrained optimum effort level. This reduces each members' utility from being the leader, causing CP to fall. To prove, first suppose that the change in $\bar{e}$ does not change the identity of the next best candidate for leader. In this case $\tilde{P}$ is differentiable and $\frac{d\tilde{P}}{d\bar{e}} = \frac{dP(A_j, e_j^*)}{d\bar{e}}$ where j is the next best candidate for leader after i. Then,

$$\frac{dCP_i}{d\bar{e}} = -\left(\frac{dC(\bar{e} - e_i^*)}{de_i^*}\right) - \left(\frac{\partial P(A_j, e_j^*)}{\partial e_j^*}\frac{de_j^*}{d\bar{e}}\right)$$

The first term in parenthesis is positive from our assumptions on C. The second term is positive based on our assumptions on P and results from Prop. 1. The whole expression is therefore negative.

Next, suppose that the identity of the next best leader changes, so that $\tilde{P}$ is reduced. This can happen only if the previous next best leader j drops out of the candidate pool, but since $A_j < A_i$ this implies that $CP_i < CP_j < 0$ by Assumption 2, i.e., i must have also dropped out of the candidate pool ($CP_i \leq 0$).

Finally, suppose that somehow the identity of the next best leader changes so that $\tilde{P}_i$ increases. This would only cause a further decrease in CP_i.

Next, we show that when Assumptions 1 and 2 hold, high ability members will opt out of the candidate pool first.

Proposition 3 *Under Assumptions 1 and 2, if $A_i > A_j$, then whenever member j opts out of the candidate pool, member i will also opt out of the candidate pool. However, it may be the case that member i opts out of the candidate pool while member j remains in the pool.*

Proof: Suppose we have two individuals i and j with abilities $A_i > A_j$ that both choose candidacy under some initial $\bar{e}$. Suppose that we increase $\bar{e}$ such that the high ability individual just drops out, i.e., such that $CP_i = 0$. Assumption 2 them implies that $CP_j > CP_i = 0$, so the high ability individual has opted out of candidacy first. Conversely, suppose that there is an increase in $\bar{e}$ such that the low ability individual just drops out, i.e., $CP_j = 0$ Assumption 2 implies that $CP_i < CP_j = 0$ so the high ability candidate must have also opted out of candidacy.

Given the results above, it is important to know the parameter values under which low ability members have greater candidacy incentives (Assumption 2 holds), because then we will know the conditions under which we expect an increase in effort demands to drive high ability individuals out of the candidate pool. The following proposition shows that Assumption 2 is more likely to hold when there are more private income opportunities.

Proposition 4 *Low ability individuals are more likely to have greater candidacy incentives (Assumption 2 is more likely to hold) when there are more private income opportunities.*

$$\frac{dCP_i}{dA_i d\alpha} < 0$$

Proof: Taking the derivative of Equation 9 with respect to α, we obtain the following.

$$\frac{d^2CP_i}{dA_i d\alpha} = \left[\frac{\partial I(A_i, e_i^*)}{\partial A_i} - \frac{\partial I(A_i, 1)}{\partial A_i}\right] + \left[\frac{\partial^2 I(A_i, e_i^*)}{\partial e_i^* \, \partial A_i} + \frac{\partial^2 P(A_i, e_i^*)}{\partial e_i^* \, \partial A_i}\right] \frac{de_i^*}{dA_i} < 0$$

The first term on the right-hand side is negative due to the complementarity between ability and effort. The second term on the right-hand side is zero due to Assumption 1.

Putting Proposition 3 and Proposition 4 together, we obtain Corollary 1.

Corollary 1 *When there are high private income opportunities, low ability members will have greater candidacy incentives and high ability members will opt out of candidacy earlier in response to an increase in effort demands.*

Corollary 1 is our main empirical result related to the self-selection effect. It shows that private income opportunities and effort demands can work together to drive high ability individuals out of the candidate pool. It is this three-way relationship that we will take to the data in Section 6.

2.6.3 Combined effects

This section uses simulated data to explore how changes in effort demand affect the public good output when both the discipline and self-selection effects are operating. The simulation results involve assuming an initial distribution of abilities from which the ability of N group members are drawn at random. We then use our model to derive the candidate pool, identify the leader, and calculate the public good value obtained by each group. Repeating this procedure many times for each set of parameter values, we can begin to discern how changes in parameter values affect the outcomes of the model. Simulations are run on groups with 10 members. Results are obtained by repeating the exercise 100 times for each set of parameter values.

We select particular functional forms and parameter values that are consistent with our model's assumptions and that allow us to display a range of possible scenarios[27]. For example, we chose parameters such that at low values of $\bar{e}$ and α the incentives for individuals to be the leader are high and the candidate pool is large, and at high values of $\bar{e}$ and α there are few incentives for individuals to be the leader and the candidate pool is small. This ensures that the simulations cover a range of interesting scenarios.

Figure 1 shows the average levels of leader effort (left) and ability (right) as a function of effort demands for various levels of private income opportunities. The left panel demonstrates the discipline effect: increase in effort demands increases the amount of effort exerted by the group leader. The right panel demonstrates the self-selection effect: as effort demands increase, the expected ability of the leader decreases. This effect binds earlier when there are more private income opportunities (higher α). Additional results, available in Appendix B, suggest that increasing $\bar{e}$ also reduces the ability rank (relative to other group members) of the leader, and the size of the candidate pool, and that these effects bind earlier when there are higher outside income opportunities.

Figure 2 shows the result of these combined effects on the value of the public good. There is a clear inverted U-shaped relationship present for all levels of private income opportunities. The discipline effect dominates for lower effort demand levels and the self-selection effect dominates for high effort demand levels. The higher are private income opportunities, the earlier this inflection point is reached.

[27] The details of the functional forms and parameter values used are presented in Appendix B.

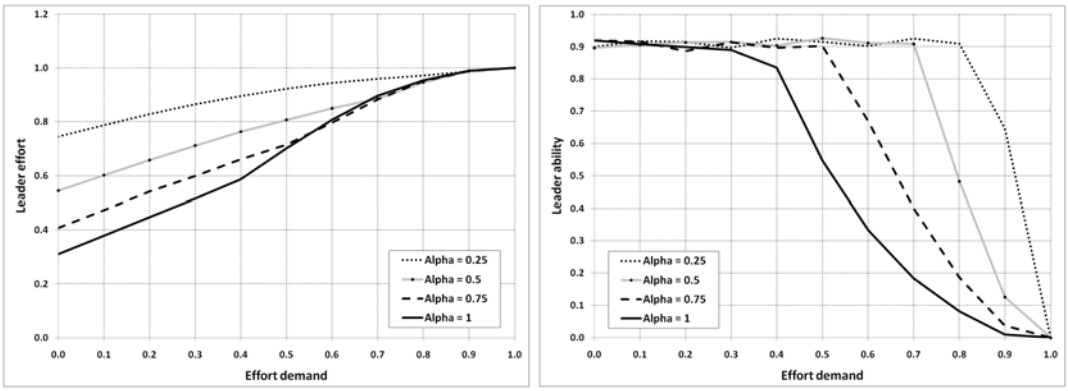

Figure 1: Simulated Leader Effort and Ability

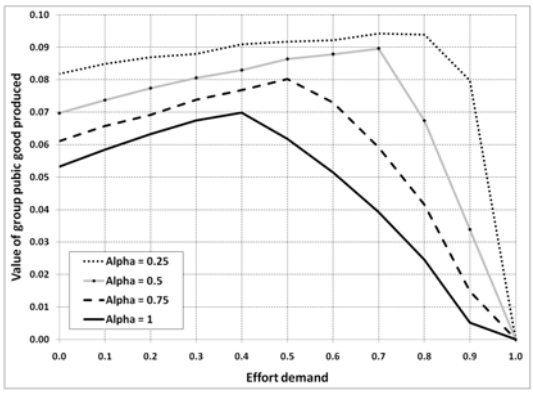

Figure 2: Simulated Public Good Values

In this section we have established the existence of the discipline effect and self-selection effects under certain conditions and shown that when these effects are both operating, there is an inverted U-shaped relationship between group effort demands and the value of the public good produced. The next step is to compare these predictions to real-world data from one set of small groups.

3 Background

There are several good reasons to test our theoretical predictions with data gathered from farmer groups. Farmer associations are small self-governed organizations that exist to provide members, who join voluntarily, with a group public good. The preferences of members of farmer groups with respect to their group's services– the most important of which is securing higher outputs prices through collective marketing– are closely aligned[28]. Also, members of farmer associations that cover relatively small geographical units, tend to have a high level of information about other members. These factors are consistent with the small group features described in our model.

[28]Other services that farmer groups may provide include securing lower input prices and training in agriculture.

3.1 Farmer associations

Farmer associations raison d'étre is to improve the performance of their members' farms as economic units engaged in market transactions. Because of the high costs of transportation and of market information, dispersed small-holder farmers have little options but to sell to local middlemen who are able to exploit asymmetries in information and in bargaining powers. By contrast, organized farmers who sell their cash crops via their association (in bulk), can obtain higher prices by increasing their bargaining powers and by reducing buyers' transaction costs (Staatz, 1987). Members of farmer groups collectively own the organization and have the right to control its decision-making process. Nonetheless, in order to ensure the production of services–which are, by nature, collective goods– members will tend to select leaders and develop centralized governance structures.

