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Do Development Projects Crowd Out Private-Sector Activities?

A Survival Analysis of Contract Farming Participation in Northern Ghana

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ABSTRACT

Contract farming (CF) is attractive as a possible private-sector-led strategy for improving smallholder farmers' welfare. Yet many CF schemes suffer from high turnover of participating farmers and struggle to survive. So far, the dynamics of CF participation have remained largely unexplored. We employ duration analysis to examine factors affecting entry into and exit from different maize CF schemes in northern Ghana, focusing specifically on the impact of development projects on CF entry and exit. We find that agricultural development projects reduce the likelihood of scheme entry and increase the likelihood of exit. Our findings confirm concerns that, if interventions are not planned in accordance with relevant private-sector actors, private-sector initiatives can be hindered by competing development projects.

Keywords: contract farming; duration analysis; private-sector-led development; development projects; Ghana

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1. INTRODUCTION

Contract farming (CF) has attracted considerable attention over the past decades. In a CF arrangement, an aggregating or processing firm and a farmer enter into an oral or written contract. The farmer produces the agricultural products while the firm retains responsibility for input provision and technical assistance and marketing (Bellemare 2012; Glover 1984). It is a popular institutional arrangement in transitional and developing countries. On the one hand, it guarantees the quality and quantity of inputs or raw materials for processors, traders, and exporters; on the other hand, it is a means of providing credit in the form of inputs and ensures a market for the produce of farmers (Swinnen and Maertens 2007).

A number of case studies show that CF can increase agricultural productivity and profitability, increase farm income (Bellemare 2012; Maertens and Swinnen 2009; Wang, Wang, and Delgado 2014; Warning and Key 2002; Winters, Simmons, and Patrick 2005), and also improve other welfare measures (such as subjective well-being—Dedehouanou, Swinnen, and Maertens 2013). These successful examples raise hope that this could be a private-sector-led strategy for inclusive and sustainable economic growth and poverty reduction in less-developed countries (Glover 1984; Kolavalli, Mensah-Bonsu, and Zaman 2015).

Aside from a range of positive examples, a fair amount of CF schemes struggle to achieve or sustain the anticipated success. Smallholder farmers do not always benefit from CF, and contracting firms do not necessarily thrive (Brambilla and Porto 2011; Glover 1987; Key and Runsten 2002; Porter and Phillips-Howard 1997). The CF schemes are marked by considerable dynamism, with frequent entry and exit by both farmers and contracting firms (Barrett et al. 2012). Yet this phenomenon has largely remained ignored or unexplained.

In this study, we use original survey data from northern Ghana to understand the dynamics of smallholder farmers' participation in CF schemes. Our study makes three main contributions to the current literature on CF. First, we look at CF schemes for maize, the main staple crop of the region we study. Many CF studies focus on arrangements with high-value crops where quality and market coordination are critical, but relatively few focus on undifferentiated staple food grains such as maize (Barrett 2008). Our research reveals that a number of maize CF schemes, both foreign and locally managed, operate in the Upper West Region. Farmers are mainly attracted by access to inputs on credit under CF, especially mineral fertilizer. CF operators mainly strive to have a more stable supply of high-quality maize. High repayment requirements are mentioned as the main reason for exiting CF.

Second, we use a dynamic framework to analyze farmers' entry and exit decisions regarding CF schemes. Smallholder farmers' frequent entry into and exit from CF can be problematic for the sustainability of CF schemes, especially if firms face fixed entry and exit costs—for example, due to screening and farmer training at scheme entry or farmers' default at scheme exit. Moreover, profitability of scheme participation can increase over time due to increased familiarity with specific inputs and new agricultural practices. High CF participant turnover and shorter scheme participation durations can significantly reduce overall scheme profitability, hence lowering profitability for participating farmers and further reducing CF participation (for example, Brambilla and Porto 2011).

Most empirical studies analyze the drivers of CF participation in a static, binary regression model. They focus on demographic and economic factors in explaining CF participation (Wang, Wang, and Delgado 2014). Yet farmers are typically exposed to CF schemes at different times. Hence, the use of static models can give biased estimates of who enters into or exits from CF schemes, especially when there are relatively high turnover rates in CF participation. The dataset for this analysis is collected as cross-sectional data. Yet it contains recall data on the key indicators of interest, which allows us to employ duration models for smallholders' entry into and exit from CF.

We look at three districts in Ghana's Upper West Region. CF participation increased over the past seven years, and in 2016 (at the time of the survey) up to 46 percent of maize farming households had at some point participated in CF. However, only half of them still participated in CF. We find that both entry into and exit from CF is not significantly affected by asset or livestock holdings. Yet vulnerable

households—such as female-headed households, households with less land, and households that experience shocks—are less likely to enter CF and more likely to exit CF. Social capital in the form of association membership is related to a higher likelihood of entering schemes but also a higher likelihood of exiting schemes. Households with a source of nonfarm income remain longer in CF schemes.

Third, we look at the extent to which the presence of governmental and nongovernmental development projects in the community affect participation in CF. The possible impact of projects from nonmarket institutions on private-sector activities is a pertinent issue. When they deliver complementary services, interventions from nonmarket institutions can improve the effectiveness of the private sector or enhance the capacity of smallholders to interact with the private sector (Barrett et al. 2012). In a review conducted by Barrett et al. (2012), the role of nongovernmental organizations (NGOs) and their projects consistently showed as positive and significant in initial and continued participation in CF.

However, when the inputs and services they offer are similar to those that the private sector aims to provide, such interventions run the risk of crowding out the private sector (Ricker-Gilbert, Jayne, and Chirwa 2011). Moreover, development projects may foster a dole-out mentality among participants, threatening loan repayment, CF scheme profitability, and sustainability. This concern was particularly echoed during our scoping fieldwork by claims of firms and aggregators that their business and their contractual arrangements with farmers were being crowded out by development projects that compete with them or perpetuate a dole-out mentality.

Evidence of private-sector crowding out has been shown under a diverse range of settings—for example, in cases of provision of government fertilizer subsidies (Jayne et al. 2013; Ricker-Gilbert, Jayne, and Chirwa 2011), government health insurance programs (Gruber and Simon 2008), or unemployment insurance schemes (Cullen and Gruber 2000). It has mostly received attention in settings with large-scale government programs, but less so for smaller-scale development projects. To our knowledge, there exist no studies on the crowding-out effect of development projects on contract farming.[1]

We find that the presence of agricultural projects affects participation in CF. On the one hand, CF schemes collaborate with governmental and nongovernmental development agencies for training and capacity building for their management staff or farmers. On the other hand, a range of development projects take place independently of the CF schemes. Our analysis shows that the presence of such agricultural projects in the community lowers entry into CF and increases exit from it, whereas nonagricultural projects do not affect CF participation. Exit from CF is higher in the presence of maize-focused projects, but not of nonmaize agricultural projects.

Section 2 gives a conceptual overview of possible pathways of crowding in or out of the private sector due to nonmarket projects. We describe the study background in Section 3, describe the study methodology in Section 4, and discuss our results in Section 5. We conclude in Section 6.

[1] In this paper we refer to crowding out of CF participation due to the presence of development projects. Different CF schemes may indeed have competed with one another, yet we have too few observations of farmers who sequentially or simultaneously participate in different schemes. Hence, it was not possible to explore interscheme competition analytically in this paper.

