Leaders needed
Experimental Evidence from Rural Producer Organizations in Senegal[·]

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Abstract

Most decisions are taken in group contexts where one person's behavior is affected by others. We explore drivers of coordination in Rural Producer Organizations (RPOs) of groundnut farmers in Senegal. We conduct a randomized controlled trial motivated by a theoretical model, where we varied the number and type of individuals invited to a training on collective commercialization. We use this variation to identify effects on subsequent commercialization behavior of members who did not attend the training. Our results suggest that non-trained individuals are likely to sell more through the group if a sufficient number of group leaders attended the training.

Keywords: Coordination, leadership, farmer groups, strategic uncertainty, collective marketing, field experiments, development

JEL Codes: C72, C93, D71, O12, Q13

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1. Introduction

Over the past decade, Rural Producer Organisations (RPOs) such as cooperatives have received increased support from the development community as a means to provide smallholder farmers with better access to input and output markets (World Bank 2008, Uphoff 1993, Rondot and Collion 2001). Collective action is often thought of as an effective means to reduce transaction costs in conditions where commercialization is characterized by important economies of scale (Berdégué 2001, Poulton et al. 2010). Such organizations have indeed played a major role in the successful performance of family farms in today's richer countries (Malassis, 2000). Cooperatives currently account for 60% of commercialized agricultural outputs in the European Union (Mercoiret, Pesche and Bosc, 2006). Successful examples in developing countries include Indian dairy and Colombian coffee cooperatives, facilitating market access for, respectively, 12 million and 300,000 small-scale producers. Yet, many organizations in developing countries still struggle to offer the type of commercialization services that could potentially lead to higher output prices for their members (e.g. Fafchamps and Hill 2005 in Uganda, Bernard et al. 2008 in Senegal and Burkina Faso, Bernard et al. 2010 in Ethiopia, Ragasa and Golan 2013 in the Democratic Republic of Congo).

To explain this limited capacity, one strand of the literature has highlighted factors such as size and heterogeneity as well as unfavorable institutional and market environments (Coulter et al. 1999, Markelova et al. 2009). Several studies note that small and relatively homogeneous organizations often fail to engage in such activities, even when returns are potentially high (Fafchamps and Hill 2005, Bernard et al. 2010). Another strand of literature investigates the issue of member commitment to reach the type of product aggregation necessary for successful collective commercialization (e.g. Hill and Maruyama 2013, Bernard and Seyoum-Taffesse 2012). As put by a member of a groundnut RPO in Senegal "[larger buyers] only come for large enough quantities". In the absence of sufficient commitment of members to commercialize collectively, the efforts of RPOs to effectively obtain higher prices will fail, further contributing to the low commitment of members in the future.

In this paper, we focus on two main aspects that primarily fall in this second strand of the literature. First, we argue that coordination issues between members need to be taken into consideration. In line with standard stag-hunt coordination games, we postulate that an individual's belief concerning the minimum number of other members who are committed to selling through the organization will affect the expected benefits from collective commercialization and thereby this individual's decision to sell through the RPO. In such games, with rational individuals and imperfect information regarding the behavior of others, *coordination failure* is often predicted (e.g. Van Huyck et al. 1990, or Morris and Shin 2003). Even where there is a payoff-dominant coordination equilibrium that may be preferred by all, an individual player may choose not to coordinate given strategic uncertainty about the actions or beliefs of others.

Such coordination failure is consistent with our data from 27 groundnut RPOs in Senegal. Most producers sell their output individually and point to important difficulties when dealing with traders, partly related to issues of local monopsony, collusion, failure to pay, and asymmetric information with respect to quality-related issues. While members believe that collective commercialization has the potential to solve these issues, their limited involvement in collective commercialization appears to be

significantly correlated with their aversion to strategic uncertainty as measured by an experimental instrument similar to that of Heinemann et al. (2009).[1]

Second, we investigate some mechanisms through which coordination towards more collective commercialization may be enhanced. Leadership has often been emphasized as *the* means to enhance coordination because of (1) leaders' privileged access to information (see for example Hermalin 1998 and Potters et al. 2007), (2) leaders' methods to lead by example or sacrifice (see same references) or (3) leaders' actions being more visible by others (see for example Acemoglu and Jackson, 2011). Yet, others have argued that too much emphasis is being placed on leaders as opposed to interactions between regular members, leading to so-called 'leadership attribution error or bias' (see for example Hackman and Wageman 2005 and Majumdar and Mukand 2008). Lastly, a significant literature largely based on Granovetter (1978) argues that, independent of leadership issues, critical mass is necessary to achieve coordination.

We assess the relative importance of these mechanisms using a randomized training intervention aimed at enhancing collective commercialization. The training itself consisted of three days of interactive discussion on the benefits, conduct and constraints associated with collective commercialization and was administered in collaboration with GRET (a French NGO), PINORD (a Senegalese NGO) and the two cooperative federations to which the 27 village-level RPOs mentioned above belong. All RPOs had stated collective commercialization as one of their main objectives though they mentioned facing important difficulties in aggregating their members' produce.[2]

In each selected organization we randomly varied the number of regular members and leaders (members of the management committee) invited to the training.[3] This enables us to assess the effect of training on member engagement in collective commercialization through three complementary treatments: (i) whether or not an organization was selected for training; (ii) the total number of members of an organization invited to the training and (iii) the number of regular members versus leaders that were invited.[4] According to measures of strategic uncertainty collected both before and shortly after training, all trained individuals displayed strong improvement – reaching the maximum possible score – in their intentions to engage into collective commercialization.

We also assess how differences in the number and type of members trained affect the behavior of a sample of randomly chosen individuals in each organization who were not themselves invited to the training. For these individuals, our main outcome variable is the total quantity of groundnuts contributed to the organization's collective commercialization effort in the nine months following our intervention. In all treated RPOs, a general assembly was convened shortly after training to discuss training content with non-participants such that any differential effects of treatments (ii) and (iii) cannot be attributed to information about the training itself and are interpreted as related to changes in beliefs about the commitment of other members.

[1] For comparison purposes, no such correlation is found with similar indicators that measure risk aversion, preference for present, and altruism vis-à-vis other group members.

[2] The initial design included another series of onion- and rice-related RPOs. It turns out that these organizations are not involved in collective commercialization and thus, they are not included in the analysis

[3] These individuals were themselves randomly selected from an initial list of members and leaders.

[4] Leaders include all individuals that are part of the RPO's management committee.