3.2 APEP: The development project

All the farmer associations we surveyed were created as part of one of Uganda's largest recent development projects: the Agriculture Productivity Enhancement Project (APEP)[29]. APEP's stated goal was to support subsistence farmers' transition into commercial farming. Between 2004 and 2008 it helped organize over 60,000 small-holder farmers into more than 2,500 village-level farmer groups, which were further organized into more than 200 farmer associations across Uganda[30]. Serving, on average, 200 members from ten neighboring village-level groups, farmer associations (known as Depot Committees, or DCs) were designed to exploit economies of scale and to bargain for better prices based on quality and volume.

In addition to the development project's scope and size, there were several other good reasons for studying the APEP groups. First, focusing on APEP groups allowed us to control for national factors, such as the political and legal environments. Secondly, influenced by project field-trainers who facilitated the process of group formation, APEP groups share a similar governance structure. Each farmer association has an executive committee– comprised of a manager, a chairperson, a secretary and a treasurer– which is responsible for making the key decisions at the association level. Operationally, the DC manager is the principal leader of the association, and we will henceforth refer to him as the 'leader'. The leader's most important responsibilities include organizing the collection of crops from members, searching for buyers and negotiating the price paid for these crops. Additionally, leaders are involved in coordinating training activities and facilitating the diffusion of information to group members, negotiating input prices (in those groups that purchased inputs collectively), and maintaining records of the group's economic activities.

Under the DC executives there is an additional governance body, the DC council, which is comprised of one or two elected representatives from each of the village-level groups. These

[29] APEP was funded by USAID, and implemented by Chemonics International, an International Development consulting firm based in Washington D.C. A follow-up project (LEAD), is currently being undertaken by a new contractor: Associates in Rural Development (ARD).

[30] In Uganda, districts are the most important administrative unit. Districts consist of 2-4 counties, each county has 3-6 sub-counties, each sub-county consists of 3-6 parishes, and each parish has about 5-15 villages. Between 200 and 800 households live in each village. It is rare to find more than 1-2 associations operating within a parish.

representatives form the pool of potential candidates from which the DC leader is elected. The council's main responsibilities are monitoring the DC executives as well as helping to implement their decisions at the village level.

APEP facilitators played a key role in shaping the governance structure of the farmer associations, influencing both effort demand $\bar{e}$ and remuneration[31]. Between 12 to 24 months after creating village-level farmer groups (known as Producer Organizations, or POs), APEP facilitators encouraged neighboring POs to form a single association with a federal structure. Representatives from each of the neighboring POs were invited to participate in a three day workshop, designed specifically to help the representatives agree on the structure and rules that govern their newly established cooperative. While all of the associations adopted governance structures that are generally similar, we observe a significant amount of variation in the amount of effort demanded from group leaders, and the monitoring structures created to incentivize leaders to meet these requirements. This variation had several potential sources, including the identity of the facilitator assigned to each group, the information the group member had about each other prior to group formation, group members' previous experience in participating in other small groups, etc.[32]. Once established, groups, by and large, retained these institutions, usually enshrined in constitutions[33].

An example of the resilience of governance institutions in the groups, is leaders' compensation. When established, APEP facilitators strongly encouraged new groups to keep monetary remuneration to leaders as low as possible[34]. Our data confirms that 4-5 years after their creation, only one association paid its manager any salary[35].

4 Data and sampling scheme

This section briefly describes the data used in this paper and how it was collected[36]. Our sample was selected using a stratified, random, multistage cluster design. First, to reduce crop-related variability, we limited the target population to only those associations that marketed the same crop: in our case coffee[37]. Starting from 5 district-areas (strata), we used unequal probability sampling without replacement to sample associations within strata (proportional to their size) for

[31] We note that the information here is based on the authors' interviews with APEP's staff as well as with DC and PO leaders.

[32] We note that groups that were created by the same facilitators share more similar structures and rules that groups created by different facilitators.

[33] We note that the vast majority of the constitutions we were able to personally examine had both quorum and super-majority rules for making constitutional amendments.

[34] The idea was to postpone paying salaries to group leaders, until after members build trust with the system of governance. The reason for this was APEP's fear that if members were asked to contribute towards the salaries of group leaders, farmers would be reluctant to join. This fear harks back to the exploitation that small-farmers have endured, in many post-colonial East African countries, by state-controlled cooperatives, until their collapse in the mid-1990s. See, e.g., Bates (1981) and Ponte (2002). For an account of the history of Ugandan farmer cooperatives, see Young *et al.* (1981) and Kyamulesire (1988).

[35] In about 50% of associations, leaders reported receiving small payments in kind, usually in the form of inputs.

[36] A more thorough technical appendix will be made available on the authors' web sites.

[37] Coffee was, by far, the most common cash crop marketed by the APEP groups. Limiting the sample to coffee has reduced the universe of farmer cooperatives in about half: from 213 to 105.

a total of 50 associations. The number of associations that were sampled from each stratum was proportional to the number of associations in each strata[38]. A map of these strata is available in Appendix C.

Within each association, different types of data were collected. At the association level, data was collected using a questionnaire completed in an interview with all DC executives. Data on the DCs' economic activities were also collected from the associations' books and records. For each association, we sampled six producer organizations (or POs), for a total of 287 village-level POs[39]. An interview with the leaders of the sampled producer organizations allowed us to collect additional data at that level. We also collected individual-level data. From each sampled PO, we further sampled, in average, six members for a total of 36 members per association[40]. Sampled members were surveyed in person by trained interviewers in the respondents' local language, for a total of 1,784 surveys. We refer to this data source as the "members' survey".

As noted, members of the DC executives, the PO representatives to the DC council and the leaders of the village-level producer organizations, are the relevant pool of candidates for the leader's position. A significant effort was made to survey each of those *potential* candidates. In each sampled farmer cooperative we surveyed (i) the four DC executives, (ii) the chairmen of all village-level POs that make up the DC, whether or not their group was sampled, and (iii) one or two representatives from each village-level POs, irrespective of whether their farmer group was sampled. Thus, we have individual-level data on the complete set of potential candidates for the senior management position, for a total of 1,319 interviews. These "representatives' surveys" only partially overlap with the members' surveys, as they were tailored to capture the representatives' roles and responsibilities within the DC structure. Note that we visited each association up to four times to reduce attrition, which was brought down to less than ten percent. Table 2 briefly summarizes the sample design and data sources.

	Sampling Unit	Data Source	Number
1	Farmer Associations (DCs)	DC Questionnaires	50
2	Village-level groups (POs)	Group Questionnaires	287
3	Ordinary members	Individual-level Surveys	1,784
4	Representatives	Individual-level Surveys	1,319

Table 2: Data Sources

Quantitative data for the empirical analysis was collected between July and September 2009 by a team of 60 local interviewers. Though the quantitative analysis uses data collected via the individual-level surveys and group questionnaires, the construction of those instruments and the meanings we derived from them, relied heavily on more than a year of field work, in which we held dozens of open-ended interviews and meetings with regular group members, group leaders, APEP-staff and Chemonics staff in both Uganda and Washington DC.

[38]We note that the universe of coffee farmer cooperatives is spread over nine districts. Strata were defined by meaningful district-areas: neighboring districts that were covered by the same project field trainers and trading partners, and that share a dominant ethnicity and/or were historically part of the same district.

[39]In few cases, when a farmer association had fewer than seven POs, we selected all its village-level groups.

[40]The number of sampled members from each of the six *sampled* village-level groups was proportional to the size of the PO. This assured that the sample is self-weighted.

4.1 Measurement of key variables

One of the greatest challenge in conducting empirical research of this type is obtaining reasonable measures of the variables of interest. In this section we will walk through the information and procedures employed to construct each of the variables used in the subsequent analysis.

One advantage of the farmer associations we study is that one of the key variables in the model, the value of the public good, is relatively straightforward to measure. Since farmer associations' central activity is collective marketing, it is reasonable to relate the value of the public goods directly to the marketing decisions of members. A high value public good exists when members sell a large fraction of their crops via their farmer association. In the analysis, we use two self-reported measures of member's marketing decision, derived from the members' survey, to proxy the value the public good, (i.) an indicator variable capturing whether a member sold his crops via the association at least once in the past season, and (ii.) the share of a member's total seasonal coffee yield that was sold via the farmer group in the past season.

We check our results against three alternative measures of collective marketing, gathered from other sources. First, leaders of each of the sampled producer organizations were asked to provide information on a roster of group members, including whether members sold their coffee via the group in the past season. We note that members' self-report and the PO leaders' report were consistent for over 70% of our sample. Secondly, we use information provided by the DC executives to construct a variable that captures the proportion of members selling in bulk in the past season. Finally, we divided the total volume that the association sold in bulk–as appears in the DC's books– by the number of members, to construct a measure of volume per member. Similar results were obtained using these alternative measures. A summary statistics of these variables is presented in Table 3. Figure 3 and Figure 4 provide a sense of how the level of cooperation towards the public good varies by strata and by position in the association.

Variable Description (Past Season)	Mean	SDs	N	Source
Whether sold at least once via the DC	.614	.49	1,749	Members Self-report
Proportion of total yield sold via the DC	.488	.45	1,678	Members Self-report
Whether sold at least once via the DC	.606	.49	1,714	Village-level Leaders' Report
Percent of members selling their crops via the DC	.437	.32	50	DC Executives Interview

Table 3: Variables related to the size of the Public Good

Measuring the remaining key variables in the model is a more complex task. For some of the variables, e.g. members' ability, a number of questions were asked related to different aspects of the variable, and responses were collected from a variety of sources. These values were then collapsed into single measures using principal component analysis[41].