2. PUBLIC AND PRIVATE-SECTOR RESPONSES TO FARMERS' CONSTRAINTS: CROWDING IN, OUT, OR MORAL HAZARD?

Many smallholder farmers operate in an environment of missing, failing, or imperfect markets for inputs and outputs, credit, and risk (de Janvry, Fafchamps, and Sadoulet 1991; Mather, Boughton, and Jayne 2013). Farmers' participation in agricultural markets is constrained by production-related factors such as insufficient access to productive assets, financial assets, and production technologies (Barrett 2008; Mather, Boughton, and Jayne 2013). It is also constrained by consumption-related factors such as lack of insurance mechanisms against uncertainty over food prices and food availability (Mather, Boughton, and Jayne 2013). Finally, accessibility and transaction costs constrain farmers' and traders' participation in agricultural markets. Especially in more remotely located communities and regions, high transport costs limit farmers' and traders' engagement in markets. This renders markets thinner and more volatile, further reducing incentives for market participation (Barrett 2008; Jayne, Mather, and Mghenyi 2010; Omamo 1998).

Interventions that address market failures and help improve smallholder market participation hold substantial promise to reduce poverty (Barrett 2008; de Janvry and Sadoulet 2009; de Janvry, Fafchamps, and Sadoulet 1991; Fafchamps 1992; Goetz 1992, 1993). During the past decades a significant number of government and donor projects have been directed to increase smallholders' productivity and encourage market access. There are numerous examples of large- and small-scale interventions aimed at increasing technology adoption through extension service provision, provision of subsidized farm inputs, or facilitating farmers' access to credit (for example, Fan, Gulati, and Thorat 2008; Ricker-Gilbert, Jayne, and Chirwa 2011). Some interventions focus on improved access to market information—for example, through information and communication technology (Aker 2011; Fafchamps and Minten 2012)—whereas others facilitate linkages between input suppliers and rural markets through rural agro-dealer networks (Kelly, Adesina, and Gordon 2003).

At the same time, the private sector has developed strategies to operate in imperfect markets, such as through CF (Key and Runsten 2002; Swinnen and Maertens 2007). Contracts can reduce market failures for smallholder farmers by provision of inputs, provision of credit, and reduction of marketing risks. Moreover, contracting firms mitigate market failures that affect their operations by generating a guaranteed supply of produce with specific characteristics. Finally, CF arrangements can also reduce transaction costs for both the participating farmers and the organizing firms (Key and Runsten 2002).

Often development projects and private-sector activities do not occur in isolation but take place in the same operational areas. The services they offer can be complementary, substitutes or duplicates, or independent. The literature on agricultural extension and advisory services also emphasizes that in some instances conflicting or contradictory messages and advice are being promoted by development projects, NGOs, and private-sector and government agencies (Ragasa, Mazunda, and Kadzamira 2015). It is therefore a valid question to ask how they affect one another. Yet the literature on CF and development projects remains largely silent on that question. We distinguish three possible scenarios of impact of development projects on CF: no influence, crowding in, and crowding out.

First, a development project may have a clearly distinct scope that does not interfere directly with CF activities, either because it offers a different range of services—for example, health or education interventions—or because it has different target beneficiaries. Second, a development project may benefit CF scheme participation if it, accidentally or purposively, offers complementary or supplementary services to CF participants or contracting firms. Barrett et al. (2012) note that the presence of NGOs and farmer groups may be beneficial for the establishment of successful CF arrangements. They refer to scenarios in which NGOs can facilitate technical trainings, initial input provision, and recruitment of commercial buyers for contracting firms.

Third, a development intervention may hinder the establishment or sustained operation of contracting firms. Such projects could reduce farmers' incentives to engage in commercial CF schemes. When farmers participate in CF mainly to alleviate specific market constraints, they may refrain from entering CF or may exit CF if they find other means to overcome some of those constraints. Hence, CF participation rates may decrease in the presence of development projects that address similar market constraints at a lower cost to the farmer.

Even when the addressed market failures and offered services of CF schemes and projects do not strictly overlap, private-sector actors often voice the concern of moral hazard problems that may arise when individuals are frequently exposed to development projects. Concerns are raised that projects possibly create and perpetuate a dole-out mentality by providing products and services at below-market prices or for free. Even where products are offered on credit, many projects do not succeed in strictly enforcing repayment due to weak enforcement mechanisms and short project cycles (Kelly, Adesina, and Gordon 2003). Past experiences in the community with development projects coupled with the prospects of such projects in the future could result in strategic default and lower overall participation in CF (Poulton, Dorward, and Kydd 1998).

3. BACKGROUND

During the past decade, Ghana has become known for its stability, good governance, and relatively well-developed institutions (Cooke, Hague, and McKay 2016). This has rendered the country attractive to donors, leading it to be called a "donor darling" in West Africa (Hughes 2005; Kamstra and Knippenberg 2014). Ghana has experienced steady economic growth since 2005, and in 2010 Ghana officially changed its status from a low- to middle-income country (Cooke, Hague, and McKay 2016). Yet poverty reduction and the incidence of poverty has not been equal throughout the country. The northern regions of Ghana, especially the Upper East Region, Upper West Region, and Northern Region, still experience high poverty rates (Cooke, Hague, and McKay 2016). Continuing their engagement in Ghana and yet aiming to address the neediest populations, nongovernmental projects are gradually reducing their activities in the south and becoming more prominent in the north.

Our study focuses on the Upper West Region. That region has the highest level of poverty in Ghana, with 70.7 percent of its population living below the poverty line in 2013 (Ghana Statistical Service 2014). The population is largely rural and depends mostly on subsistence agriculture. Agroecologically, the region belongs to the West African semiarid savannah, with a unimodal rainfall pattern with one wet and one dry season per year (Rademacher-Schulz, Schraven, and Mahama 2014). Maize is the main cereal crop produced in the Upper West, representing 48 percent of the cereal crop area in the three districts of our study (based on official data received from the Statistics, Research and Information Directorate, Ministry of Food and Agriculture 2015).

The Upper West Region has a relatively high concentration of maize CF schemes. Due to the dry climate, maize here can more easily be dried and preserved, and is therefore less prone to mold and aflatoxin contamination than in other parts of Ghana (oral communication with Masara management). Moreover, the area faces a range of market failures that makes CF arrangements attractive to both aggregators and smallholder farmers. These are mostly organized as interlocked contracts, in which inputs are provided in-kind to the farmers, and the costs of those inputs are subtracted from the price paid for the harvest.

The most prominent and well-known CF scheme in northern Ghana is organized by the Masara N'Arziki farmers' association (generally referred to as Masara). Aside from the Masara scheme, a number of smaller-scale, homegrown maize CF schemes exist in the Upper West, set up by local farmers or aggregators. At least 10 different local CF schemes were identified in the Upper West Region during preparatory qualitative fieldwork.

The Masara CF Scheme

Masara was created in 2009 by two major private agribusiness firms—Wienco and Yara (Amanor 2011). It is registered as a nonprofit organization with the overall objective of using maize growing as a source of prosperity (Guyver and MacCarthy 2011). However, it is essentially set up as a CF scheme, and association membership is possible only through CF participation. Masara strives to be self-sustained in terms of funding and considers turning itself into a profitable enterprise, possibly changing its status from a nonprofit to a for-profit association (Prorustica 2013; oral communication with Masara management and field staff).

Farmers that participate in the Masara association engage in a written contract with Masara. They receive a fixed package of quality inputs and extension services, but they must pay back a specified number of maize bags during harvest season. The exact amount of that payback is calculated based on the principle that farmers return the value of the inputs they have received. This arrangement provides an opportunity for the founding agribusiness firms to disseminate agricultural inputs. The input package consists of Actyva fertilizer from Yara and herbicides and hybrid maize seeds from Wienco.