Our results show statistically significant evidence that training led to higher collective commercialization of output in those organizations randomly selected to have at least one individual trained. Further, we find that this effect is reinforced by the number of leaders selected to attend the training, beyond the total number of individuals trained. Training one of the leaders, or the actual chairman of the RPO, is not associated with such increased effects of training onto collective commercialization. Laslty, we do not uncover evidence that trust-level or available quantity of output to be commercialized help explain these results.

This paper contributes to the existing literature in two ways. First, our results support a rather mixed story with respect to the theoretical literature. In line with Hermalin (1998) or Acemoglu and Jackson (2011), we do find that leaders exert a stronger influence on the behavior of regular members compared to member-to-member influence. Yet, a single leader may not be sufficient to trigger a large enough change in other members' beliefs with respect to the potential benefits of collective commercialization. Thus, while the literature has mostly focused on leadership as the responsibility of a single individual, our results point to a more nuanced story, according to which leadership should be seen as exercised by a pool of individuals. Second, from a methodological perspective, we study coordination issues within existing organizations using both a randomized controlled trial and a lablike experimental measure of strategic uncertainty. This enables us to contribute to the strand of literature that has argued generalizability of lab-in-the-field measures (in this case, perceptions/beliefs about strategic uncertainty) vis-à-vis corresponding real-life behavioral outcomes in the form of collective commercialization (see Camerer 2011 for a review). Our results also contribute to the small but growing empirical literature attempting to identify spillover effects from variation in treatment intensities within groups (see Baird et al. 2012 for a review and methodological discussion). In our case, spillovers arise from strategic complementarity in joint actions.

The remainder of the paper is organized as follows. In Section 2, we provide some contextual background on commercialization and the role of RPOs in the Senegalese groundnut sector. In Section 3, we use a lablike experimental measure for strategic uncertainty and its relationship with past commercialization behavior to motivate our focus on coordination issues in explaining cooperatives' limited success in collective commercialization. Section 4 posits a simple model of coordination and strategic uncertainty applied to this context. In Section 5, we present details on the experiments and data alongside tests of experimental integrity (internal validity). Section 6 discusses the results. Finally, Section 7 concludes with a discussion of potential policy implications and areas for future research.

2. Context

Groundnut production has long constituted the backbone of the Senegalese economy. At independence, the sector employed 87% of the active population in rural areas and took up half of the cultivated land. Groundnut processing contributed to 42% of all industrial output and groundnuts represented 80% of all export revenues (Caswell, 1984). Similar to other cash crops in West Africa, the entire value chain was organized and controlled by state entities in charge of providing extension, inputs and credit to farmers as well as collecting, processing and exporting output. The groundnut sector is said to have contributed to the modernization of Senegalese agriculture, promoting innovations such as inorganic fertilizer application, animal traction and other farm technologies (Faye, 2005). Over time, however, revenues

from the sector steadily declined through a combination of external factors such as lower international prices, the abolishment of preferential tariffs to the French market (1972), droughts (1969-1973), oil shocks (1973 and 1979), exchange rate devaluation (1994) and internal factors related to mismanagement and political considerations at various levels of the value chain. These resulted in several attempts to reform the sector, which in the late 1990s culminated in the gradual privatization of all segments of the groundnut value chain.

At the producer-level the most important reform occurred in 2001 with the dismantling of the parastatal (SONACOS) in charge of all input provision and output collection through a dense network of producer cooperatives. Although privatized, the principal end-buyer of groundnuts, now named Suneor, still exists, but procures groundnuts through a system called "carreau-usine" in which private traders and collectors are ensured a fixed price upon delivery at the processing plant. This is in contrast with the fixed and unique producer-level price that had existed before. Following the reforms, competitive forces were expected to support producer prices but issues of local monopsony, collusion, failure to pay, and asymmetric information with respect to quality-related issues has led to general dissatisfaction with this new system. In the last evolution to date in 2010, the export monopoly previously granted to Suneor was abolished, facilitating the entry of new international players that procure groundnuts directly from producers via a new network of collection points. During the 2012 season, prices offered by these newcomers significantly surpassed those offered by Suneor, further weakening what remains of the former system.

Following these reforms, the role, functioning and capacity of what were initially producer cooperatives significantly changed. Formed and controlled by parastatal organizations, these cooperatives evolved towards independent member-controlled entities capable of dealing with various kinds of partners. Through membership of federations, these organizations have sometimes been able to better respond to the needs of their members in comparison to the former, state-controlled system. Yet, as they are no longer the only service provider, these RPOs face new challenges in ensuring the commitment of members. This is particularly true for activities related to collective commercialization of output. In fact, while RPOs remain active in input and credit provision, their capacity to aggregate output has considerably weakened. At harvest time, member-farmers are now visited by private collectors and traders (Banabanas) offering an immediate cash payment. This has led to important side-selling implying that a large share of produce is not marketed through the organization. As a result, RPOs are seldom able to aggregate the necessary amount of groundnuts that would effectively trigger economies of scale and bargaining power at time of commercialization. This is despite evidence that groundnut RPOs in Senegal can, in fact, provide their members with profitable and reliable output commercialization services (for example, Vandercam 2005). To reiterate, if they are not able to aggregate a sufficient amount of produce, RPOs are not in a position to effectively obtain higher output prices further contributing to side-selling and a lack of interest of members in commercialization services offered by the organization.[5]

[5] It should also be noted that RPOs seldom enforce any sanctions against members who engage in side-selling. In effect, no formal contract is established that could lead to appeal to the court of law. Further, as they are located within villages with dense family and kin ties, these organizations are rarely ever able to exclude anyone from continued membership even when members have not fulfilled their obligations.