To construct individual's ability measure we used information on respondent's ability to read and write, their level of English proficiency, and their level of educational attainment. Because

[41]This technique is used to re-express multiple variables as one (or more) variables that explain as much of the variation in the original variables as possible. In technical terms, the first principal component of a set of variables $X_1, X_2, \ldots X_n$ is the linear combination of these variables that exhibits maximum variance. A good source for more information about principal component analysis is Lattin *et al.* (2003). For an example of the use of principal component analysis in practice see McKinzie (2005).

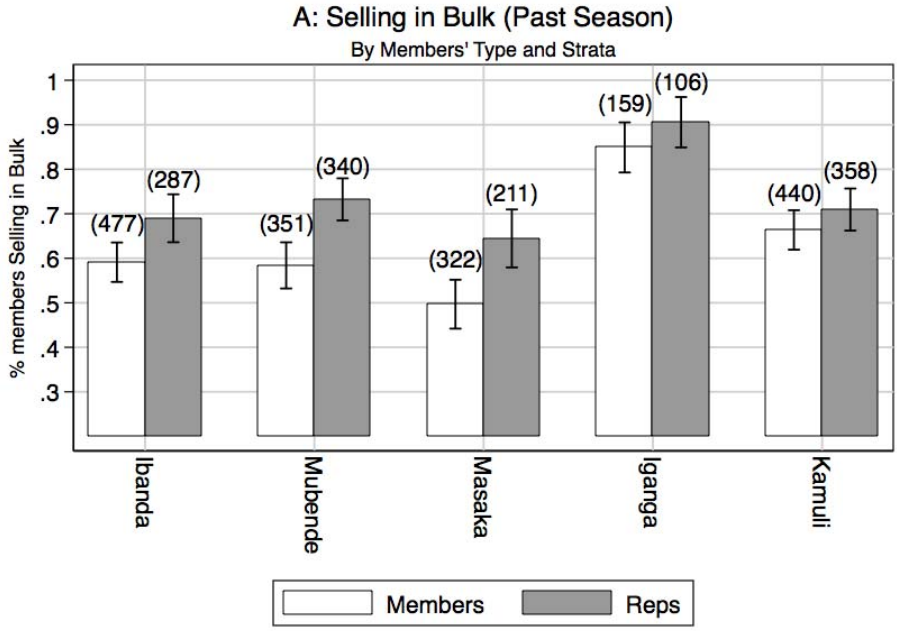

Figure 3: Proportion of respondents reporting to sell coffee via their farmer group, at least once, in the past season, by type of member and region. Number of observations in parenthesis. Caps represent 95% CI.

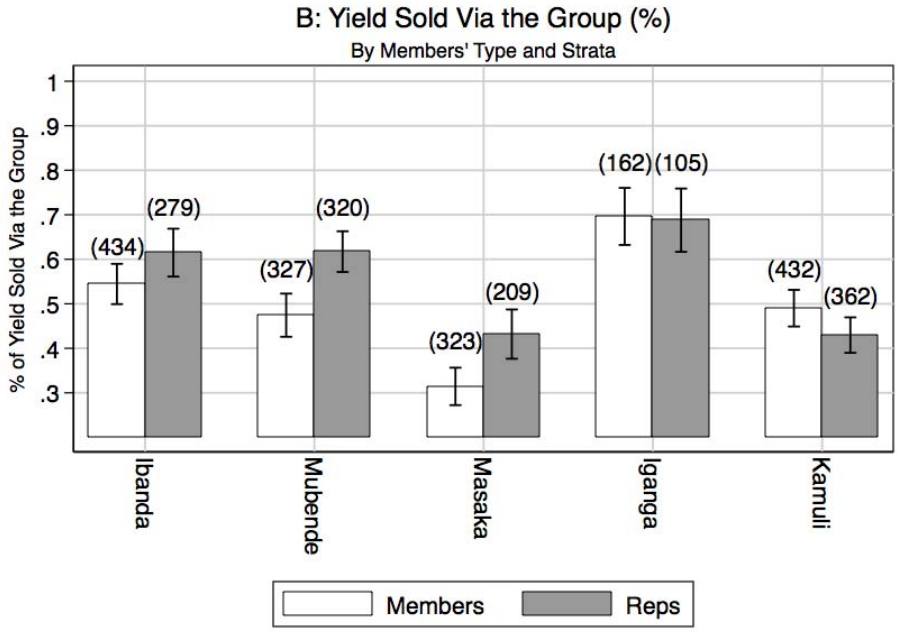

Figure 4: Mean of the proportion of a member's total seasonal yield sold via her group, by type of member and region. Number of observations in parenthesis. Caps represent 95% CI.

no local language is spoken by more than 20% of Ugandans, English is the lingua franca of the business and political class. English proficiency allows individuals to communicate with potential trading partners outside their small geographic areas. Respondents also completed two types of cognitive tests[42]. Out of these variables we constructed two measures of ability, one that used all variables, and the other that used all ability proxy variables, except the cognitive tests[43].

All of the variables that are included in the ability measure are positively correlated, and the first principal component was able to explain more than 61% of the variance. To test the reasonableness of the constructed ability measure, we conduct three checks. First, we compare the standardized ability measure to employment status, by respondents' type[44]. We find that for both ordinary members and group representatives, those who hold high skilled off-farm jobs, have significantly higher ability scores, as shown in panels A-C in Figure 5. For example, the ability score of members who hold a steady job that pays a weekly or monthly salary, is more than 1 standard deviation higher than the score of members who do not have such job (Panel A). Secondly, we test whether ability increases, on average, with the position within the associations' governance structure. We find (Panel D) that the more senior the position, the larger the ability gap between the office holder and the grand mean (zero). Finally, we found a very strong positive relation between the standardized ability measure and wealth, as shown in Figure 10 in Appendix D. These tests give us some confidence in the measurement of the ability variable.

The model makes an important distinction between the associations' effort demand $(\bar{e})$ and the leaders' realized effort once in office (e_i). To measure the effort leaders spend producing the public good, we combined effort ratings from sampled members and from the DC representatives. We also used information on the number of times the leader organized collective marketing in the past season. All of these variables were positively and highly correlated, with the first principal component explaining 45% of the variance of these variables. To check the reasonableness of the effort measure, we compare it with the leader's self-reporting regarding their effort. We find that leaders who have high effort scores also report working longer hours and have a better sense of whether members are following the association's rules and by-laws.

The measure of associations' effort demand $(\bar{e})$, must take into account both the amount of effort demanded by groups and the amount of monitoring undertaken to ensure that these demands are met. This is because effort demand is ineffective without monitoring. Table 4 gives a sense of the types of information we used to construct the measure of group effort demands. The included variables come from both the member's and the representative's surveys. The variables were combined using principal component analysis to obtain one measure of effort demand for each DC. All of the variables are positively correlated, often strongly, with the first principal component explaining more than 46% of the variance[45].

[42]Information on the cognitive tests can be found in the technical appendix.

[43]Some regression results reported in this paper use the variable constructed without the cognitive tests, since logistical hurdles prevented us from administering the cognitive tests to all individuals. Both variables are highly correlated (0.948%) and produce quite similar results.

[44]It is worth noting that political economy studies often proxy ability with private income (see, e.g., Gagliarducci *et al.* (2010)). Alas, income levels cannot be reliably measured in rural Uganda.

[45]Other alternative PCA measures that included additional input variables (e.g. voting variables), were all highly correlated. ($> .95$).

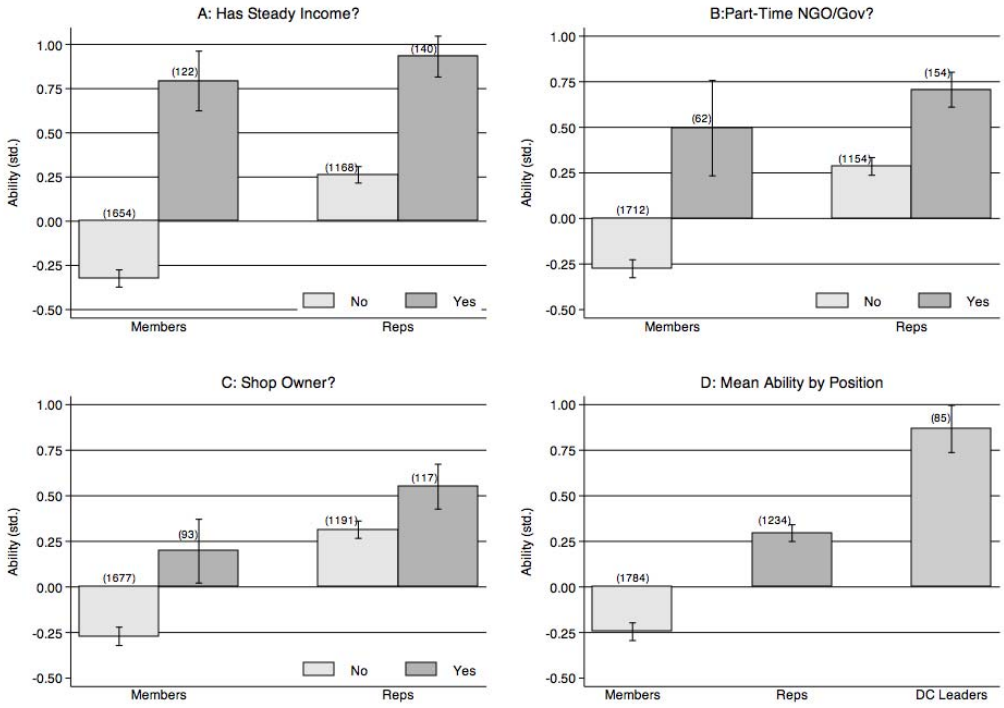

Figure 5: Figure provides information on the relationship between a continuous ability measure and a binary indicator of employment status, broken down by position in the association (ordinary group members and DC representatives). In each graph, point estimates represent the mean ability score for survey respondents who report having any steady source of off-farm income (panel A), work part-time in an NGO or a local government (panel B) or own a store (panel C), against the mean ability score for those who do not have such jobs. Caps represent 95% confidence intervals.