Originally, farmers had to sign up in joint liability groups of 5 to 10 farmers. Farmers were encouraged to cultivate on plots that were closely located. If one farmer did not pay during harvest season, the other members were equally excluded from the program (Prorustica 2013). Yet individual farmers with sufficient land and credibility were also accepted in the scheme.

Most packages contain imported hybrid maize seed: Pannar 53 or Pannar 12. Farmers can request a less expensive package with Obatanpa seed instead of Pannar, but such requests are rare. Obatanpa, an open-pollinated maize variety, was released in Ghana in 1992 and is currently the dominant maize variety (Ragasa et al. 2013). Overall, it is estimated that Pannar varieties produce 15 to 60 percent higher yields and are on average 18 to 90 percent more profitable than Obatanpa, although with greater use of fertilizer (Ragasa et al. 2013; Tripp and Ragasa 2015; IPA/IFPRI/SARI 2016).

For several years, CF participation was the only means for smallholder farmers to acquire Pannar seeds in Ghana. Wienco sold some of the seed to larger farmers, local CF schemes, and government programs but provided only a small amount to seed dealers (Tripp and Ragasa 2015). Only in 2015 was Pannar 53 officially released in Ghana, whereas the release of Pannar 12 is still pending at the time of writing (Tripp and Ragasa 2015).

With time, Masara made several adjustments in order to reduce problems of default and scheme exit. Despite a very low default rate of less than 4 percent in 2015 (oral communication with Masara management), scheme exit was high. According to the Masara management, the default of one group member led to high overall exit rates from the scheme. In 2015, Masara therefore abandoned the approach of joint liability groups. Moreover, new entrants were offered a package with Obatanpa rather than the more expensive Pannar. Only if those farmers succeeded in fulfilling the repayment requirements would they be allowed to get a more expensive package with Pannar in the following year. In principle, farmers are also required to sell their excess produce to Masara. In practice, that is rarely done and is not strictly enforced (oral communication with Masara management and field staff).

Masara started with 1,250 farmers in 2009 (Prorustica 2013). By 2015, about 10,000 farmers participated in the Masara CF scheme (oral communication with Masara management). In that period, Masara expanded operations to new districts and regions but also stopped its operations in other areas. The activities in the Brong-Ahafo Region and around Tamale, the capital of the Northern Region, have dwindled to a few hundred acres. In these regions especially, the scheme encountered challenges for repayment and continued participation. According to Masara management, the presence of development projects reduced interest in participating in Masara and increased hesitance to fulfill repayment requirements. Communities and farmers in these areas are more frequently beneficiaries of development projects compared with the more remotely located communities in the Upper West Region where Masara has successfully increased its operations.

Akate Farms and Other CF Schemes

Akate Farms, the most active aggregator in our case study area, began its CF activities in 2011, and rapidly expanded the number of CF farmers from 156 in 2011 to 695 in 2015. Its primary objective is to ensure a consistent supply of quality maize to produce feed for its poultry farm. The Akate CF scheme operates very similarly to the Masara scheme. CF participants sign a written contract and receive a fixed input package consisting of fertilizer; Obatanpa, Pannar 12, or Pannar 53 hybrid maize seeds; and herbicides. Upon request, Akate Farms can also provide tractor and shelling services. For farmer training and extension advice, Akate collaborates with extension officers from the Ministry of Food and Agriculture. The amount of maize requested to repay the received inputs is also similar to the Masara repayment, but additional payment is required for the tractor and shelling services. Unlike Masara, Akate outgrowers are not required to sell all output to Akate.

Other CF schemes range in size from 25 up to 700 participating farmers. Larger schemes and those that provide more inputs typically use written contracts, whereas smaller schemes with lesser inputs often rely on verbal agreements. The smaller CF schemes do not provide hybrid maize seeds to the contract farmers and generally have more flexible input packages. Aggregators explained that the main

motivation to organize the CF schemes is to have a more consistent supply of maize, access good-quality maize, and reduce search costs and haggling over prices at the spot market. Many of the CF schemes in our research area have recently received support from NGOs (mainly USAID's ADVANCE project) or the government (as part of the Savannah Agricultural Development Authority program) in the form of capacity-building activities, provision of training for the CF participating smallholder farmers on agricultural practices and farm business, and sponsoring of some business assets for the aggregator, such as a laptop. The aim of these NGO and governmental organization projects is to improve the capacity of the aggregators to successfully organize and scale up their CF business. Except for the organization of training, they do not interfere directly with CF participating farmers.

4. METHODOLOGY

Data

The empirical data analysis is based on an original dataset collected in February to March 2016 in three districts (Sissala East, Sissala West, and Wa East) in Ghana's Upper West Region. Those districts have the highest maize production and the highest concentration of maize CF schemes in the Upper West Region (based on official Ministry of Food and Agriculture data from 2014 and fieldwork in 2015). For each district, data were collected using a two-step stratified random sampling method. First, all communities were listed and categorized into two strata: communities with CF schemes and communities without CF schemes. A total of 13 communities were randomly selected per district, with the number of communities selected per strata proportional to the total number of communities per strata.

Second, for each community, a full listing of maize-growing households was made with the help of agricultural extension agents. In the without-scheme communities, 15 maize-growing households were randomly selected. In the with-scheme communities, households were divided into strata according to scheme membership, after which there was a random selection of households within each strata proportional to the number of households in the strata. After removing four households with incomplete information, we have a total of 1,261 households.

The household questionnaire contains different modules that ask about socioeconomic and farm characteristics. Data about assets were reported for the time of survey, as well as recall data for one year ago and for the year 2010. Detailed information was acquired about participation of household members in CF and association membership during the past 10 years. We asked the respondents in which year they first joined a specific CF scheme or association as well as the year of exit where applicable. This means that we do not have adequate information on multiple entry and exit decisions. Decisions are modeled as single entry and single exit decisions, and therefore we possibly overestimate households' CF participation. It is expected that this reduces the accuracy of parameter estimates in the empirical models. However, our oral communications with a few technical officers and farmers in the study sites during our preparatory survey fieldwork suggest that multiple entries into the same scheme in a duration of 10 years are unlikely, although it is possible for some farmers to move from one CF scheme to another CF scheme. Thus, we do not expect substantial overestimation of our results. Moreover, given that the recall data that we use in our analyses are mainly related to salient events and households' key assets, concerns over recall decay and data quality are limited (Beegle, Carletto, and Himelein 2012).

Community data were collected using a community questionnaire. That instrument was designed to elicit information on key characteristics such as infrastructure, population, and presence of associations, groups, and organizations in the community. Moreover, the questionnaire asked whether any CF activities and governmental and nongovernmental development projects took place during the past 10 years in the community. If so, we asked when the CF scheme started and in which year it ceased operating in the community.

Estimation Strategy

We use duration analysis to model households' entry into and exit from CF. Duration analysis, also called survival analysis or time-to-event analysis, estimates the length of time that elapses from the beginning to the end of a certain event, or until the time of measurement (Greene 2008). A key concept in duration analysis is the hazard function, which is a function that estimates the "risk" of an observation to exit the current state of the variable of interest. With $T \geq 0$ being the duration of time to the event, also called the survival time, the conditional hazard function at time t can be written as follows (Lancaster 1990):

$$h[t; X(t)] = lim_{s \to 0} \frac{P[t \leq T < t+s | T \geq t, X(t+s)]}{h}. \quad (1)$$

The hazard, h, is a function of time t and a range of time-invariant and time-variant covariates $X(t)$.