The discussion in this section suggests that while liberalization may have enabled groundnut RPOs to actively seek better output market conditions for their members, they are now in competition with local traders when attempting to aggregate a sufficient amount of output to trigger economies of scale and enhance bargaining power. As we discuss below, while lack of financial means and technical capacities are likely to be significant constraints, issues of coordination between members may also contribute to this phenomenon

3. Members' commitment and strategic uncertainty

We investigate issues of collective commercialization using a sample of 27 village-level RPOs for which we conducted a baseline survey in November 2011. This sample was drawn from a dataset of 204 Senegalese RPOs involved in three value chains (onions, rice and groundnuts) from which we selected those organizations that stated collective commercialization as one of their core objectives. We identified 75 of these marketing-type of organizations, but only include the 27 organizations involved in the commercialization of groundnuts in our analysis.[6]

From each of these 27 groundnut RPOs, 10 member farmers were randomly selected for our baseline survey. Data collected include socio-economic characteristics, production and commercialization behavior during the season preceding the survey as well a set of attitudinal measures related to risk aversion, preference for present, altruism vis-à-vis other members and aversion to strategic uncertainty.[7] Baseline data reveal that, first, the overwhelming majority of members were found to sell individually in spot market-like transactions. These individual-level sales to a local trader appear to be fraught with difficulties. Member-farmers are found to trade on-farm or at the market place without an indication of repeated interactions (only 7% deal regularly with the same trader) or

[6] In fact, RPOs supposedly marketing onions were found to only engage in the commercialization of wood collected from nearby forest with proceeds being used to provide public goods for their village-communities. These organizations were not found to offer any services related to the onion value chain, effectively limiting their relevance for our study. These organizations may be better categorized as community-oriented organizations, whose purpose is to provide public-good type of services, not market-oriented services for their members (Bernard et al. 2008). RPOs involved in the rice value chain were found to effectively collect some output from their members. However, members provide this input to the organization only to pay for irrigation-related services provided by the RPO. In other words, RPOs operating in the rice value chain are essentially water-usage associations collecting payment for services in kind. These rice-related water user associations therefore also fall outside the scope of our study.

[7] Aversion to strategic uncertainty was elicited by means of framed hypothetical coordination games akin to Heinemann et al. (2009). Respondents were asked to choose between selling to a local trader at a known and certain price or selling through the RPO at a price that could be high or low, depending upon whether 15 other members would also decide to sell through the organization, although the individual would not know it at the time he made his decision. The price offered by the local trader was initially set to be the equivalent of the low price that could be obtained in the organization if less than 15 members coordinated and then increased by increments of twenty USD. The level at which an individual switches to selling through the local trader therefore measures the maximum level of risk he or she is willing to take through the organization. Risk and time preferences were elicited using, respectively, Holt and Laury (2002) and Andersen et al. (2008) multiple price lists. These were framed similarly to the strategic uncertainty instrument – a similar approach was taken by Heinemann et al. (2009). Finally, altruism was elicited by means of a standard dictator game, again with similar payoff levels. The exact questions are available from the authors upon request.

pre-harvest contracting (input or credit provision exists in less than 2% of the cases). When asked about difficulties faced when selling their produce only 21% of the respondents indicated that there were no major problems. For the remaining 79% of respondents, the main issues cited were related to lack of transportation means to reach more lucrative markets, insufficient knowledge of current prices, insufficient visits by potential buyers, and insufficient quantity of produce to be able to negotiate prices.

Second, RPOs provided limited commercialization services despite their potential to address some of the constraints affecting their members. In 2011 only 11 out of 27 groups had been able to conduct a collective sale or to secure access to more remunerative markets. For those that did, only about half of members were found to have participated. This limited involvement is in stark contrast with an apparent strong potential for collective commercialization. For instance, three quarters of the respondents believed that the management committee has better knowledge and information on where to find good traders or on current market or farm-gate prices in the region. More generally, virtually all members appear to be convinced that collective commercialization could alleviate the main constraints that they face at time of commercialization and 73% believe that the organization of which they are a member is technically capable of providing them with significant assistance for the sale of their output.

Third, the limited or non-involvement in collective commercialization appears partly driven by a member's belief about the limited or non-involvement of other members. For instance, following the measurement of their strategic uncertainty, respondents were asked what they thought the response of other members would be; nearly two thirds believed that fellow members would have settled for a lower price offered by the trader. In Table 1 we report correlation coefficients from a simple OLS regression relating the quantity that a member commercialized through the RPO in the previous season (2011) and individual-level measures of aversion to strategic uncertainty, risk aversion, preference for present and altruism vis-à-vis other group members. Because of high censoring these variables are entered as binary measures. The dependent variable is the quantity commercialized by the individual through the RPO in the season preceding the baseline survey. Control variables include basic farm and household head characteristics, one's leadership status within the group, along with a dummy variable taking into account which of the two federations the group is a member of – as federations sometimes play an active role in securing output markets. Results are rather clear showing that aversion to strategic uncertainty is significantly and negatively correlated with past collective commercialization behavior. Using this binary measure, individuals who reported any amount of strategic uncertainty aversion sold 0.27 standard deviations less through the group in the previous year. No such evidence is found for risk aversion in the second column. While we do find that preference for present is negatively correlated with group sales – while traders tend to pay cash, selling through RPOs sometimes means payment only a few weeks later – the effect is found to be small in column 3. Quite surprisingly, we find that individuals that are found to be more altruistic vis-a-vis their fellow members are less likely to sell their production through the group, although the magnitude of this effect is small in column 4. Taken altogether in column 5, we find that aversion to strategic uncertainty clearly dominates all other attitudinal measures when correlated with past commercialization behavior.

Overall, results suggest that issues of strategic uncertainty may play a significant role in explaining collective commercialization behavior. Essentially, unless it is certain that a sufficient number of other members will sell their output through the organization, an individual member has very little incentive to refuse the offer of a trader and hold out for a collective sale through the organization. The

process may be further reinforced by a member's belief that others will react in a similar manner culminating in an equilibrium with limited coordination as predicted and described by game theory (see for example Morris and Shin 2003).

The relationship may run both ways: in organizations that have successfully managed to collectively commercialize in the past, individuals may revise their beliefs that fellow members will also contribute to the organization upward thereby contributing to a reduction in their aversion to strategic uncertainty. Further, some environmental or RPO attributes such as leadership capacities of the management committee or kinship ties of individuals within the organization may contribute to explain both aversion to strategic uncertainty as well as past experience of collective commercialization. To establish a causal relationship, we thus design an experiment in which we affect an individual's belief that others may contribute to the organization.

4. A model of strategic uncertainty and collective commercialization

A useful starting point for our theoretical model is the coordination game with complete but imperfect information discussed by Heinemann et al. (2009). Apart from the fact that it can serve as a simple descriptive model of the collective marketing context, it also directly corresponds to the strategic uncertainty measure we collected. Applied to the collective marketing context, we have the following critical mass coordination game. Suppose an organization consists of N small-scale farmers who simultaneously decide between two actions, A (selling individually/directly to a trader) and B (selling collectively through the RPO of which they are a member). Action A is associated with a fixed monetary payoff M (medium) regardless of what other members do since a direct and individual sale to a trader typically pays a certain amount per kilogram. Action B has an uncertain monetary payoff since it depends on what other members do (this is the so-called strategic uncertainty stemming from (beliefs about) the actions of others). In particular, this monetary payoff is H (High) with $H \geq M$, if and only if at least K farmers choose B and L (Low), with $L \leq M$ otherwise (where $1 < K \leq N$).