Another important variable in the model is the local availability of private income opportunities (α). This is a group-level variable, which was constructed using survey questions that asked about the respondent's employment status. Only data from the representatives' survey (complete sample) were used to construct this measure, since this is the relevant candidate pool that we are concerned with. The primary measure of a group's private income opportunities is the fraction of representatives in the association holding off-farm jobs (except as unskilled laborers). Alternative measures were also tested and produced similar results.

In order to test whether higher values of the public good have positive welfare effects of, we construct a measure of the change in a member's welfare since joining his or her farmer group. The measure was constructed using answers to questions about ownership of 12 different assets[46]. This list included assets that reflect the purchasing power of farmers, such as bicycles and livestock. For each asset type, respondents were asked to provide information on the number of items they currently have and the number of items they had in the year before joining the group. For each asset, a new variable was created that took the value -1 if the group member reported having fewer

[46]Using asset ownership to measure the welfare of poor households is a commonly used technique. See, e.g., Filmer & Pritchett (2001).

Question	From Member's Survey	From Rep's Survey
Whether someone is responsible for monitoring the DC manager	X	X
How accountable is the DC manager?	X	
Whether receipts were given when bulking	X	X
Whether there is a rule regarding the DC manager's time commitment		X
Whether external auditors are used		X
If the respondent had ever asked to see the DC's books		X

Table 4: Variables used to measure group effort demand

items than in the year before joining the group, 0 if the number of items had not changed, and 1 if the number of items had increased. The welfare effect index was constructed by adding the values of these 12 variables[47]. Figure 11 in Appendix D provides information on the distribution of welfare changes, for the entire sample. Note that measurement errors, typical in survey-based recall questioned, are minimized given that (i) the median member joined her group merely three years ago, (ii) the creation of the farmer group is considered a major milestone to the majority of members, and (iii) the included assets are central to households in rural Uganda.

If the model is useful, it should be able to explain some of the puzzling features we observe in our data. We begin our empirical analysis in the next section, by describing the case studies of Masaka and Iganga, which present one such puzzle. Following the case studies, in Section 6, we will test more rigorously whether the main predictions of the theoretical model– the discipline effect, the self-selection effect, and the existence of an inverted U-shaped relationship between group effort demands and the value of the public good produced– are consistent with the data.

5 Case studies: Iganga district vs. Masaka district

This section describes the experience of farmer associations from two district-areas, Masaka and Iganga, that represent extreme cases in our sample[48]. Masaka is a relatively well-off district, benefiting from it's proximity to the capital Kampala. Compared to Iganga, coffee growers in Masaka are more educated, have more available land, and are wealthier. For example, whereas the median member of a farmer association in Iganga grows coffee on less than one acre, producing a seasonal median yield of 250 KGs, the median group member in Masaka grows coffee on 1.5 acres, yielding 363 KGs per season. Given these facts, one might expect that the farmer associations in Masaka would function more effectively than in Iganga. Yet, we find that farmer groups in Iganga have higher levels of public goods production. For example, 85% of the members of the farmer associations in Iganga report selling at least once via their association in the past season, compared with 49% of the members of groups from Masaka. In addition, members in Iganga sell 69% of their seasonal yield via their farmer groups. In Masaka the figure is 31%.

[47]This index is highly correlated ($> .98$) with other indexes that use alternative aggregation methods, such as PCA.
[48]Note that Masaka strata includes two farmer associations from the neighboring Rakai district.

Our model suggests that variation in the value of the public good depend on the ability of leaders, and the effort they exert. According to the data, the mean ability scores of leaders in Iganga is between 0.17 to 0.34 standard deviations above the mean ability scores of leaders in Masaka. Furthermore, when we examine the entire network of DC representatives, the mean ability of Iganga representatives is, on average, 0.25 standard deviations higher than those in Masaka. This contrast sharply with our findings from the members' survey, in which the average *member* in Masaka is significantly more educated than members in Iganga (see Table 9 in the appendix). In other words, high ability group members in Masaka appear to be less willing to take on leadership positions than those in Iganga. Turning to the leader's effort, we observe that the average effort that leaders in Masaka exert, e_i, is 2 standard deviations *lower* than the effort exerted by Igangan leaders. This occurs even though, in Masaka, the mean effort demand is 1.5 standard deviations *higher* than in Iganga.

Given that leaders in Iganga have higher ability and spend more time in producing the public good, it is not surprising that farmer groups in that district are more effective. The question is then why groups in Masaka, which are better endowed, end up with lower quality leaders than groups in Iganga. The model provides an explanation to this result, by pointing to the important role of private income opportunities.

According to the model, in areas that have high private income opportunities, both the discipline and self-selection effects are present, and groups face a trade-off between leaders' effort and ability. This causes higher-ability members to drop-out of the candidacy pool at lower levels of effort demand, and causes elected leaders to exert less effort. In contrast, when private income opportunities are low, our framework suggests that this trade-off is not present (i.e., groups will be in Region A in Table 1). In this case, high ability members have an advantage in public goods production and greater candidacy incentives. Under these conditions, high ability members will choose to be candidates and will exert high levels of effort if they are the leader, *even without the incentives created by effort demands*.

Turning to the data, we observe that groups in Masaka have, on average, the highest level of private income opportunities for representatives, with a mean across DCs that is 0.65 standard deviations above the mean for the entire sample. Groups in Iganga, on the other hand, have the lowest mean score of private income opportunities for representatives, at 0.95 standard deviations below the mean for the entire sample.

These findings support the predictions of the model. In particular, they suggest that, because of high local private income opportunities, groups in Masaka are forced to trade-off between leader effort and ability. The result is that groups demand more effort from their leaders, with the result that, in Masaka, high ability members tend to opt out of being the leader. In contrast, low levels of local private income opportunities in Iganga mean that groups do not face this trade-off, and are therefore able to obtain leaders with high ability, who are also willing to invest more time in public goods production, resulting in a higher group public good value[49]. In the next section we test the model's predictions on the entire sample.

[49]These findings are consistent with an optimization strategy by Masaka coffee growers, who seem to be diverting efforts away from agriculture towards other income generating activities. We do not claim that the low performance of Masaka cooperatives is the result of individual members failing to optimize.

6 Empirical analysis

In this section we look for evidence of the three main predictions of the theoretical model: the discipline effect, the self-selection effect, and the existence of an inverted U-shaped relationship between group effort demands and the value of the public good produced. At the end of the section we present evidence linking the public good to group members' welfare outcomes.

6.1 Discipline effect

The first prediction of the model is that increased effort demands ($\bar{e}$) increase the amount of effort exerted by the group leader (e_i). We explore this relationship by regressing the DC leader's effort standardized score on the group's effort demand. Results of this regression are shown in Table 5 below. The first specification includes only strata fixed effects, while the second includes DC-level controls for the age and size of the association, the mean size of members' coffee seasonal yield, a measure of ethnic fractionalization among the association's representatives and of its density of associational life[50]. The third model adds a variable measuring private income opportunities and its interaction with effort demands. These results suggest that there is a strong positive relationship between groups' effort demands and the amount of effort exerted by the group leader. The results also supports our prediction that increase in private income opportunities weakens the discipline effect.

An increase in the leader's effort level is only valuable if this extra effort increases the value of the public good. To explore this relation, we run a series of multi-level random intercept logistic regressions, where the dependent variable y_{ij} indicates whether member i sold his coffee through his farmer association j during the last season (rather than selling it all to a local middleman). The key independent variables are the ability of the DC leader A_j and effort e_i, and the interaction between the leader's ability and effort. In model (2) we add a set of individual level controls X_{ij}, and in model (3) we add group-level controls J_j. All three models include strata fixed effects F_s. The full model's specification is below in Equation 6. Note that we use two different measures of the dependent variable - one which is derived from the reporting of the producer organizations' leaders and one which is derived from members' self-report.

$$pr(y_{ij} = 1) = \quad \beta_0 + \beta_1 A_j + \beta_2 \bar{e}_j + \beta_3 (A_j \times \bar{e}_j) + X_{ij}\Gamma_1 + J_j\Gamma_2 + F_s\Gamma_3 + \zeta_j + \epsilon_{ij} \tag{6}$$

Results, which are displayed in Table 6, suggest that both leader's effort and ability are positively related to the value of the public good, though only the coefficient on effort is significant. Since coefficients in logistic regressions are not easily interpretable, we calculated the predicted probabilities of y_{ij}, holding the controls variables at meaningful values (means or medians). Moving from one standard deviation below the mean effort to one standard deviation above the mean

[50]The Ethnic fractionalization index was constructed using a simple Herfindahl concentration index: $ELF = 1 - \sum_{i=1}^{n} s_i^2$ where s_i is the share of group i, and $(i = 1 \dots n)$. To measure the density of associational-life we calculate the group mean of the number of voluntary associations in which DC representatives are regular participants.