Since scheme participation is on a yearly basis, we analyze discrete, rather than continuous, time periods. We analyze scheme entry and exit at the household level. In our CF entry analysis, we aim at identifying the risk of entering a CF scheme. In our exit analysis, we identify the risk of exiting a CF scheme. The choice of covariates is based on the conceptual framework described in Section 2 and on a review of the empirical literature on CF participation.

Several functional forms have been developed to analyze duration data with discrete time periods (Greene 2008). In parametric duration models, it is assumed that each individual has a baseline hazard with a specific distribution function (Greene 2008). A range of covariates can then shift the hazard multiplicatively (Schipmann and Qaim 2010). The most common distribution functions are the Weibull, exponential, lognormal, log-logistic, and Gompertz (Wooldridge 2002; Greene 2008). To determine which distribution function is most appropriate, one can use the Akaike information criterion (AIC) to evaluate the fit of different models (Lapple 2010; Schipmann and Qaim 2010).

Based on the AIC, we choose the Weibull functional form for the duration analysis of CF entry and the exponential distribution for the analysis of CF exit. The Weibull hazard function is as follows:

$$h[t; X(t)] = exp(\beta' X)\, pt^{p-1}, \tag{2}$$

where X represents the covariates, which can vary at time t, and p is a shape parameter. If $p > 1$, the hazard rate rises monotonically with time, but if $p < 1$ it falls monotonically with time. The exponential model is a special case of the Weibull distribution with shape parameter = 1 (Greene 2008). Our results are robust to different parametric distributions as well as when we apply the semiparametric Cox proportional hazard model (Cox 1972) (results available on request). We correct for possible bias in parameter estimates due to oversampling of CF-participating households by using sampling weights.

A duration analysis of CF entry and exit offers several improvements over the use of a simple binary model (typically probit or logit model) that analyzes CF entry or exit at one point in time. First, the analysis offers more insight into the dynamics of participation. This allows us to see not only who enters or exits CF, but also which farmers are more likely to enter first, and which farmers are more likely to exit the CF scheme in a shorter time period compared with others. Second, the model accounts for incomplete information due to censoring (Greene 2008). Some farmers may decide to enter the scheme at a later point in time that is not yet observed at the moment of data collection. Similarly, some CF participants are likely to exit CF at a later point in time.

Another advantage of a duration model is that it allows one to enter time-varying covariates. The time-varying covariates in our model include the presence of governmental and nongovernmental agricultural and nonagricultural projects in the community, our main variable of interest. Other time-varying covariates are the experience of a shock by the household, association membership, and the age of the household head.

The number of covariates that vary over time is limited due to survey data limitations. For example, for livestock, land, and household assets we do not have information for every year included in our duration model. We therefore settle for a one-time measure, recall data for the year 2010, the earliest year for which data are available. For most households this is before or during the first year of scheme entry, and arguably this is less endogenous than the available recall data for 2014 and 2015.

Scheme Entry Model

In analyzing the time of CF scheme entry, careful consideration must be made concerning the time at which a farmer can first decide whether or not to enter CF. In our case, the CF schemes did not approach farmers in the different communities at the same time. We therefore consider the start of the time of CF entry as the year before the first farmer in the community engaged in CF. This means observations are not included if, in a respective community, nobody participates in CF in the current and following year. For each community, we carefully made use of the household data, the community data, and information achieved from the semistructured interviews with aggregators in order to obtain an adequate estimate of

the year in which farmers could take part in CF. If the farmer started farming after the CF scheme started in the community, the entry duration starts at the time he or she started farming.

A concern in our analysis is whether the time-varying variables of interest—that is, presence of agricultural and nonagricultural projects—are strictly exogenous to CF entry. Overall, contemporaneous endogeneity should not be an issue. Since we condition on current and past covariates, the covariates are sequentially exogenous (Wooldridge 2002). However, there could be a reverse effect of the outcome variable on the time-varying covariate. Lancaster (1990) defined strict exogeneity as follows:

$$P[X(t,t+s)|T \geq t+s, X(t)] = P[X(t,t+s)|X(t)] \quad for\ all\ t \geq 0, s > 0. \tag{3}$$

Estimation bias would arise in the CF entry model if CF schemes purposively chose not to engage with farmers in communities where other projects were already ongoing. This could lead to a downward bias in the estimation of the impact of projects on CF participation. However, that bias may be limited since our empirical estimations are only on a sample of observations that are considered to have the opportunity of CF entry. Schemes only work in communities where farmers are willing to join, and they stop working in communities if too many farmers drop out or default. Once a scheme is operating in a community, whether or not to enter CF is a farmer's choice rather than the scheme's choice.

In addition, strict exogeneity could be violated if projects select communities based on the absence of CF schemes. This could lead to an overestimation of the negative impact of agricultural projects on CF participation. Yet our data and anecdotal evidence suggest that the choice of project locations is mostly independent of the presence of CF schemes. We find no significant pairwise correlation between the share of CF-participating households in a community and the presence of agricultural and nonagricultural projects in the community (Table A.1). Rather, we find significant positive correlations between the number of different CF schemes operating in a community and the number of agricultural (maize and nonmaize) and nonagricultural projects (mainly infrastructure, education, and livelihood projects) (Table A.1). Qualitative and quantitative information suggests that projects and schemes tend to work in locations with similar characteristics, such as communities that are more easily accessible and with a higher population density. We controlled for both variables in the scheme entry and exit estimation.

Scheme Exit Model

To analyze scheme exit, observations enter the empirical analysis at the time they first enter into CF. The key covariates of interest remain the presence of agricultural and nonagricultural projects in the community. In the exit model, estimation bias could arise if CF schemes, rather than farmers, choose to leave a community at the time another agricultural project starts up in the community. However, that scenario is unlikely. From our qualitative interviews with the management of the main CF schemes in the region, the choice about whether a CF scheme stops working in a community ultimately depends on the participation decisions of the community's farmers.

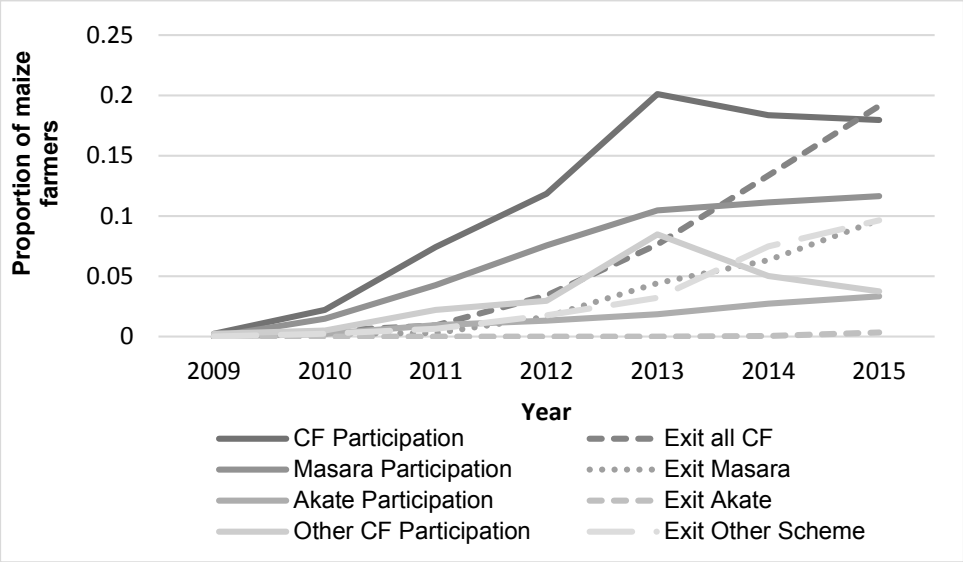
Similar to the entry model, biased estimates could also occur if projects choose not to locate where there is already a high degree of CF participation. As explained in the previous subsection, we do not anticipate this playing a big role in our case study and that bias, if any, would be very limited.