Intuitively, benefits to market collectively only arise when enough members are involved. The basic rationale for this is the following. The RPO will typically negotiate a price with a contract buyer who offers a premium above the trader's price (the payoff from action A) provided a minimum level of quantity is offered. This quantity tends to be so large that it cannot be provided by just one individual farmer; complying with the contract thus requires coordination. Furthermore, contracts tend to be rather discrete: if a certain threshold is not met, the contract is void since the benefits do not outweigh the costs for the buyer. Alternatively, one may think of the RPO renting a truck to access more distant and remunerative markets. The rental cost has to be borne by the quantity that is transported such that only if a minimum quantity is aggregated is it worthwhile to rent the truck for those who used the service. In both cases of failure to comply, which arises if not enough farmers choose action B, tends to lead to a low payoff of $L \leq M$.

The strategic uncertainty that is inherent in this coordination game makes it an ideal descriptive model of our collective marketing context.[8] The game is characterized by N, K, the own monetary payoffs $\Pi = \{L, M, H\}$, and (4) utility functions over these payoffs, $U(\Pi)$. To illustrate our model further, suppose that we represent the N-farmer game as a game between farmer i and all other farmers, represented as farmer $-i$.[9] Then, the normal or strategic form representation of this game can be given by means of the following table where the players each have a choice between two possible actions A and B of which the monetary payoffs depends on the others players' actions:

Table 2: Normal-form representation of coordination game with generic payoffs

		Farmer $-i$	
		A	B
Farmer i	A	(L, L)	(M, L)
	B	(L, M)	(H, H)

If farmers are able to coordinate on action B, everyone receives a high monetary payoff equal to H. In the absence thereof, those who choose action A never face a payoff risk and receive M, while those who choose B suffer the consequences since they get the lowest possible payoff L. For illustrative purposes, suppose $L = 0$, $M = 5$, and $H = 10$. Then we would have the following payoff matrix:

Table 3: Normal-form representation of coordination game with sample payoffs

		Farmer $-$i	
		A	B
Farmer i	A	(5,5)	(5,0)
	B	(0,5)	(10,10)

(i) Equilibrium and the effect of changes in perceptions

To solve the generic version of the game (Table 2), suppose that farmer i believes that farmer $-i$ will choose action A with probability $1 - q$ and action B with probability q. Farmer i's expected utility from choosing action A and action B are $EU_i(A) = U(M)$ and $EU_i(B) = (1 - q)U(L) + qU(H)$ respectively. Similarly, if farmer $-i$ believes that farmer i will choose action A with probability $1 - p$ and action B with probability p, we have $EU_{-i}(A) = U(M)$ and $EU_{-i}(B) = (1 - p)U(L) + pU(H)$. So, the farmers'

[8] This type of game is similar to Rousseau's "stag hunt" parable. As noted by Van Huyck et al. (1990) based on the discussion by Crawford (2001; originally, a working paper from 1989), critical mass is needed when hunting a stag (in our case, selling through the RPO), whereas hunting a rabbit (in our case, selling to the trader) can easily be done individually although associated benefits may be lower.

[9] An underlying assumption of this coordination game is that individual decisions are being made simultaneously. This is different from certain threshold or critical mass models (see for example Granovetter 1978) in which decision-making is sequential. While such models give rise to first-mover opportunities, we do not have access to such level of detail in our data in order to test a model with sequential decision-making. Furthermore, traders typically visit farmers before any eventual call by the RPO for collective commercialization occurs (traders may even visit farmers before harvest). With imperfect information regarding what fellow members may (have) answer(ed) when visited by a trader, an individual facing a trader's offer is in effect playing a simultaneous game.

decisions will in part depend on the assumptions on utility functions. We assume, in a rather standard way, that utility is non-decreasing over own monetary payoffs, that is $U' \geq 0$.

Farmer i will choose action B over action A if $EU_i(B) > EU_i(A)$, which implies that $q > (U(X) - U(S))/(U(R) - U(S))$. In equilibrium the probability with which each player chooses B, p, solves $q = (U(M) - U(L))/(U(H) - U(L)) \leq 1$ (since $U' > 0$ and $H \geq M \geq L$), where q is the probability that at least $K-1$ of the other $N-1$ farmers choose action B. This probability can be expressed as $q = P(J \geq K-1) = 1 - P(J \leq K-2) = 1 - Bin(N-1, K-2, p)$, where J is the number of other farmers who choose option B and $Bin(.)$ represents the cumulative binomial distribution. The binomial distribution is appropriate since each farmer coordinates with probability p (a so-called success) or does not coordinate with probability $1-p$ (a so-called failure). So, p solves the following equation:

$$F \equiv 1 - Bin(N-1, K-2, p) = \big(U(M) - U(L)\big)/\big(U(R) - U(L)\big).$$

This equation allows us to derive the following main comparative static using the implicit function theorem:

$$\partial p/\partial K = -[\partial F/\partial K / \partial F/\partial p] = -[-\partial Bin(.)/\partial K / -\partial Bin(.)/\partial p] = -[- \cdot + / - \cdot -] > 0$$

by properties of $Bin(.)$.[10] This result states that as the minimum number of farmers choosing to coordinate (K) increases or is perceived/believed to increase, the probability of a given farmer choosing to coordinate (p) also increases. This is an important finding in our context since our intervention varied the number of members or leaders invited to the three-day training. Given that the training was designed to highlight the net benefits of collective marketing, one would expect this to increase K or at least, foster the perception of an increase in K. This in turn is expected to increase a given farmer's likelihood to coordinate, p.