DV: LEADER'S REALIZED EFFORT IN PRODUCING THE PUBLIC GOOD			
	Model A	Model B	Model C
Effort Demand	0.715***	0.668***	0.651***
	(0.15)	(0.18)	(0.18)
Age of DC		-0.097	-0.095
		(0.09)	(0.10)
N members (units of 50)		0.085	0.085
		(0.06)	(0.06)
Mean total seasonal yield (units 100)		0.059	0.062
		(0.07)	(0.08)
Ethnic fractionaliztion		-0.557	-0.578
		(0.71)	(0.69)
Associational-life		0.058	0.061
		(0.13)	(0.12)
Private income opportunities			-0.033
			(0.12)
Effort demand X PIO			-0.040
			(0.18)
Constant	0.291**	0.070	0.063
	(0.10)	(0.43)	(0.45)
Observations	50	50	50
r^2	0.586	0.635	0.636

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Relation Between the association's effort demands and the leaders' realized effort. Results from OLS regressions using group-level data.

(a range that covers 38% of associations) translates to a 20 percentage points increase in the probability that a member sells her coffee through her farmer association.

6.1.1 Self-selection effect

The second main prediction of the model is that an increase in effort demands decreases the likelihood that high ability members will be candidates (and thus the probability that they become the group leader), *but only in areas with sufficiently high private income opportunities*. In particular, the model predicts that when there are ample private income opportunities and effort demands are high, high ability individuals will opt out of candidacy, so lower ability leaders will be elected. In the model, the elected leader represents the highest ability individual willing to be a candidate.

We explore this prediction by looking at how the identity of the elected leader is affected by effort demands and private income opportunities. To do so, we run an individual-level logit regression across all DC representatives where the dependent variable indicates whether the individual is the group leader. Note that the model's predictions are most clear for the identity of the

DV: SELLING IN BULK VIA THE DC IN THE PAST SEASON						
	Leader's Reporting			Self-Reporting		
	A1	A2	A3	B1	B2	B3
Leader's ability (std.)	0.14	0.17	0.11	0.31	0.33	0.22
	(0.14)	(0.14)	(0.13)	(0.20)	(0.20)	(0.19)
Leader's Effort (std.)	0.61***	0.53**	0.41*	0.79***	0.78***	0.64**
	(0.17)	(0.16)	(0.16)	(0.23)	(0.23)	(0.22)
Ability × Effort	-0.04	-0.09	-0.08	-0.19	-0.21	-0.15
	(0.13)	(0.13)	(0.13)	(0.19)	(0.18)	(0.18)
Strata FE	X	X	X	X	X	X
Individual Controls		X	X		X	X
Group Controls			X			X
Constant	0.28	-2.75***	-3.32***	0.83**	-1.56**	-2.57***
	(0.21)	(0.46)	(0.54)	(0.30)	(0.53)	(0.66)
Random Intercept						
Constant	-0.48**	-0.58***	-0.68***	-0.09	-0.12	-0.22
	(0.16)	(0.17)	(0.19)	(0.15)	(0.15)	(0.16)
Observations	1571	1492	1492	1537	1462	1462

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Table describes a series of random intercept logistic regressions, in which members' decision to cooperate is modeled as a function of the leader's ability and effort. In Models A1-A3, the dependent variable is obtained from the group leaders, whereas in models B1-B3, we rely on members' self-reporting. In both cases, we first run the model with only the key independent variables and strata fixed effects (A1, B1), we then add a series of individual-level controls (A2, B2), and group-level controls (A3, B3).

elected leader (DC manager). By contrast, the model's predictions are less clear about the identity of the losing candidates. This is because, in the model, when "low types" have an advantage in candidacy, everyone with ability below that of the leader will also be willing to be a candidate. This result is based on a near-indifference of group members to being candidates given that there is a higher ability member who will also be a candidate. It is important to note however, that even when a large number of members may be willing to join the candidacy pool, the *actual* number of candidates can be relatively small[51].

The key independent variables are the individual's ability, group effort demands, private income opportunities, and a full set of interactions between these variables. Our regression equation is given below, where $\tilde{y}_{ij}$ is an unobserved latent variable that determines whether an individual becomes the group leader, y_{ij} is an indicator variable that takes the value one if individual i in group j is the group leader, A_{ij} represents ability, α_j represents private income opportunities, $\bar{e}_j$ represents group effort demands, X_{ij} is a set of individual level controls, and F_j is a set of group

[51] For example, most farmer associations limit the number of candidates to a maximum of 3 or 4.

fixed effects. To account for correlation in the error terms of members of the same DC, in all models we cluster standard errors at the association level.

$$y_{ij} = I[\tilde{y}_{ij} > 0]$$

$$\begin{aligned} \tilde{y}_{ij} = \quad & \beta_0 + \beta_1 A_{ij} + \beta_2 \alpha_j + \beta_3 \bar{e}_j + \beta_3 (A_{ij} \times \alpha_j) + \beta_4 (A_{ij} \times \bar{e}_j) + \beta_5 (\alpha_j \times \bar{e}_j) + \\ & \beta_6 (A_{ij} \times \alpha_j \times \bar{e}_j) + X_{ij}\Gamma_1 + F_j \Gamma_2 + \epsilon_{ij} \end{aligned} \tag{7}$$

The main coefficient of interest in this analysis is β_6, the coefficient on the interaction between ability, effort demands, and private income opportunities. Based on the models predictions we should expect a negative coefficient, since effort demands should decrease the probability that a higher ability individual is the leader when there are more private income opportunities.

Two measures of ability are used in this regression. In model A, we use our baseline ability measure, which was constructed from information on education, literacy, English proficiency, and cognitive test results. In Model B, we use an ability measure that does not include the cognitive test results, which allows us to increase our sample size. We include two individual-level controls. Wealth is included because it is likely to be related to the individual's standing in the community, which will affect the likelihood that they become the group leader. Individual's coffee yield is included because it indicates how much the individual values the public good produced by the group. Members that place a higher value on the public good are expected to devote more effort as leaders and therefore should be more likely to be elected.

Results obtained from the regressions are displayed in Table 7[52]. These results support the main prediction of the model, as we observe a negative and significant coefficient on the interaction term between ability, effort demands, and private income opportunities. Other coefficients take values that seem reasonable. As expected, individual's ability, wealth, and the size of their coffee yield all have a positive influence on an individual's likelihood of being the leader.

In order to get a sense of the magnitude of the relationships found in this regression, we use a graphical representation. In Figure 6 we plot the marginal effects of private income opportunities on the likelihood that any member of the association's "potential candidates" is the actual leader, as group's increase their effort demand in it's entire range, while setting members' ability constant[53]. In the left panel, members' ability is set to one standard deviations below the mean, while in the right panel it is set to one standard deviations above the mean. This ability-range covers 75% of the sample. As Figure 6 makes clear, when members' ability is *low* (left panel), the marginal effect of even a significant increase in private income opportunity on likelihood of being the group's leader is no different than zero, whatever is the group's effort demand. By contrast, when members' ability is *high* (right panel) the marginal effect of private income opportunity is negative and significant once effort demand increase above one standard deviation below the mean. At this

[52] We have tested specifications that included other individual-level control variables, such as age, land size, sex and other group-level controls, but none improved the model fit, and none were close to being significant.

[53] Note that the regression coefficients represent unconditional effects, whereas the marginal effects of each of the independent variables is conditional on the values of the other two variables.

DV: IDENTITY OF THE ASSOCIATION'S LEADER

	Ability		Education	
	β	ORs	β	ORs
Rep's Ability (std.)	1.153***	3.167***	0.874**	2.398**
	(0.27)	(0.84)	(0.29)	(0.69)
Effort demand	0.586**	1.797**	0.131	1.140
	(0.19)	(0.35)	(0.10)	(0.11)
Private Income Opportunity	-0.589**	0.555**	-0.185*	0.831*
	(0.19)	(0.11)	(0.09)	(0.08)
Ability × Effort demand	0.0573	1.059	0.181	1.199
	(0.30)	(0.32)	(0.25)	(0.30)
Effort demand × PIO	-0.137	0.872	-0.00517	0.995
	(0.09)	(0.08)	(0.06)	(0.06)
Ability × PIO	-0.295	0.744	-0.440*	0.644*
	(0.24)	(0.18)	(0.22)	(0.14)
Ability × Effort demand × PIO	-0.320*	0.726*	-0.291*	0.747*
	(0.13)	(0.10)	(0.13)	(0.10)
Seasonal Coffee Yield (units 100)	0.0839**	1.087**	0.0584**	1.060**
	(0.03)	(0.04)	(0.02)	(0.02)
Wealth (std.)	0.482**	1.619**	0.465**	1.592**
	(0.18)	(0.30)	(0.15)	(0.24)
Group size (units of 50)	-0.532***	0.587***	-0.324***	0.723***
	(0.12)	(0.07)	(0.06)	(0.04)
Constant	-1.598***	0.202***	-2.733***	0.0650***
	(0.32)	(0.06)	(0.16)	(0.01)
N	913	913	1202	1202

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: In columns 1 and 2, the ability measure includes information from the cognitive tests. The ability measure in columns 3 and 4 does not include the cognitive tests. PIO stands for private income opportunities. In columns 2 and 4 we report exponentiated coefficients (odds-ratios). All models include farmer-association fixed effects. Standard errors are clustered at the association level.

level, both the low and high lines representing a 95% confidence interval are below zero. Not only is the marginal effect negative for all effort demands above -1 standard deviations, as effort demand further increases, the negative marginal effect of increased private income opportunity becomes increasingly strong.