5. DESCRIPTIVE ANALYSIS

Dynamics of CF Participation

Figure 5.1 shows the share of households that participate in maize CF and the cumulative proportion of the households that have exited maize CF in each respective year in the three case study districts. We asked farmers to recall participation in maize CF over the past 10 years (that is, 2006–2016), but no entries were reported prior to 2009. This is in line with the start of CF schemes reported by scheme managers during qualitative interviews and information from community questinonaires. However, we cannot rule out that maize CF schemes that are not operating anymore have not been recalled by some of the respondents.

Figure 5.1 Evolution of current CF participation rates and cumulative CF exit rates



Source: Author's data.
Notes: CF = contract farming.

As time elapses CF participation increases, but so does CF exit, causing a stagnation in overall CF participation rates for 2014 and 2015. By 2015 the proportion of households that exited CF was higher than the proportion of CF-participating households. On average, farmers that participated in CF in 2015 were members for 2.7 years and 3 percent participated in two different CF schemes. Farmers that had exited CF by 2015 spent on average 1.3 years in CF (results not shown).

Farmers mainly join CF schemes to access agricultural inputs (Table 5.1). For more than three out of four farmers, access to fertilizer is one of the main reasons to participate in CF. Others also indicate access to the preferred seed (59 percent) and timely access to inputs (22 percent). Being able to sell maize, that is, having a guaranteed output market, is of lesser importance to CF participants (11 percent). Except for access to tractor services, we find no significant differences between the reasons for scheme entry of farmers still engaged in CF compared with farmers that have exited CF. When asked why they quit CF, farmers responded that repayment rates were too high (36 percent); they had defaulted (18 percent) or a person in their joint liability group had defaulted (7 percent); the scheme stopped in the community (15 percent); or services provided were not good (12 percent) (Table 5.2).

Table 5.1 Main reasons for participation in CF (proportion of CF farmers)

		If ever in CF	
Variable	**Ever in CF**	**In CF**	**Exit CF**
Access to fertilizer through credit	0.768	0.730	0.806
Access to preferred seed	0.593	0.582	0.604
Timely access to inputs	0.217	0.254	0.179
Have buyers or market for maize grain	0.108	0.165	0.050
Access to technical assistance	0.074	0.079	0.069
Timely access to tractor services	0.061	0.007	0.115***
Stable price of maize grain	0.014	0.021	0.006
Number of observations	743	540	203

Source: Authors' data.
Notes: CF = contract farming. Significant differences between in-CF and exit-CF households at * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 5.2 Main reason for exiting CF (proportion of exiting CF farmers)

Variable	**Frequency**	**Percentage**
Rates for repayment are too high	61	35.7
Past history of default	30	17.5
Some person of my joint liability group defaulted	12	7.0
The scheme has stopped in the community	25	14.6
Services provided were not good	21	12.3
Other	22	12.9
Total number of observations	171	100.0

Source: Authors' data.
Notes: CF = contract farming.

Table 5.3 shows some key socioeconomic characteristics of the maize-cultivating households in our research area. On average, 11 percent of the maize-growing households are female headed, and 26 percent of household heads have a polygamous marital status. An average household consists of three or four adults and three children. Household heads are on average 44 years old and did not receive any formal education (81.7 percent); 38.1 percent have relatives that hold official or traditional political office.

Table 5.3 Comparison of socioeconomic characteristics according to participation status in CF

Variable	All	Never in CF	Ever in CF	a	If ever in CF: In CF	If ever in CF: Exit CF	b
Female-headed household	0.110	0.155	0.057	***	0.048	0.065	
Polygamous household	0.262	0.278	0.244		0.219	0.268	
# Adults	3.566	3.577	3.554		3.508	3.601	
# Children	3.138	2.977	3.330	*	3.076	3.588	*
Age of household head	44.236	45.528	42.688	**	42.696	42.681	
Household head has no education	0.817	0.828	0.804		0.785	0.823	
Household connected with political traditional office	0.381	0.358	0.408		0.329	0.488	**
Association member	0.308	0.311	0.305		0.154	0.459	***
Nonfarm income (dummy)	0.540	0.532	0.550		0.625	0.474	**
Tropical livestock units in 2010[1]	3.541	3.073	4.101		3.150	5.063	
Tropical livestock units in 2015	3.180	3.031	3.359		3.594	3.122	
Household asset index in 2010[2]	1.939	1.831	2.069	**	1.985	2.154	
Household asset index in 2015	2.422	2.272	2.602	**	2.503	2.703	
Total farm size in 2010 (in acres)	5.570	4.517	6.831	***	7.342	6.313	
Total farm size in 2015 (in acres)	9.025	7.568	10.770	***	11.438	10.092	
Number of shocks since 2010[3]	1.930	2.015	1.828		1.452	2.209	***
# Agricultural projects in community	1.147	1.143	1.153		1.204	1.100	
# Maize projects in community	0.443	0.456	0.428		0.467	0.387	
# Nonmaize agricultural projects in community	0.705	0.688	0.725		0.737	0.713	
# Nonagricultural projects in community	1.421	1.338	1.519		1.582	1.456	
Electricity in community	0.746	0.752	0.738		0.740	0.736	
Input shop in community	0.080	0.069	0.093		0.124	0.062	**
Population in community	1965.152	1850.453	2102.534		2404.430	1796.814	**
Distance of community to road (in km)	4.770	8.185	0.679	***	0.347	1.015	
Number of observations	1,254	511	743		540	203	

Source: Authors' data.

Notes: CF = contract farming. [a] Significant differences between households that never and ever participated in CF at * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. [b] Significant differences between in-CF and exit-CF households at * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. [1] One cow equals 1 livestock unit, one donkey equals 0.8, one small livestock (goat/sheep/pig) equals 0.25, and one chicken/guinea fowl equals 0.04.[2] The household asset index is calculated as the first principal component of a polychoric principal component analysis on nonproductive assets and housing quality (Filmer and Pritchett 2001).[3] Shocks are asked at household level, and include agriculture and non-agriculture-related shocks.

We find that households that ever joined CF are less likely to be female headed, they have more children, and the household head is younger compared with households that never participated in CF (Table 5.3). Households that ever joined CF had significantly more assets and more land in 2010 and 2015 compared with non-CF households. They also live in communities located nearer to a road. If we compare households that had exited CF with households that were engaged in CF at the time of the survey, ex-CF households have significantly more children, are more likely to be connected to political officeholders, and are more likely to be an association member. In addition, the ex-CF households are less likely to have a source of nonfarm income, encountered more adverse shocks since 2010, are less likely to have an input shop in the community, and live in communities with smaller populations (Table 5.3).