(ii) The effect of different types of players

Now we suppose that any given farmer i has a type θ_i. If farmer i is a regular member, his type is θ_{im}, and if farmer i is a leader of the organization, his type is θ_{il}.[11] This parameter can be seen as the farmer's social category which also determines his social distance from others.[12] Suppose we let $D_{i,-i} = |\theta_i - \theta_{-i}|$ define the social distance between farmer i and farmer $-i$ where each of these farmers can be of type θ_m or θ_l. $D_{i,-i}$ can take three values:

[10] The curvature properties of the binomial distribution can be shown analytically by taking partial derivatives with respect to the full expression. Basically, as p increases, each distribution first-order stochastically dominates the previous. Empirically, these can also be confirmed by simulating an initial distribution with parameters $p = 0.5$, $N = 30$, and $K = 15$, and subsequently changing p ceteris paribus. This is just an example; the broader point is that for any N and $K \leq N$, this property can be confirmed.

[11] We can extend this setup to comprise a continuum of types; however, we believe this setup is sufficiently general to capture reality.

[12] As discussed by Sobel (2005, page 402), such a parameter can comprise the farmer's personal/social characteristics as exposited by Stigler and Becker (1977) as well as Akerlof and Kranton (2000).

1) If both farmers are regular members, we have $D_{i,-i} = D_{im,-im} = |\theta_{im} - \theta_{-im}|$.
2) If both farmers are leaders, we have $D_{i,-i} = D_{il,-il} = |\theta_{il} - \theta_{-il}|$.
3) If the farmers are not of the same type, we have $D_{i,-i} = D_{im,-il} = D_{il,-im} = |\theta_{im} - \theta_{-il}|$.

This social distance may affect farmer i's belief about the likelihood of other farmers to coordinate. In other words, farmer i may place a different weight on another farmer's p depending on the social distance between them (more below).[13]

Suppose farmer i weighs other farmers' p by the social distance between them $D_{i,-i}$. Let this weight be bounded below by 0 and above by 1.[14] Introducing this weight into the former model, we have the following revised indifference condition: $q = 1 - Bin(N-1, K-2, D_{i,-i}p)$. So, p now solves the following equation which we define as G:

$$G \equiv 1 - Bin\big(N-1, K-2, D_{i,-i}p\big) = \big(U(M) - U(L)\big)/\big(U(H) - U(S)\big).$$

This equation allows us to derive the following comparative static using a discrete version of the implicit function theorem:

$$\Delta p/\Delta D = -[\Delta G/\Delta D/\ \Delta G/\Delta p] = -[-\Delta Bin(.)/\Delta D/-D_{i,-i}\,\Delta Bin(.)/\Delta p] = -[-\cdot -/-\cdot -] < 0$$

by properties of $Bin(.)$. This result says that as the social distance between farmers decreases, the probability of a given farmer choosing to coordinate (p) increases. This finding is relevant for our context since we varied the type of person—member or leader—who was invited to the training. We also elicited trust attitudes within the group by asking whether the respondent would trust person X to look after her/his agricultural plot if s/he had to leave the village for two months. So, we can test whether social distance matters. While this is an empirical question, what matters eventually for the purpose of this study is that social distance can theoretically affect (perceptions of) coordination since this in turn yields a testable hypothesis.

(iii) Combined effects

The first comparative static above suggests that (the belief that) a sufficient number of other farmers commercializing through the RPO will impact one's likelihood of also commercializing through the organization. The second comparative static suggests that another farmer's type (as characterized by a social distance parameter) may also impact one's likelihood of commercializing through the organization. These results can of course be combined. Together they suggest that if enough other

[13] Social distance may matter because (1) peers tend to have better information about each other's preferences, constraints; and (2) trust and trustworthiness tend to be different among peers than among people of distinct social strata.

[14] This is a technical assumption, which allows the weighted probabilities to satisfy standard properties. It is a fairly common assumption for weight functions.

farmers of a given type—in this case leaders—change their behavior, an individual farmer is also likely to change his/her behavior.

5. Experimental design and data

(i) *Sample and power issues*

We use the sample of 27 RPOs for which we collected baseline information and conduct the randomized control trial described further below. The Impact is estimated for 240 members of these organizations who did not attend the training. Our current design is limited in power for at least two reasons. First, our initial sample of 75 RPOs for which collective commercialization is a core objective is reduced to those 27 handling groundnuts. Second, our main treatment and its variations are implemented at the RPO-level further contributing to limited power. In effect, individuals within these organizations may not take a fully independent decision. Not only are they exposed to a similar natural and economic environment and its variations, they may also respond to each other's behavior in terms of collective commercialization. Our data indicate a .64 intra-group correlation coefficient for the quantity of groundnuts sold through the organization in the year prior to the intervention. With large intra-cluster correlation, RPO-level treatment and limited number of organizations, our study is only powered to detect the relatively large effect of the intervention on our main outcome variable. In other words, our conclusions are limited in scope to those effects that are sufficiently large in size to be statistically detectable given our sample size and structure.

(ii) Intervention design and beneficiaries

To test the importance of coordination issues in explaining successes or failures to commercialize collectively, we organized a three-day training and discussion around the potential benefits and difficulties of coordinating towards collective marketing.[15] The training was held in January 2012, and was organized in three modules: (1) the potential and pitfalls of collective marketing, (2) coordination within organizations – the role of communication in collective marketing and (3) motivation for coordination – members and leaders.[16]

Five randomly selected organizations served as a pure control group in our design as neither their regular members nor their leaders were invited to the training. For each of the remaining 22 organizations, we randomly drew two discrete numbers me and le, each ranging from 0 to 4. The number me provided us with the number of members to be invited to the training and le with the number of individuals in leadership positions (that is, members of the management committee) to be invited to the training. The total number of individuals trained is thus obtained by $to = me + le$.

It is important to note that treatment assignment was not fully respected in about half of the organizations. As Table 4 shows, there were instances where some invited individuals did not show up

[15] The training was organized in partnership with GRET (a French non-governmental organization) and PINORD (a Senegalese NGO) and the two federations to which the 27 RPOs belong

[16] The training manual is available from the authors upon request.

to the training; more than the intended number of invitees showed up or the distribution of proportion of members and leaders invited was not fully respected. There is thus some level of imperfect compliance, which may in turn be related to organization and individual-level characteristics. To account for this imperfect compliance, all estimations presented in the paper rely on the intended treatment only.

Invitees were randomly selected from lists of leaders and members obtained from a survey held in 2009 to identify collaborating RPOs. Our main research interest however lies in the behavior of those individuals who did not attend the training but who observed participation of some of their fellow members. Our effective experimental sample thus rests on ten randomly selected members from the initial list who were not invited to the training. By the time our intervention took place some individuals no longer lived in or were absent from their village. Our final sample thus includes 304 individuals of whom 64 attended a training session and 240 did not. The behavior of the latter group can only be affected by the training in an indirect manner through interaction with or observation of fellow members who had attended the training.