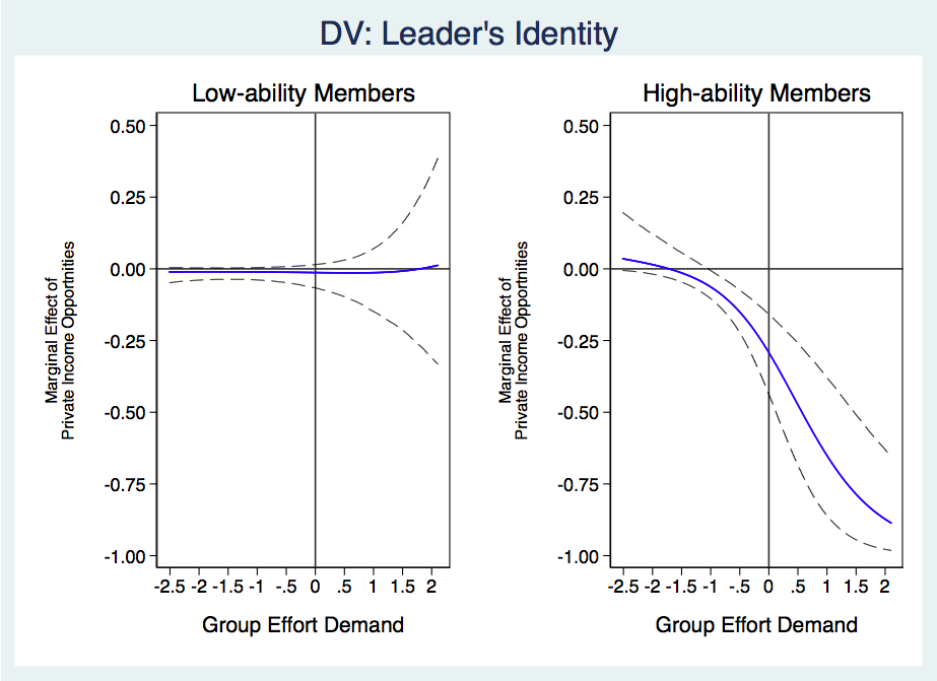

Figure 6: Marginal Effect of Private Income Opportunity on the probability that a DC representative is elected as leader as effort demand increases over its entire range, for both low-ability and high-ability Reps. Dashed lines represent 95% confidence intervals, based on bootstrap SEs (10,000 iterations). In both panels the marginal effect of private income opportunity is measured for a significant change: from two standard deviations below the mean to two standard deviations above the mean. This change covers a range that includes the private income opportunity of 95% of the sample.

6.1.2 Inverted U-shaped relation: effort demand and the value of the public good

This subsection explores the third main prediction of the model: the existence of an inverted U-shaped relationship between the value of the public good and effort demand. The approach that we use involves running locally weighted regressions of the value of the public good on effort demand and then graphing the results[54]. Figure 7 graphs locally weighted regressions of the value of the public good (group-means) on the group-level effort demand using four different specifications of the public goods. Though crude, the inverted-U shape is observed in all specifications.

[54]This approach was inspired by Urquiola & Verhoogen (2009).

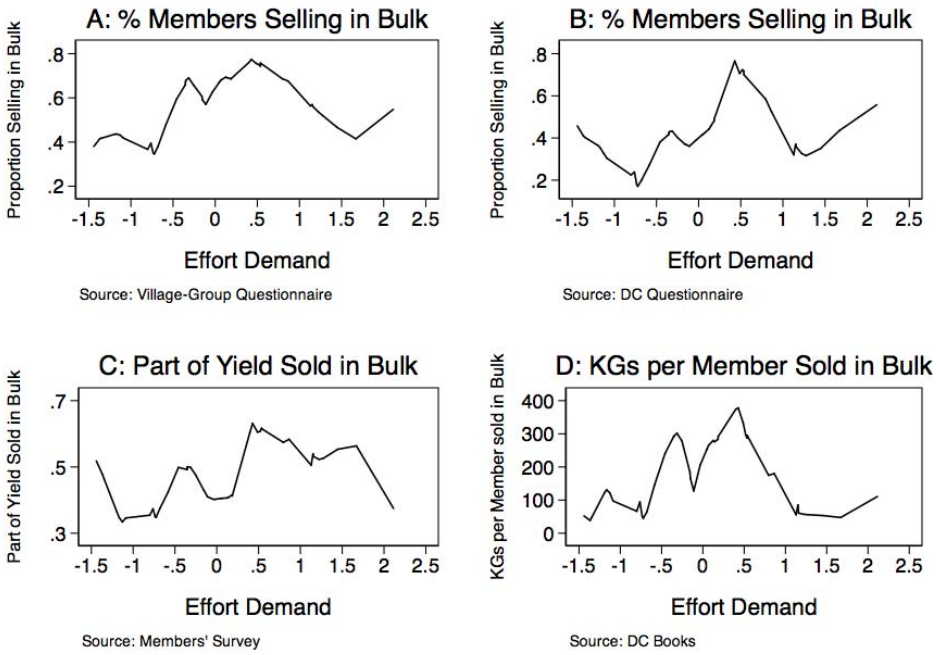

Figure 7: Effort Demand and the value of the Public Good, using four different specifications of the value of the public good. In each panel, the lines plot fitted values of locally weighted regressions (using Stata's *lowess* command and a bandwidth of 0.3) of group-level means of the value of the public good on group-level effort demand. The figures omit observations at the bottom of the effort demand from Iganga district, for reasons that we discussed in Section 5.

6.1.3 Welfare effects

In the last piece of the empirical analysis, we consider the relation between the group public good value and members' welfare. This project is based on the assumption that leaders of small groups produce public (club) goods that impact the welfare of members. Thus, we should expect to see that in groups with a high public good value, i.e., where many members sell via their association, there is a larger increase in welfare since the group's inception. Furthermore, the change in any member's welfare should depend on the total amount of collective marketing by the group, rather than how much they sell via the group individually. In fact, generating the group public good involves overcoming a collective action problem in which each individual would be better off not selling to the group, as long as the other group members bulked enough to drive up the local coffee price (Grossman & Baldassarri, 2010). The reason is that by not selling via their association, members can take advantage of the greater convenience of selling to local traders, while still enjoying the high local prices set by the group through yardstick effects[55]. If this is true, we should observe that welfare is increasing in the amount of collective selling done by the group, but decreasing in individual's own decision to sell in bulk.

[55]Local traders (middlemen), tend to collect the crops from the producers' farm, pay cash-on-delivery, while also paying scant attention to quality.

To test these predictions, we run individual-level OLS regressions, in which a member's welfare increase since joining the group is modeled as a function of the amount of collective marketing done by the group and the member's own marketing decision. We include two measures of individual's marketing decisions: an indicator of whether they sold through the association in the past season, and a measure of the share of their yield that was sold through the association. In some specifications we include individual level controls for sex, age, year of joining the group, and level of education, as well as association level controls for age and membership size. In all models we include strata fixed effects and cluster standard errors at the association level. Two different group-level measures of participation in collective marketing are used: the share of group members selling at least some coffee through the association, and the average share of group member's output sold via the group. Note that while we believe that these results can be informative, they should be only viewed as suggestive given the identification strategy.

Table 8 presents the regression results. We find that the change in member's welfare since joining the farmer group is positively related to the value of the public good for either measure of the group-level value of the public good, and that this relation is statistically significant. Turning to an individual member's decision to sell through the association, we find that cooperation towards the production of the group's good is negatively related to welfare increase, as expected. This is consistent with the idea that selling through the association is a collective action problem. If the member does sell through the group, then there appears to be a positive relationship between the amount that she sells and the change in welfare, as shown in the fourth line of the table. This suggests that, conditional on a member selling through the association, they are better off selling a greater share of their output through the association. In sum, these results seem consistent with the idea that selling collectively through the association is a group public good that contributes positively to members' welfare, but one which each individual member would be better off not contributing to.

7 Conclusions

The main argument of this paper is that small groups face a complex problem when deciding how much effort to ask from their leaders. The problem arises out of a tension between two possible outcomes of increasing effort demand: extracting more effort from the leader *and* driving higher ability members out of the candidate pool. The result is an inverted U-shaped relationship between the amount of effort demanded by a group, and the value of the public good produced. Private income opportunities play a key role in determining the importance of this trade-off. The trade-off will be particularly important in locations with high private income opportunities, where high ability individuals face a greater opportunity cost of devoting time to public goods production. Evidence from the sample of Ugandan farmer associations that we surveyed support these predictions.

These effects can lead to some counterintuitive results, which are best illustrated by the comparison of farmer associations in Iganga and Masaka districts. One might have expected that farmers in the wealthier and better educated Masaka district would end up with more effective

DV: CHANGE IN A MEMBER'S WELFARE SINCE JOINING THE FAMER GROUP

	Indicator Measure		Proportion Measure	
	(A1)	(A2)	(B1)	(B2)
Fraction of members selling via DC	0.085**	0.078*		
	(0.03)	(0.03)		
Mean share of member's output sold via DC			0.077*	0.055
			(0.04)	(0.04)
Sold at least once via DC	-0.275	-0.335*	-0.249	-0.313*
	(0.16)	(0.16)	(0.16)	(0.15)
Share of Yield sold via DC	0.247**	0.253***	0.238**	0.249**
	(0.07)	(0.07)	(0.07)	(0.07)
Ind and Group Controls		X		X
Strata FE	X	X	X	X
Observations	1630	1620	1630	1620
r2	0.046	0.108	0.044	0.107

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Relation Between Value of the PG and Welfare. In models A1 and A2 the group-level value of the public good is measured as a proportion of members who report selling their coffee at least once via the group, in the past season. In models B1 and B2, the value of the public good is the group mean of the share of total seasonal yield that members sold via their group. In A2 and B2 we controls for member's sex, age, year of joining the group, and level of education and for the association's age and membership size. All models include strata fixed effects and clustered standard errors at the association's level.

associations than those in Iganga. In fact, we find exactly the opposite. Our theory helps us make sense of this. In the model, high private income opportunities such as those found in Masaka incentivize leaders to exert less effort, make high ability members less likely to be leaders, and force groups to trade-off leader effort and ability. In contrast, when there are few private income opportunities, as in Iganga, high ability members seek to be leaders and to exert a high level of effort.