Projects

The numbers of governmental organization and NGO development projects in the communities in our case study area have steadily increased over the past seven years (Table 5.4). By 2015, on average one or two projects take place in the community. Note, however, that some communities have no projects at all, while others have up to five ongoing projects. A smaller share of the projects is related to agriculture than the share related to nonagricultural projects. In 2009, about one in eight communities had one or two projects related to maize; that had increased to about one in four communities in 2015. Most, but not all, of those projects also worked on hybrid maize adoption, and about half of them provided free inputs.[2]

Table 5.4 Overview of project and CF scheme presence in sample communities (*n* = 39)

Variable	2009	2010	2011	2012	2013	2014	2015
# Projects (total)	0.59	0.69	0.77	1.10	1.33	1.51	1.82
	(0-3)	*(0-3)*	*(0-4)*	*(0-4)*	*(0-4)*	*(0-5)*	*(0-5)*
# Agriculture projects	0.18	0.23	0.33	0.51	0.59	0.62	0.69
	(0-3)	*(0-3)*	*(0-4)*	*(0-4)*	*(0-4)*	*(0-5)*	*(0-5)*
Maize-related project	0.13	0.18	0.18	0.21	0.21	0.21	0.28
	(0-2)	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*
Hybrid maize project	0.10	0.15	0.15	0.15	0.15	0.15	0.21
	(0-2)	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*
Maize projects with inputs provided	0.08	0.13	0.13	0.10	0.08	0.08	0.10
	(0-2)	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*
# Nonagricultral projects	0.41	0.46	0.44	0.56	0.72	0.87	1.08
	(0-2)	*(0-2)*	*(0-2)*	*(0-3)*	*(0-3)*	*(0-3)*	*(0-4)*
Livelihoods project	0.13	0.15	0.15	0.15	0.21	0.31	0.36
	(0-1)	*(0-1)*	*(0-1)*	*(0-1)*	*(0-1)*	*(0-3)*	*(0-2)*
Health project	0.10	0.10	0.10	0.13	0.15	0.18	0.18
	(0-1)	*(0-1)*	*(0-1)*	*(0-1)*	*(0-2)*	*(0-2)*	*(0-2)*
Infrastructure project	0.05	0.05	0.08	0.13	0.15	0.13	0.28
	(0-1)	*(0-1)*	*(0-1)*	*(0-1)*	*(0-1)*	*(0-1)*	*(0-1)*
Education project	0.13	0.15	0.10	0.15	0.21	0.26	0.26
	(0-2)	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*	*(0-2)*

Source: Authors' data.
Notes: Minimum and maximum amounts reported in parentheses.

There is a diversity of nonagricultural projects: livelihoods projects (such as cash transfer projects and cash-for-work projects), education projects (for example, renovation of school building), infrastructure projects (for example, borehole drilling, road improvements), and health projects (for example, sanitation campaigns). Again, we see an increase in the occurrence of such projects over time (Table 5.4).

[2] Unfortunately, we do not have information on the provision of free inputs or other services under the nonmaize agricultural and nonagricultural projects.

6. REGRESSION RESULTS

Tables 6.1 and 6.2 show the results of the duration analysis on CF scheme entry and exit. The hazard rates show the impact of the covariate on scheme entry and exit, respectively. Hence, for the entry (exit) models a hazard rate higher than 1 indicates a higher likelihood of entry into (exit from) CF, whereas a hazard rate below 1 indicates a lower likelihood of entry into (exit from) CF. To see how participation determinants may differ according to the scheme, we conduct the analysis for general scheme entry as well as for specific entry into the Masara, Akate, or other CF schemes. Similarly, we look at exit from any CF scheme, as well as from the Masara subsample. Due to the limited number of observations, we cannot do this for the Akate or other CF scheme subsamples. Finally, to understand scheme exit we also look at a subsample of the full sample from which we exclude all observations that report that CF exit was due to scheme exit from the community. For each subsample we run two models. In the first model we look at the number of agricultural projects in the community. In the second model we distinguish between agricultural projects that focus on maize and agricultural projects that do not focus on maize.

Table 6.1 Results of duration analysis of CF scheme entry (hazard rates)

	Full sample		Masara		Akate		Other CF scheme	
Variable	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Female-headed household	0.437***	0.435***	0.273***	0.273***	0.191**	0.192**	0.819	0.814
	(0.136)	(0.136)	(0.079)	(0.079)	(0.142)	(0.141)	(0.495)	(0.494)
Adults	0.992	0.992	1.018	1.017	1.155	1.155	0.812*	0.812*
	(0.046)	(0.046)	(0.051)	(0.052)	(0.116)	(0.118)	(0.091)	(0.092)
Children	1.036	1.036	1.057	1.056	0.961	0.962	1.082	1.082
	(0.038)	(0.037)	(0.047)	(0.047)	(0.091)	(0.089)	(0.065)	(0.066)
Household head had no education	1.379	1.359	1.804**	1.769**	1.418	1.419	1.033	1.018
	(0.341)	(0.341)	(0.425)	(0.419)	(0.584)	(0.587)	(0.424)	(0.432)
Age household head	1.082**	1.082**	1.060*	1.060*	1.255**	1.255**	1.050	1.050
	(0.034)	(0.033)	(0.035)	(0.035)	(0.123)	(0.122)	(0.049)	(0.048)
Age household head squared	0.999***	0.999***	0.999**	0.999**	0.997**	0.997**	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Link with political/traditional office	1.238	1.230	1.209	1.206	0.650	0.652	1.457	1.442
	(0.192)	(0.191)	(0.212)	(0.211)	(0.235)	(0.233)	(0.415)	(0.425)
Nonfarm income	0.974	0.970	1.062	1.051	0.980	0.983	0.824	0.820
	(0.142)	(0.141)	(0.197)	(0.193)	(0.323)	(0.316)	(0.235)	(0.233)
Tropical livestock units in 2010	0.999	0.999	1.001	1.001	0.935**	0.935**	1.001	1.002
	(0.009)	(0.009)	(0.007)	(0.007)	(0.029)	(0.029)	(0.011)	(0.010)
Household asset Index in 2010	0.904*	0.910	0.862*	0.869*	1.476***	1.472***	1.012	1.017
	(0.052)	(0.052)	(0.068)	(0.068)	(0.172)	(0.167)	(0.103)	(0.103)
Total land size in 2010	1.032***	1.032***	1.040***	1.039***	1.009	1.009	0.974	0.974
	(0.010)	(0.010)	(0.015)	(0.015)	(0.020)	(0.019)	(0.035)	(0.035)
Total land size in 2010 squared	1.000*	1.000*	1.000	1.000	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household shock	0.670**	0.674**	0.601**	0.602**	1.337	1.343	0.764	0.768
	(0.119)	(0.119)	(0.130)	(0.130)	(0.432)	(0.426)	(0.256)	(0.257)