(iii) Data

We collected three rounds of data. First, baseline data on all 304 individuals was collected in November 2011. At that time, while people may have assumed that there would be subsequent activities, no details of the intervention were given and it was kept intentionally unclear that there would be subsequent primary beneficiaries. The baseline survey was very short and essentially collected minimal member and organizational-level characteristics as described in Section 3.

The training for the groundnut RPOs was held during January 2012. We conducted another survey two to four weeks after the training. This survey was essentially focused on collecting another round of the attitudinal measures (strategic uncertainty, risk, time, and social preferences, and so on) and dissemination of the training content to those who did not participate in the training. In particular, each non-trained individual was asked about the strength of his or her personal relationship with each trainee (pictures were used for this purpose). Finally, each RPO was asked to collect collective commercialization data during the months following the training using purposefully designed notebooks. These were collected by the researchers 9 months later when the 2012 groundnut commercialization campaign had come to an end.

One important limitation of our data is the lack of complete 2012 commercialization data for all individuals in our sample: we are only able to observe whether an individual has sold any output through the RPO, and if so, the corresponding quantity. In the absence of data on prices obtained by farmers through individual sales, we are therefore unable to estimate the impact of our intervention on farmers' welfare. Our analysis is thus restricted to assessing the impact of our intervention on the willingness of members to sell their output via the organization of which they are a member.

(iv) Experimental integrity

To ensure that our various treatments are independent from any baseline characteristics, we run a series of balancing tests relating treatment to characteristics of individual members and the

organization to which they belong. In Table 5, we report results from OLS regressions in which the dependent variables are the three treatment variables that will be used in the following section. Column 1 presents the mean and corresponding standard deviation of each variable. Results presented in columns 2 to 4 suggest that the various treatments are independent of individual and organization-level characteristics. There is some indication that land controlled by member farmers is slightly lower in the treatment group as opposed to the control group but this difference is not quantitatively meaningful.

Overall, these results support the absence of correlation between the type of treatment an individual is exposed to, and his/her own characteristics. As our sample is somewhat small, it is difficult to identify relatively small differences in these characteristics. All estimates reported below therefore control for these characteristics in order to ensure robustness of results.

6. Empirical strategy and results

We start by assessing whether aversion to strategic uncertainty has evolved between our baseline and the follow-up survey. Table 6 reports simple tests of difference in the proportion of individuals who reported no aversion to strategic uncertainty (variable is equal to zero) or reported some (variable is equal to one). Column 1 shows that there are no differences in strategic uncertainty at baseline between the group of trainees (row A), non-trainees in treatment groups (row B), and non-trainees in control groups (row C). We find however that all trainees had the lowest possible level of aversion to strategic uncertainty at follow-up and thus a difference with their baseline level that is statistically significant (Row A, column 3). Similarly, non-trainees in the treatment groups reported a statistically lower level of aversion to strategic uncertainty at follow-up as compared to their baseline level (row B, column 3). No such differences are found in the control group (row C, column 3). Thus, while merely suggestive, there appears to be an evolution of attitudes vis-a-vis collective commercialization between baseline and follow-up surveys in the treatment group. More specifically, results suggest that trainees did return to their respective organization with a strong level of commitment to collective commercialization and that part of their renewed motivation was passed on to fellow members who had not attended the training. We further test for these changes in actual behavior below.

(i) Econometric specification

We are interested to assess whether a member's knowledge of the likely participation of other members in collective commercialization can help trigger his or her increased involvement in such activities. We rely on the three treatment variables discussed above, along with the part our sample composed of non-trained individuals.[17] Our main outcome variable is the quantity of groundnuts that was sold through the RPO in the 2012 commercialization season.

To account for potential remaining bias not revealed in Table 5, we control for member and organization-level characteristics, including literacy, gender, age, farm size, leadership position within the organization, size of the organization as well as a dummy for the federation to which the RPO

[17] All results presented hold if we include the rest of trained individuals alongside non-trained individuals in the sample. However, for clarity purpose we report results on-trained individuals only.

belongs. This last variable is particularly important as some of the commercialization-related services offered by a village-level RPO may depend on the activities undertaken at the federation level. For instance, while one of the two federations sometimes engages in providing access to credit at time of commercialization, this is not the case for the other one. All estimates rely on the ANCOVA specification, where an individual's level of commercialization through the organization in the previous year is included amongst the regressors. As discussed by McKenzie (2012), ANCOVA specifications prove more efficient when using potentially noisy outcome measures. Lastly, all standard errors are clustered at the level of the RPO-level in order to account for non-independence of behavior among members of the same RPO.

(ii) Treatment effects

Our main results are reported in Table 7. In column 1, we first assess whether being affiliated with an organization where at least one individual was invited to the training affects a member's level of commercialization through this organization. This binary treatment does not necessarily reflect issues of coordination and could instead merely capture an informational effect. In fact, trainees were encouraged to relay the training content to fellow members. According to the data collected two to four weeks after the training, 96% of trainees did relay training content; in 85% of the cases this was done through an organization-level meeting. This in turn suggests that non-trainees of the treatment group may have had access to similar information on the training content regardless of the number of trainees within the organization. While this does not constitute a direct test of our main hypothesis, this result provides a first assessment of the impact of the intervention on collective commercialization, indicating that being in the treatment group is associated with an average of about 137 additional kg of groundnuts sold through the organization. This is rather large in magnitude, accounting for 0.3 standard deviations of collective commercialization in the previous year.

(iii) Number and type of trainees

We subsequently test the hypothesis that the number and type of members committed to collective commercialization affects the commercialization behavior of others above and beyond mere informational channels. Results are reported in columns 2 to 6 of Table 7. In column 2 we introduce the number of members invited to the training. We find no effect beyond that of having at least one individual trained. This contrasts with results in column 3 where we introduce the number of leaders who were invited to the training. Here, we find evidence that for a given number of individuals trained, each additional leader invited to the training is associated with 74 kg of additional output commercialized through the organization in the sample of non-trained individuals. Thus, while we find no evidence of critical mass effect in column 2, column 3 does suggest that the type of individuals that were trained (leaders in this case) affects commercialization behavior beyond the binary treatment effect identified in column 1.