From a policy perspective, this paper suggests that the quality of group leaders should be considered, at least partially, to be endogenous. Thus, small groups should be structured in ways that take into account how these structures will affect the quality of leadership obtained. A second policy-relevant point of this paper is that the level of private income opportunities in a location has a central role to play in determining the success of small groups. When setting up the governance structure of these groups, care should be taken to assess the level of private income opportunities and the trade-offs that these opportunities create. Another implication of the paper's results is that changes to the level of private income opportunities in an area can affect the success of small groups operating in that area. Thus, it may be necessary to build flexibility into the governance structures of small groups so that they can adjust to changing local economic conditions. Moreover, interventions that affect the level of local private income opportunities may have

unexpected consequences for small groups located in the area. For example, if an intervention designed to build leader capacity in small groups through training also increases the private income opportunities of potential leaders, then our results suggest that this program may not have the intended effects.

There remain important outstanding questions related to factors affecting the ability of groups to adjust the costs and rewards of holding office in order to obtain better leadership. In the case we study, groups were constrained by institutional structures imposed when the groups were formed, a time when they likely lacked the information and experience to choose optimal effort demand levels. Our theory suggests that there can be substantial gains if groups are able to adjust effort demands (and leader remuneration) in order to obtain better leaders. However, allowing flexible institutional structures seems likely to increase the chances the incumbent leaders can make changes that benefit themselves. Perhaps this is why we often observe institutional structures that change slowly over time. Understanding these issues is likely to be a fruitful avenue for future research.

Finally, this paper highlights the importance of small groups and discusses some of the differences between small groups and larger political units. We argue that, while the existing citizen-candidate framework is a good starting point, models designed for understanding large groups must be modified to fit the small group case. While we have pointed out some of the ways that small groups may differ from larger political units, there are certainly others. Moreover, there is sure to be wide variation among small groups that exist in different settings, or were formed for different purposes. The ubiquity of small groups, and dearth of political economy work on this topic, suggests that more research focused on the political economy of small groups is needed.

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A Tradeoffs and key assumptions appendix

The condition under which higher ability leaders will produce a *higher public good value* is given in Equation 8 below.

$$\frac{dP(A_i, e_i^*)}{dA_i} = \frac{\partial P(A_i, e_i^*)}{\partial A_i} + \frac{\partial P(A_i, e_i^*)}{\partial e_i^*}\frac{de_i^*}{dA_i^*} > 0 \tag{8}$$

The first term on the right hand side represents the direct effect of ability on the public good value and will always be positive. The second term represents how ability affects the public goods value through effort. Equation 8 tells us that high ability individuals will have an advantage in public goods production whenever an increase in ability does not cause too large a substitution of effort away from public goods production. We can be sure this holds whenever the complementarity between ability and effort in generating private income is not too much larger than the complementarity in producing the public good. So, high ability individuals will have an advantage in public goods production whenever G is not too large, where,

$$G = \frac{\partial^2 I(A_i, (1-e_i)^*)}{\partial(1-e_i^*)\,\partial A_i} - \frac{\partial^2 P(A_i, e_i^*)}{\partial e_i^*\,\partial A_i}$$

Equation 9 below gives the conditions under which low ability individuals will have greater candidacy incentives[56].

$$\frac{dCP_i}{dA_i} = \left[\frac{\partial I(A_i, (1-e_i^*))}{\partial A_i} - \frac{\partial I(A_i, 0)}{\partial A_i}\right]\alpha + \frac{\partial P(A_i, e_i^*)}{\partial A_i} < 0 \tag{9}$$

The first bracketed expression on the right hand side, which is negative, represents the extra opportunity cost that high ability members pay for allocating effort away from producing private income. The second term on the right hand side is positive, since higher ability members benefit from the higher valued public good that they produce.

This expression makes it clear that, in order for low ability members to have greater candidacy incentives, three conditions must hold. First, private income opportunities must be sufficiently high. If few private income opportunities are available, then the high ability leaders will give up little if they decide to devote their efforts to generating the public good. Second, there must be a sufficiently strong complementarity between effort and ability in generating private income opportunities. It is this complementarity that increases the opportunity cost of management for higher ability members. Finally, members' equilibrium effort level if they are the leader must not be too low. If equilibrium effort levels are very low then there is little effort cost of being the leader.

[56] We do not need to account for the effect on $\tilde{P}$ in this equation because the increase in A_i will not affect the value of the public good produced by the next best leader unless the next best leader changes, in which case an increase in A_i will increase individual i's ability to free ride, thereby further reducing CP_i.

B Simulation appendix

The following functional forms are used in the simulation exercise.

$$I = A_i^{\beta}(1-e_i)^{1-\beta} \qquad P = p * A_i^{\beta} e_i^{1-\beta} \qquad C = 10^{(}\bar{e} - e_i) - 1$$

The parameter values used for the simulations are $p = .1$, $N = 10$, and $\beta = .5$. The simulations are run for values of $\bar{e}$ from 0 to 1 by steps of .1 and for $\alpha = \{0.25, 0.5, 0.75, 1\}$.

Figure B presents additional results from the simulation exercise. The left panel presents data that are constructed by ranking the individuals in each group by their ability, with 10 being the highest and 1 being the lowest ability member. It shows the ranking of the member that ultimately becomes the leader. The main point here is that not only is leader ability falling, but that it is falling even though higher ability members are available. The right panel shows the average size of the candidate pool. Here we see that as effort demands increase, the candidate pool is shrinking. This is because higher ability members are dropping out, an effect which occurs earlier and more sharply when there are more private income opportunities.

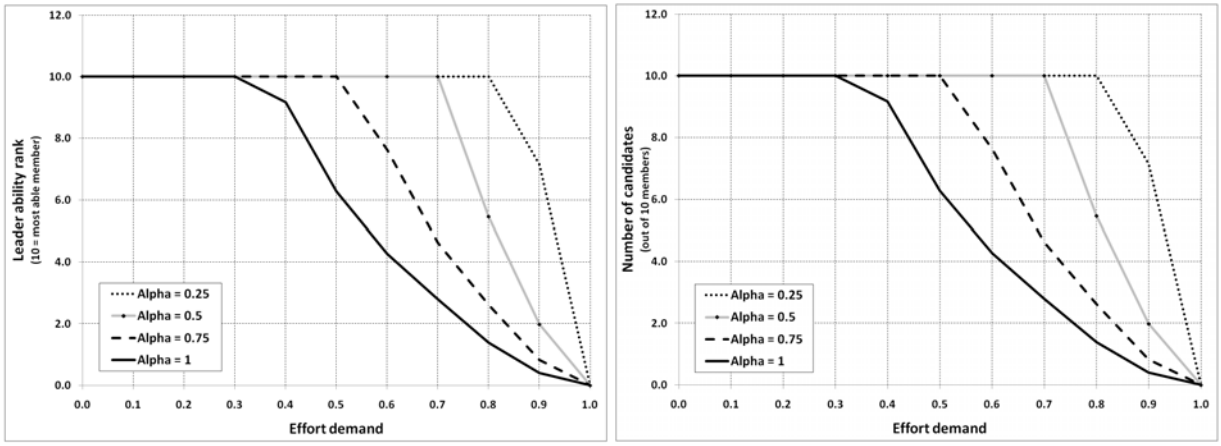

Figure 8: Simulated Leader Ability Rank and Candidate Pool Size

C Data appendix

Table 9 and Table 10 provide some descriptive statistics for the sample of group members and for group representatives, respectively. Data is organized by the five district areas.

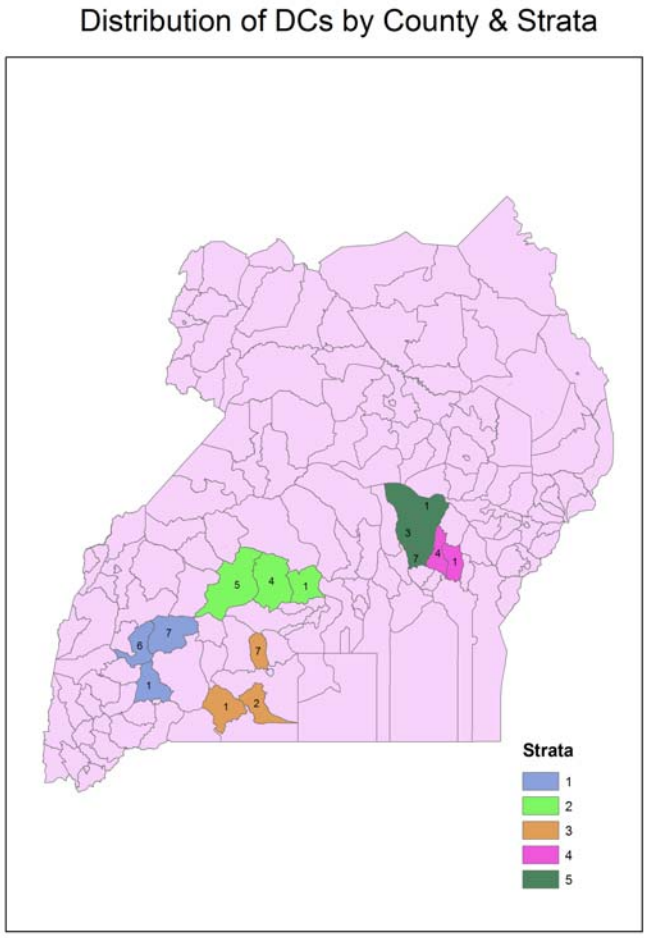

Figure 9: Number of Sampled Farmer Associations (DCs), by Strata

D Empirical analysis appendix

Table 9: Descriptive Statistics (Members' Sample)