Table 6.1 Continued

	Full sample		Masara		Akate		Other CF scheme	
Variable	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Association member	1.488**	1.486**	1.476	1.463	0.894	0.894	1.675*	1.676*
	(0.276)	(0.275)	(0.352)	(0.348)	(0.429)	(0.430)	(0.525)	(0.526)
Agriculture project in community	0.697***		0.696***		0.619***		0.685	
	(0.059)		(0.077)		(0.089)		(0.158)	
Maize project in community		0.802		0.807		0.588		0.776
		(0.126)		(0.152)		(0.290)		(0.299)
Nonmaize agricultural project in community		0.622***		0.621***		0.650		0.622*
		(0.080)		(0.098)		(0.213)		(0.151)
Nonagricultural project in community	0.995	0.981	0.904	0.882	1.131	1.138	1.169	1.148
	(0.089)	(0.088)	(0.087)	(0.095)	(0.216)	(0.203)	(0.296)	(0.279)
Electricity in community	0.654**	0.636***	0.555***	0.537***	0.197***	0.205***	0.558*	0.548*
	(0.109)	*(0.108)*	*(0.112)*	*(0.111)*	*(0.066)*	*(0.106)*	*(0.187)*	*(0.197)*
Input shop in community	0.874	0.860	0.879	0.864	0.538	0.538	0.623	0.609
	(0.209)	*(0.206)*	*(0.239)*	*(0.237)*	*(0.392)*	*(0.391)*	*(0.405)*	*(0.393)*
Log of population in community	1.449***	1.470***	1.263**	1.279**	0.765	0.755	1.440	1.462*
	(0.126)	*(0.128)*	*(0.135)*	*(0.134)*	*(0.312)*	*(0.344)*	*(0.320)*	*(0.330)*
Distance to road (community)	0.973**	0.973**	0.861***	0.859***	0.907***	0.909***	0.980	0.980
	(0.012)	*(0.012)*	*(0.026)*	*(0.026)*	*(0.029)*	*(0.032)*	*(0.013)*	*(0.013)*
p (shape parameter)	1.199***	1.206***	1.363***	1.372***	2.299***	2.295***	1.092	1.098
	(0.061)	*(0.061*	*(0.110)*	*(0.107)*	*(0.228)*	*(0.236)*	*(0.088)*	*(0.091)*
No. of obs.	5,117	5,117	4,784	4,784	2,711	2,711	3,868	3,868

Source: Authors' data.

Notes: Year effects are included in the model but are not shown here. Hazard rates are significant at *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; standard errors in parentheses.

Our results show that the presence of agricultural projects in the community results in significantly lower odds of entry into CF and higher odds of exit from CF (Tables 6.1 and 6.2). Both maize as well as nonmaize projects reduce CF entry in the full sample, although the effect of maize projects is only statistically significant when we use a dummy rather than a count variable for the presence of maize and nonmaize projects (results available on request). Scheme exit is mostly driven by projects that focus on maize, and we see no significant effect of other agricultural (nonmaize) projects. The presence of nonagricultural projects in the community does not affect the odds of scheme entry or exit. Distinguishing between agricultural and nonagricultural projects, and maize and nonmaize projects, offers an interesting placebo test and gives more insight into what drives the negative impact of development projects on CF participation. Our results indicate that the impact on scheme participation is mostly driven by projects that offer similar services related to maize or agriculture, rather than by a more general dole-out mentality that can arise from a broader subset of projects.

A number of other community characteristics also affect scheme participation. In accordance with the literature on transaction costs, we find that the odds of CF scheme entry is negatively correlated with community connection to the electric grid and community distance to the main motorable road, and it is positively correlated with a larger population size in the community (Table 6.1). Moreover, households are more likely to exit when their community is located further away from the road and less likely to exit

when the community has a higher population density (Table 6.2). Interestingly, the presence of an input shop in the community does not affect entry or exit from CF schemes. Hence, it may not be the presence of input providers as such but other aspects, such as timely access to inputs, sufficient and good quality inputs, or the receipt of inputs on credit, that drive CF participation.

Table 6.2 Results of duration analysis of CF scheme exit (hazard rates)

	Full sample		Masara		Sample excludes community exit	
Variable	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Female-headed household	1.603*	1.681*	0.467	0.427	1.796	1.772
	(0.456)	(0.489)	(0.325)	(0.287)	(0.706)	(0.729)
Adults	0.981	0.970	1.008	0.990	1.006	0.990
	(0.051)	(0.049)	(0.042)	(0.043)	(0.059)	(0.057)
Children	0.986	0.991	1.041	1.044	0.983	0.990
	(0.038)	(0.036)	(0.037)	(0.038)	(0.044)	(0.041)
Household head had no education	1.193	1.192	1.109	1.034	1.333	1.361
	(0.333)	(0.345)	(0.452)	(0.412)	(0.459)	(0.481)
Age household head	1.046	1.039	0.982	0.972	1.062	1.062
	(0.047)	(0.046)	(0.037)	(0.037)	(0.053)	(0.052)
Age household head squared	1.000	1.000	1.000	1.000	0.999	0.999
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Link with political/traditional office	1.038	1.024	1.301	1.225	1.166	1.187
	(0.182)	(0.173)	(0.246)	(0.227)	(0.252)	(0.241)
Nonfarm income	0.734*	0.700**	0.721*	0.667**	0.677**	0.583***
	(0.125)	(0.111)	(0.135)	(0.127)	(0.130)	(0.099)
Tropical livestock units in 2010	1.008	1.010*	0.995	0.997	1.006	1.009
	(0.005)	(0.006)	(0.007)	(0.006)	(0.008)	(0.008)
Household asset index in 2010	1.074	1.082	1.046	1.056	1.008	1.003
	(0.077)	(0.076)	(0.091)	(0.091)	(0.089)	(0.084)
Total land size in 2010	0.971**	0.967***	0.977	0.975*	0.976*	0.968**
	(0.012)	(0.012)	(0.014)	(0.015)	(0.014)	(0.014)
Total land size in 2010 squared	1.000**	1.000***	1.000*	1.000*	1.000*	1.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household shock	1.684***	1.623***	1.095	1.111	1.552**	1.465**
	(0.283)	(0.261)	(0.187)	(0.188)	(0.287)	(0.255)
Association member	1.236	1.263	1.381	1.396*	1.216	1.210
	(0.198)	(0.195)	(0.277)	(0.278)	(0.232)	(0.217)
Agriculture project in community	1.165*		1.208**		1.174**	
	(0.092)		(0.111)		(0.094)	
Maize project in community		1.559***		1.653***		1.974***
		(0.218)		(0.256)		(0.322)
Nonmaize agricultural project in community		0.965		0.959		0.836
		(0.114)		(0.139)		(0.121)

Table 6.2 Continued

Variable	Full sample		Masara		Sample excludes community exit	
	(1)	(2)	(1)	(2)	(1)	(2)
Nonagricultural project in community	1.109	1.076	1.099	1.053	1.094	1.040
	(0.087)	(0.086)	(0.108)	(0.103)	(0.095)	(0.090)
Electricity in community	0.922	0.902	1.561	1.359	0.792	0.769
	(0.181)	(0.174)	(0.437)	(0.402)	(0.172)	(0.160)
Input shop in community	1.375	1.332	1.219	1.248	1.508	1.402
	(0.453)	(0.440)	(0.452)	(0.447)	(0.525)	(0.493)
Log of population in community	0.621***	0.630***	0.563***	0.597***	0.662***	0.659***
	(0.076)	(0.075)	(0.075)	(0.083)	(0.095)	(0.090)
Distance to road (community)	1.017**	1.017**	0.983	0.977	1.016**	1.017*
	(0.007)	(0.008)	(0.042)	(0.041)	(0.008)	(0.009)
No. of obs.	1,203	1,203	957	957	1,165	1,165

Source: Authors' data.

Notes: Year effects and constant term are included in the model but are not shown here. Hazard rates are significant at *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; standard errors in parentheses.

In line with the literature on CF, socioeconomic characteristics help to explain CF participation. Except for Akate CF, CF participation is not significantly affected by several variables related to household wealth, such as assets or livestock, or to power, such as relations with traditional political officeholders. Yet, to some extent, we find that households that are more vulnerable—such as female-headed households, households with less land, and households that experienced shocks—are less likely to enter and more likely to exit CF. Such households may be more hesitant to take on additional risks associated with CF. Households with nonfarm income are likely to remain longer in the CF scheme. Association members are more likely to enter into CF but also are more likely to exit from CF. None of the CF schemes works explicitly with an agricultural association—hence association membership can be interpreted as social capital in our analysis. The shape parameter p indicates that the likelihood of entering CF increases with time (Table 6.1) as more farmers gain experience with the scheme and farmers have had more time to observe how the CF scheme benefits other farmers.