At this stage, however, it is unclear whether these effects are driven by the sheer number of leaders or by the fact that at least one member of the management committee was invited to the training. Column 4 reports the effect of having invited at least one member of the management

committee to the training. However, we find no clear effect for this binary variable. One may argue that not all members of the management committee exercise the same influence over their fellow members. The effect identified in column 3 could then be driven by a greater probability that the most influential element in the group of leaders was invited to the training. For instance, one could expect that training the chairman of an organization has more of an effect than training any other member of the management committee. In our sample, the chairman was randomly selected for the training in 8 of the 22 treatment organizations. In column 5 we thus test whether this affected collective commercialization of non-trainees beyond the effect of having trained at least one individual in the group and the number of individuals invited. We find no evidence of such effect.

Results from Table 7 thus indicate that training at least one individual of an organization had clear effect on non-trained individuals' willingness to sell through the group. Further, for a given number of individuals invited to the training, the number of members of the management committee trained positively affected collective commercialization while no such effect is found for having trained at least one leader or having trained the chairman of the RPO. This result is robust to the simultaneous introduction of all treatment variables in column 6, showing that each additional leader invited to the training implies an average increase of 71 kg of output commercialized through the organization by non-trained members. It is also worth noting that the mere binary treatment effect identified in column 1 is now not only smaller in magnitude but also no longer statistically significant.

(iv) Robustness checks

Results from Table 7 demonstrate that the number of leaders trained positively affects collective commercialization by non-trained members. One may argue, however, that it is not necessarily the leadership position per se that matters and that results may reflect the fact that leaders tend to be better connected within an organization – which may explain their leadership position in the first place. If this were the case, these results could merely reflect the number of individual connections of trainees, in line with the model's prediction that influence towards collective commercialization is mostly driven by peer-to-peer effects. To investigate whether this is the case, we rely on data assessing the familiarity of non-trainees with trained individuals. In particular, our data enables us to assess, for each non-trainee, whether he or she had any familial relationship with each of the individuals trained and whether he or she would trust the trainee to watch over his or her field if he or she had to leave the village for two months. For each non-trainee, we obtain indicators measuring the number of trained individuals with whom the member has a family link as well as the number that he or she would trust watching over her field. Results are presented in Table 8 and show no evidence of an effect of individual connections beyond that of the binary treatment effect.

Finally, the effect on collective commercialization may be driven by the relative magnitude of output. Non-trainees contemplating whether or not to sell through the RPO could be affected by the fact that large producers are willing to engage in such collective activities. This would positively affect the probability of reaching a large enough quantity of aggregated output to obtain a significant price premium. We include the largest landholding size as well as the total aggregated landholding size of trainees and assess whether this affects the willingness of non-trainees to sell their output through the

organization. Results, presented in columns 5 and 6 of Table 8, reveal that there is no influence of aggregated landholdings of trainees on the commercialization behavior of non-trainees.

7. Discussion

In this paper, we argue that the motivation of members and leaders and their internal coordination and communication plays an important role in the ability of RPOs to aggregate a sufficient amount of produce from their members to take advantage of economies of scale and possibly negotiate higher prices for their members. In the absence of adequate consideration of such coordination issues, development interventions aimed at supporting RPOs may not fulfill their full potential.

Our theoretical model, an adaptation of a standard coordination game, predicts that a low level of uncertainty about the actions and/or beliefs of others regarding one's own actions can cause so-called strategic uncertainty, which leads to variations in the type of equilibrium that is reached. In an RPO context, this means that changes in an individual's beliefs concerning a minimum number of other members who are committed to sell through the organization may lead to large differences in the amount of output aggregated for collective commercialization.

We have tested our model's predictions using a sample of groundnut RPOs in Senegal. Our study constitutes an RCT where our intervention consists of a three-day training administered to randomly selected organizations and randomly selected members and leaders in varying numbers. Using three rounds of data (baseline, endline and groundnut commercialization data) we assess the effect of our intervention on commercialization behavior of non-trained farmers nine months after the training.

Although limited in power, our study generates interesting results. First, it suggests that our intervention has significantly affected the quantity commercialized by members of the treatment group, which is in line with our expectation that the training has altered the level of members' aversion to strategic uncertainty. Second, we find that this effect is reinforced by the number of leaders who were trained. However, we find no effect with respect to the total number of members that were trained or any evidence that training at least one leader, the chair, family members, trustworthy individuals or larger farmers affects members' commitment to the organization above and beyond the effect of having at least one trained individual. These results suggest that leadership is not necessarily the responsibility of a single individual as suggested implicitly in the literature. Rather, our results suggest that a sufficient number of influential, informed and visible individuals may have more influence on the behavior of regular members.

As we find no evidence that larger farmers or trusted individuals exert a larger influence on commercialization behavior, our results may then in part be driven by a change in the motivation of leaders themselves and thereby their willingness to orientate the RPO towards collective commercialization. This effect may be reinforced if several leaders of a particular organization attended the training. In this case, it is not so much that individuals expect that a larger quantity will be aggregated but that the renewed motivation of leaders may affect results. While the operational consequence of the findings remain unchanged –collective commercialization involves larger quantities of groundnuts when several leaders are involved – the mechanisms at play need to be further understood. This is something we are studying in a follow up interventions with these groups.

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Tables

Table 1: Correlates of past collective commercialization behavior

Dependent: quantity of groundnut commercialized through RPO last year (kg)					
	(1)	(2)	(3)	(4)	(5)
Strategic uncertainty aversion	-121.112				-111.412
	(53.076)**				(59.655)*
Risk aversion		-42.672			-17.436
		(103.281)			(107.936)
Preference for present			-0.001		-0.001
			(0.001)*		(0.001)
Altruism vis-à-vis other members				-1.851	-1.414
				(1.057)*	(0.973)
Literate	46.447	44.632	40.694	44.523	39.292
	(56.168)	(58.496)	(53.163)	(53.972)	(54.993)
Male	-19.826	-24.633	-25.925	-26.493	-18.593
	(69.388)	(67.528)	(71.377)	(71.669)	(65.892)
Age	1.706	2.161	1.891	2.324	1.462
	(2.651)	(2.806)	(2.542)	(2.716)	(2.562)
Land owned (ha)	6.611	6.437	6.934	6.011	7.007
	(4.650)	(4.522)	(4.699)	(4.609)	(4.542)
Leadership position	244.788	250.089	253.448	249.577	239.825
	(167.171)	(177.977)	(166.136)	(166.785)	(169.744)
Size of RPO	28.645	27.826	28.251	28.027	28.291
	(19.173)	(19.860)	(19.232)	(19.102)	(19.862)
Federation dummy	-59.065	-58.140	-58.276	-60.712	-59.695
	(24.551)**	(25.481)**	(24.525)**	(25.416)**	(25.818)**
Constant	-514.983	-495.848	-504.018	-408.350	-359.789
	(564.538)	(648.913)	(557.126)	(515.017)	(600.198)
R^2	0.26	0.25	0.26	0.25	0.27
N	240	240	240	239	239