	Region					
	Ibanda	**Mubende**	**Masaka**	**Iganga**	**Kamuli**	**Total**
Male						
Female (n=572)	26.4%	26.2%	30.9%	24.6%	46.5%	32.1%
Male (n=1,212)	73.6%	73.8%	69.1%	75.4%	53.5%	67.9%
Total (n=1,784)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Tribe						
Baganda (n=330)	0.2%	24.0%	65.7%	2.4%	5.2%	18.5%
Banyankole (n=527)	99.4%	10.2%	2.8%	0.0%	0.7%	29.6%
Basoga (n=548)	0.0%	0.3%	0.3%	94.0%	87.2%	30.7%
Other (n=378)	0.4%	65.5%	31.2%	3.6%	7.0%	21.2%
Total (n=1,783)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Religion						
Catholic (n=828)	57.0%	44.3%	70.0%	21.0%	29.1%	46.4%
Protestants (n=602)	36.6%	26.9%	15.3%	35.3%	49.2%	33.8%
Muslim (n=206)	0.6%	12.7%	8.9%	38.3%	14.3%	11.6%
Borm again (n=90)	1.2%	12.2%	3.4%	3.6%	5.1%	5.0%
Other (n=57)	4.6%	3.9%	2.4%	1.8%	2.2%	3.2%
Total (n=1,783)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Formal Education *(dummy)*						
(n=300)	15.8%	13.9%	11.3%	18.8%	23.8%	16.9%
(n=1,476)	84.2%	86.1%	88.7%	81.2%	76.2%	83.1%
Total (n=1,776)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Age	Median 44	Median 45	Median 45	Median 50	Median 40	Total 44
Years Since Joining Group	3	3	4	3	4	3
Coffee Land Size *(in Acres)*	.75	1	1.5	1	1	1
Total Seasonal Coffee Yield *(in KGs)*	225	132	363	250	200	210
N Respondents *(Case Deletion)*						
Total (n=1,733)	472	352	322	163	424	100%

Source: Members' Survey

Table 10: Descriptive Statistics (Representatives)

	Region					
	Ibanda	**Mubende**	**Masaka**	**Iganga**	**Kamuli**	**Total**
	%	%	%	%	%	%
Male						
Female (n=260)	17.7%	11.3%	26.3%	15.7%	26.6%	19.7%
Male (n=1,059)	82.3%	88.7%	73.7%	84.3%	73.4%	80.3%
Total (n=1,319)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Tribe						
Baganda (n=329)	0.3%	41.2%	80.3%	0.9%	3.8%	25.0%
Banyankole (n=343)	97.6%	16.5%	1.4%	0.9%	0.3%	26.0%
Basoga (n=434)	0.0%	0.0%	0.9%	96.3%	90.1%	32.9%
Other (n=212)	2.1%	42.3%	17.4%	1.9%	5.8%	16.1%
Total (n=1,318)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Religion						
Catholic (n=582)	54.4%	44.8%	67.1%	16.7%	30.5%	44.2%
Protestants (n=453)	38.3%	29.4%	14.6%	42.6%	45.3%	34.4%
Muslim (n=168)	0.7%	12.8%	15.0%	33.3%	14.8%	12.8%
Borm again (n=68)	0.7%	8.4%	1.9%	5.6%	7.4%	5.2%
Other (n=45)	5.9%	4.7%	1.4%	1.9%	1.9%	3.4%
Total (n=1,316)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Formal Education *(dummy)*						
(n=43)	4.5%	1.5%	0.9%	2.8%	5.6%	3.3%
(n=1,267)	95.5%	98.5%	99.1%	97.2%	94.4%	96.7%
Total (n=1,310)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Median	Median	Median	Median	Median	Total
Age	45	46	45	50	45	45
Years Since Joining Group	4	3	5	3	4	4
Coffee Land Size *(in Acres)*	.1.5	1.5	2	1	1	1.5
Total Seasonal Coffee Yield *(in KGs)*	360	170	600	349	300	300
N Respondents *(Case Deletion)*						
Total (n=1,302)	287	334	212	107	362	100%

Source: Representatives' Network Survey

	Member bulked with the DC last season		
	(1)	(2)	(3)
DC Leader Ability	0.10	0.14	0.12
	(0.13)	(0.14)	(0.13)
DC Leader's Effort	0.64***	0.61***	0.43**
	(0.14)	(0.17)	(0.16)
Leader Effort x Ability	-0.02	-0.04	-0.11
	(0.12)	(0.13)	(0.12)
Female	0.19		0.20
	(0.14)		(0.14)
log coffee yield	0.34***		0.34***
	(0.06)		(0.06)
Years since Joining Group	0.24***		0.25***
	(0.04)		(0.04)
DC Number of members	0.11*		0.14*
	(0.05)		(0.07)
MM honesty	0.82***		0.82***
	(0.22)		(0.22)
Mubende		0.35	-0.04
		(0.33)	(0.40)
Masaka		0.44	-0.21
		(0.38)	(0.37)
Iganga		0.65	0.94*
		(0.48)	(0.45)
Kamuli		0.26	-0.11
		(0.31)	(0.31)
Constant	-3.37***	0.28	-3.50***
	(0.48)	(0.21)	(0.48)
lns1_1_1			
Constant	-0.56**	-0.48**	-0.66***
	(0.17)	(0.16)	(0.18)
AIC	1712	1910	1715
BIC	1765	1959	1789
Observations	1492	1571	1492

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Authors' Original Survey

Table 11: Random Intercept: Bulking with DC past Season. Regression coefficients should be interpreted as the difference in log-odds associated with a unit change in the corresponding covariate. Similar results are obtained when using other specifications of the value of the public goods.

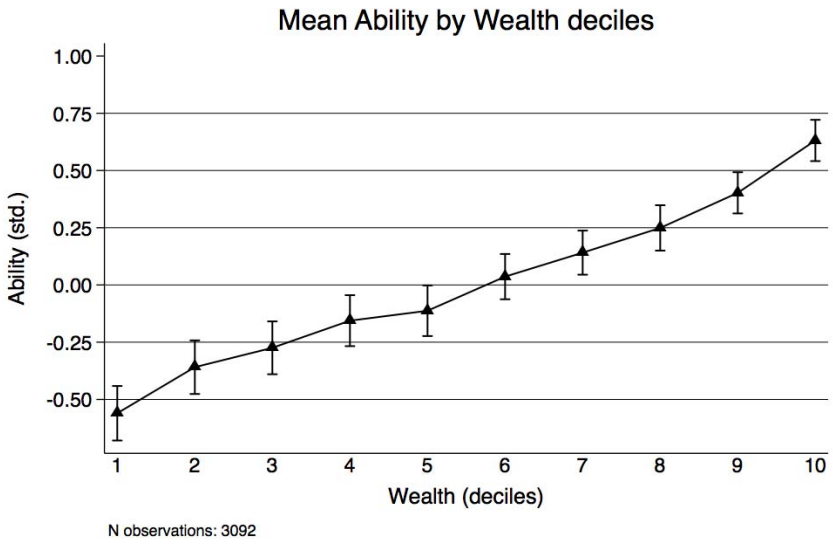

Figure 10: Relationship between wealth (deciles) and ability (std), for the entire sample (N=3092).

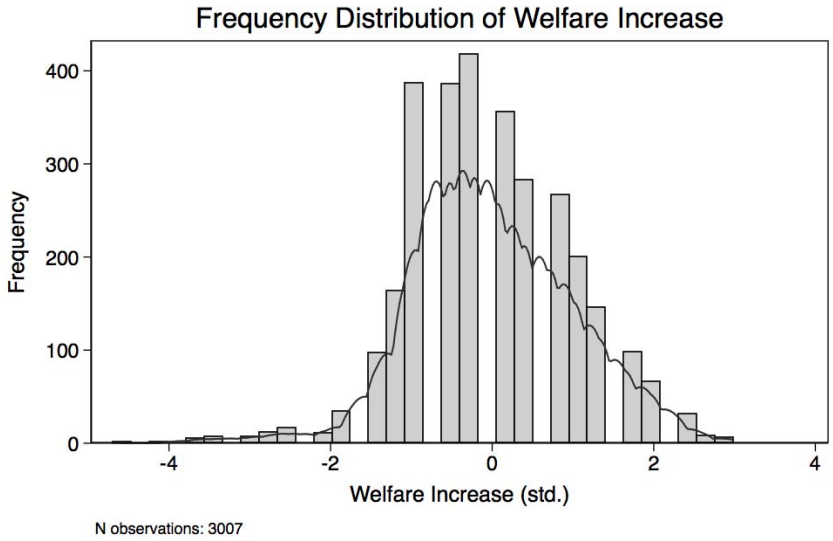

Figure 11: Distribution of Self-Reported Welfare Effect Since Joining the Farmer Group