We find some differences in participation determinants for the different schemes (Tables 6.1 and 6.2). The likelihood of participating in Masara is greater among households headed by a person without any formal education, but we do not find this effect in the other CF schemes. Entry into Akate CF is more likely for households with less livestock and more assets, but the effect of total land size is not significant anymore. Association membership, household shocks, community population size, and distance to the road have no significant effect on Akate entry.

7. CONCLUSION

Contract farming has received considerable interest over the past years as a vehicle for private-sector-led poverty reduction. The current literature mainly focuses on demonstrating the impact of CF schemes on a range of welfare measures for CF participants, although studies are marred by methodological challenges. The dynamics behind CF participation, however, are largely ignored. Yet there is considerable dynamism in CF, with frequent entry and exit of both CF participants and CF schemes.

We use duration analysis to look at entry into and exit from maize CF in the Upper West Region in northern Ghana. The region is remotely located, but several CF schemes are present that focus on maize. We find that these schemes have a relatively high turnover rate of CF participation. By 2015, the share of households that had exited CF was larger than the share of households that were participating in CF. Frequent turnover of participants in the scheme can result in high inefficiencies for scheme operation and result in overall higher costs for operation, which ultimately lowers benefits from CF participation for smallholder farmers.

Our findings indicate that wealth as such does not determine CF participation. Yet CF schemes are not able to sustainably include the more vulnerable households, such as female-headed households, households with less social capital, households without other nonfarm income sources, and households that experienced shocks.

It is inevitable that many CF schemes operate in areas where other governmental and nongovernmental development projects are taking place. Those projects possibly strive to address similar constraints as CF typically addresses. On the one hand, we find that CF schemes in our case study area successfully collaborate with public services and donor organizations for the provision of extension services and capacity-building activities. On the other hand, several other development projects are also present, many of which start with a prespecified program and a distinct set of goals, and there is little or no opportunity for coordination with the private sector, such as CF schemes. We find that commercially oriented CF schemes experience lower participation rates and higher dropout rates when they act in the presence of other NGO or governmental development projects that provide similar services. Our measure of development projects is the presence and number of development projects in the community, as well as indicators of heterogeneity of those projects that are available in the dataset. These measures are not perfect, but as crude as they are, they offer insights on the interplay between development projects and private-sector initiatives. The results are robust to several econometric modeling specifications. Our results show that the presence of agricultural projects in the community results in significantly lower rates of entry into and higher rates of exit from CF. Scheme exit is mostly driven by projects that focus on maize and those that offer similar inputs and services; other agricultural (nonmaize) projects have no significant effect.

The finding that projects can crowd out private-sector initiatives is alarming. Whereas projects are typically of limited duration, private-sector activities, if profitable, can be present for a longer time and be self-sustaining rather than dependent on donor funding. In northern Ghana specifically, the Savannah Agricultural Development Authority strongly emphasizes the need for private-sector-led development. The Masara CF scheme is often referred to as a role model in the region. Yet, at the same time, our study shows that the presence of governmental and nongovernmental development projects can undermine such private-sector development strategy.

This paper suggests that more careful placement and planning of development projects is required. First, efforts could be made to minimize offering free inputs and services that crowd out private-sector activities in areas where private businesses are thriving. Second, development projects could focus on and reach out to the most vulnerable communities and households that do not benefit from private-sector operations.

This paper calls for more coordination between donors and the private sector and better investigation by donors on where to organize specific interventions so as not to compete in the services they offer and the audience they aim to reach. If more vulnerable households have more difficulty accessing the benefits of CF participation, projects that specifically address the needs of such households can play a key role in helping mitigate the possible inequality-enhancing effects that have been reported in other case studies (for example, Singh 2002).

Our study suffers from several shortcomings, which future researchers could address. First, having more detailed information on the interventions, having household-specific benefits from development interventions, and having more time-variant socioeconomic and community variables could help to better explain the pathways through which interventions interfere with CF participation. Second, panel data can be collected to better address self-selection into CF schemes. Third, our results do not shed light on the (heterogeneity of) profitability and welfare effects of CF participation. The presence of competing projects could be warranted in cases where CF does not benefit smallholder farmers, such that this does not provide a valid strategy for farmers to improve their livelihoods and escape from poverty.

So far, research on public interventions crowding out private-sector development has mainly focused on the impact of large nationwide programs, such as fertilizer subsidy programs. No studies empirically assess the impact of nonmarket development interventions on private-sector initiatives such as CF. It is high time to look at the impact of medium- and small-scale projects on the private sector—and whether it is good or bad.

APPENDIX: SUPPLEMENTARY TABLE

Table A.1 Pairwise correlations of community-level variables for the years 2009–2015

Variable	Share of CF HHs	# Schemes	Scheme (dummy)	# Projects	# Agr. projects	# Maize project	# Agr. nonmaize project	# Nonagr. projects
# Schemes	0.5865*	1.0000						
	(0.0000)							
Scheme (dummy)	0.3206*	0.4493*	1.0000					
	(0.0000)	*(0.0000)*						
# Projects	0.0919	0.3714*	0.1906*	1.0000				
	(0.1349)	*(0.0000)*	*(0.0016)*					
# Agr. projects	0.0102	0.3223*	0.1375*	0.7060*	1.0000			
	(0.8679)	*(0.0000)*	*(0.0231)*	*(0.0000)*				
# Maize project	-0.0675	0.1474*	0.0523	0.5734*	0.7873*	1.0000		
	(0.2727)	*(0.0148)*	*(0.3892)*	*(0.0000)*	*(0.0000)*			
# Agr. nonmaize project	0.0692	0.3655*	0.1643*	0.6007*	0.8707*	0.3823*	1.0000	
	(0.2609)	*(0.0000)*	*(0.0065)*	*(0.0000)*	*(0.0000)*	*(0.0000)*		
# Nonagr. projects	0.1182	0.1550*	0.1009	0.5897*	-0.1431*	-0.0873	-0.1448*	1.0000
	(0.0541)	*(0.0103)*	*(0.0961)*	*(0.0000)*	*(0.0180)*	*(0.1503)*	*(0.0167)*	
Electricity	-0.1294*	-0.0075	-0.0029	0.0662	0.1501*	0.1391*	0.1141	-0.0838
	(0.0349)	*(0.9020)*	*(0.9624)*	*(0.2757)*	*(0.0130)*	*(0.0215)*	*(0.0598)*	*(0.1676)*
Log(population)	0.2178*	0.3443*	0.1164	0.2265*	0.2701*	0.2004*	0.2449*	-0.0231
	(0.0003)	*(0.0000)*	*(0.0547)*	*(0.0002)*	*(0.0000)*	*(0.0009)*	*(0.0000)*	*(0.7036)*
Distance to road	-0.0932	-0.1070	-0.1461*	-0.0420	-0.1147	-0.0947	-0.0965	0.0491
	(0.1296)	*(0.0775)*	*(0.0157)*	*(0.4892)*	*(0.0583)*	*(0.1187)*	*(0.1118)*	*(0.4189)*

Source: Authors' data.

Notes: n = 273; Agr. = agricultural; CF = contract farming; HH = households; nonagr. = nonagricultural. * indicates significant correlations at $p < 0.05$; significance of correlations in italics and parentheses.

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