Note: OLS estimates. Standard errors clustered at group level in parentheses.
** p<0.1; ** p<0.05; *** p<0.01*

Table 4: Intended and actual organization-level treatment

RPO id	*Intended treatment*			*Actual treatment*		
	to	*me*	*le*	*to*	*me*	*le*
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	1	0	1
7	1	0	1	1	0	1
8	*1*	*1*	*0*	*1*	*0*	*1*
9	*2*	*1*	*1*	*2*	*0*	*2*
10	2	2	0	1	1	0
11	3	0	3	2	0	2
12	3	1	2	1	1	0
13	*3*	*1*	*2*	*4*	*1*	*3*
14	3	1	2	3	2	1
15	3	2	1	1	1	0
16	3	3	0	3	3	0
17	4	0	4	1	0	1
18	4	1	3	2	2	0
19	4	2	2	4	2	2
20	4	3	1	4	3	1
21	*5*	*1*	*4*	*5*	*1*	*4*
22	5	1	4	4	2	2
23	5	2	3	5	2	3
24	5	3	2	4	3	1
25	6	2	4	6	2	4
26	6	3	3	6	3	3
27	6	4	2	6	5	1

Table 5: Experimental integrity

	Mean (Std. Dev.)	Binary treatment (RPO invited to training)	# individuals invited to training	# leaders invited to training
	(1)	(2)	(3)	(4)
Quantity commercialized through RPO last year	149.59	0.000	-0.000	-0.000
	(446.62)	(0.000)	(0.001)	(0.000)
Strategic uncertainty aversion	0.15	-0.014	-0.704	-0.549
	(0.36)	(0.050)	(0.473)	(0.340)
Literate	0.27	-0.007	0.020	-0.095
	(0.44)	(0.062)	(0.252)	(0.193)
Male	0.40	-0.037	-0.476	-0.347
	(0.49)	(0.080)	(0.380)	(0.280)
Age	41.72	0.001	0.007	-0.001
	(14.34)	(0.001)	(0.008)	(0.007)
Land owned (ha)	3.82	-0.010	-0.027	-0.017
	(5.94)	(0.005)*	(0.023)	(0.014)
Size of RPO	31.15	0.017	0.014	0.016
	(4.33)	(0.021)	(0.098)	(0.080)
Federation dummy	5.82	-0.004	0.052	0.113
	(3.49)	(0.022)	(0.116)	(0.073)
Constant		0.319	2.322	0.921
		(0.633)	(2.941)	(2.389)
R^2		0.08	0.07	0.17
N	240	240	240	240

Note: OLS estimates. Standard errors clustered at group level in parentheses.

** p<0.1; ** p<0.05; *** p<0.01*

Table 6. Changes in level of aversion to strategic uncertainty.

		Share of respondents with above minimum possible level of aversion to strategic uncertainty		
Sample	# obs.	Baseline	Endline	Diff : p-value
		(1)	(2)	(3)
A. Trainees	64	0.15	0.00	0.001
B. Non-trainees in treatment group	201	0.14	0.07	0.013
C. Non-trainees in control group	39	0.18	0.13	0.486
Diff A-B: p-value		0.892	0.0198	
Diff B-C: p-value		0.6340	0.3276	

Table 7. Treatment effects

Dependent: quantity commercialized through RPO - endline						
	(1)	(2)	(3)	(4)	(5)	(6)
At least one individual	137.410	148.628	148.109	101.277	119.470	113.021
trained in RPO	(76.470)*	(106.144)	(109.768)	(115.155)	(97.352)	(112.303)
# individual trained		-3.013	-44.904	-17.078	-1.921	-44.174
		(19.595)	(27.805)	(28.849)	(18.601)	(28.210)
# leaders trained			73.967			71.323
			(36.234)*			(33.777)**
At least one leader				118.919		15.638
trained				(150.248)		(137.074)
Chairman of RPO trained					67.897	67.250
					(105.900)	(99.850)
Constant	440.639	443.593	475.436	414.658	422.056	449.162
	(308.661)	(308.768)	(298.405)	(293.710)	(317.526)	(310.445)
R^2	0.14	0.14	0.18	0.16	0.15	0.19
N	240	240	240	240	240	240

*Note: OLS estimates. Standard errors clustered at group level in parentheses. * p<0.1; ** p<0.05; *** p<0.01*

All estimations include controls for quantity commercialized through the RPO in previous year, household head literacy status, age and gender, total land under management, leadership status within the RPO, size of RPO and dummies for organization's membership in federations.

Table 8. Alternative treatments

Dependent: quantity commercialized through RPO - endline						
	(1)	(2)	(3)	(4)	(5)	(6)
At least one individual trained in RPO	150.364 (71.856)**	146.853 (67.060)**	98.098 (89.484)	143.936 (66.946)**	151.208 (67.659)**	151.676 (67.037)**
# individual trained	-2.876 (12.612)	-11.650 (14.147)	-2.781 (12.438)	-21.093 (16.541)	-5.909 (14.905)	-13.401 (14.491)
At least one family member trained	-3.005 (43.656)					
# family link with trainees		15.862 (12.470)				
At least one trustworthy individual trained			55.334 (64.738)			
# trainees with high trust				24.964 (15.144)		
Largest landholding among trainees					0.624 (1.766)	
Total landownership size of trainees						4.437 (3.201)
Constant	442.863 (152.711)***	445.405 (151.813)***	442.555 (152.105)***	428.564 (151.718)***	447.164 (152.637)***	466.956 (152.639)***
R^2	0.14	0.15	0.15	0.15	0.14	0.15
N	240	240	240	240	240	240

*Note: OLS estimates. Standard errors clustered at group level in parentheses. * p<0.1; ** p<0.05; *** p<0.01*

All estimations include controls for quantity commercialized through the RPO in previous year, household head literacy status, age and gender, total land under management, leadership status within the RPO, size of RPO and dummies for organization's membership in federations.