Group Insurance: The Case of Cotton Producers in Mali

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Introduction

The aim of this project is to insure Malian cotton producers. The vast majority of cotton producers in Mali are small farmers for whom cotton represents the only source of cash, as the remainder of their lands is devoted to cultivating staple crops. A household survey we recently conducted in the Koutiala-Sikasso-San region of Mali, the historical cotton growing region of Mali, reveals that these producers are extremely poor and vulnerable to adverse shocks. Only a minority of their children goes to school, and when a household experiences a shock, it typically has to sell off assets such as their plow animals. Cotton yields fluctuate widely, which represents a major concern for producers, especially given that most of them rely on credit to finance cotton production and thus face the risk of defaulting on their loans when yields are low.

Context

Concretely, the project aims at designing and distributing an average yield index insurance product to these farmers. The insurance product will be offered directly to farmers' cooperatives. This original distribution channel would not exclude any cotton producer given that all cotton producers belong to a cooperative, which is the intermediary between producers and the Compagnie malienne pour le développement du textile (Malian parastatal company for the development of textiles, hereafter CMDT), which manages the distribution of loans and the marketing of seeds and chemical inputs, and which is the sole buyer of the product.[1] Cotton loans are also distributed through the cooperatives and are joint liability loans (Besley and Coate, 1995), i.e., when an individual farmer's production is not sufficient to pay back his loan, the revenues of the other members of the cooperative are used to reimburse CMDT. A defaulter is usually asked to reimburse his fellow members either immediately by selling an asset, or after

[1] In our analysis, we will be careful to take into account the fact that cotton producers face a monopsony.

the next cotton harvest, using his future production. When an entire cooperative defaults (the overall revenue from cotton production is lower than the total amount of loans contracted by individual producers), it faces exclusion from the cotton sector.[2] In this context, an average yield insurance product would be relatively easy to implement and could be extremely valuable to farmers. After conducting a detailed analysis of micro-level data, we concluded that a district area-based yield (DARBY) insurance would outperform both a satellite-based index using vegetation cover and estimated rainfall data and a hybrid index that combines the first two indexes (Carter et al., 2009; De Bock, 2010).[3] Indeed, a DARBY product has the twin advantages of implying less basis risk for farmers and of relying on data which can be obtained for free, given that they are recorded by CMDT after it has purchased the cotton crop from growers at harvest time.

A seed grant from *I4* would enable us to (i) organize a field trip to Mali in order to meet with the local partners and identify a suitable local principal investigator (PI); (ii) to be involved in the selection of pilot districts; and (iii) obtain more disaggregated historical data in order to design an appropriate contract for the specific districts to be covered by the pilot. We would then conduct the required statistical analysis to propose a final contract, and we would organize the baseline household- and cooperative-level data collection. We plan to submit an application for the full grant in order to obtain the funds necessary to conduct a complete and rigorous impact evaluation.

[2] There have been cases where CMDT has terminated its collaboration with a given cooperative as recently as 2007.
[3] The co-PI has participated to the feasibility analysis summarized by De Bock (2010). The technical aspects of data analysis and proposed contract design are exposed in Carter et al. (2009).

Hypothesized Effects of Transferring Risk

What are the hypothesized effects of transferring risk of using a DARBY insurance contract for cotton producers? At the household level, we expect the insurance contract we study to free up scarce resources that are allocated to hedging against covariate shocks. At the intensive margin, some households may choose to underinvest in cotton production so as to limit the negative impacts of an adverse covariate shocks to their cotton crop. They may instead prefer lower return, lower risk activities. Insuring cotton production would then increase overall farm profit and help households pay for schooling or afford health care. At the extensive margin, the availability of group index insurance may increase household participation in the cotton market by virtue of reducing an important transaction cost which household face when considering whether to produce cotton (de Janvry et al., 1991; Bellemare and Barrett, 2006), viz. the expected loss from covariate shocks.

At the group level, we expect the insurance to decrease the occurrence of group default situations, wherein many (if not all) members simultaneously default on their loan. These situations typically create social tensions wherein the burden of the group debt lies on few good producers, who may be tempted to leave the group if they have alternatives to cotton production. By making household less vulnerable to covariate shocks, the insurance contract would make them less likely to default and could thus improve social relations within the group. We also expect the insurance to improve social relations between the members of the group and those who are not members of the group (i.e., between cotton producers and those who do not produce cotton) by virtue of lowering the implicit barrier to entry, as explained above.

Because the group index insurance contract we study is expected to free up scarce resources within the household and reduce the likelihood that group members will default, we also expect CMDT to increase the total financial resources it devotes to lending to insured groups.

Finally, we hypothesize that cotton yield insurance in Mali will have impacts on the financial market and on the households involved in cotton production. At the financial market level, risk (especially covariate risk) appears to ration the funds available for agricultural finance (Stiglitz and Weiss, 1981). Our working hypothesis is that index insurance should offset these problems and reduce the extent of credit rationing of Malian cotton farmers.

Strategy and Priorities for Developing the Contract

Our strategy for developing the contract is as follows. First, both the PI and the co-PI will travel to Mali in July 2010 to identify a local PI, establish contact with CMDT, and present the research project to them. During that time, pilot study areas will also be selected and randomly assigned randomly to the treatment or control groups so as to collect baseline data on the communities, groups, and households in each group. Conditional on the characteristics of the selected study area and of the communities, groups, and households in that area, we will then design the contract so as to have the desired (expected) payout frequency.

As regards *interlinking index insurance with accumulation and income growth*, as discussed above, we expect the group index insurance contract to have significant impacts on farm profit, household income and consumption, household expenditures on education and household health expenditures conditional on health shocks. Moreover, we expect the insurance contract to

increase cotton market participation, although in order to study this, we will need to correctly tease out the effects of household selection into cotton production versus parastatal discrimination between households (Bellemare, 2010).

As regards *livelihood-focused contract design*, the technical analysis already conducted demonstrates that the insurance contract we will implement will be based on both an ex ante risk identification and a demand-driven contract design. As described by De Bock (2010), cotton producers have been interviewed in order to evaluate the types of risk they are exposed to. Furthermore the contract will itself be constructed on the basis of a micro-data analysis. In particular we will reproduce the analysis presented in Carter et al. (2009) with longer time series and more disaggregated data. Specifically we will first estimate the probability distribution of average yields for the selected zones using a Weibull probability function. Carter et al. argue that district specific probability functions should be estimated so that the structure of the insurance contracts can be adjusted for the productivity level of the district (the districts used in the analysis had very different level of average productivity). We will investigate whether it is feasible and desirable to define contracts for even smaller geographical zones. Moreover, we will examine how a double strike point contract could allow increasing payout frequency without increasing the price of contract. We return to this point below.

As regards *insuring households versus intermediate institutions*, the very nature of the contract we propose, i.e., group index insurance contracts offered to cotton producer cooperatives, addresses this goal, but we would also make sure to have detailed presentations of

the insurance contract to the members of each treatment cooperative so as to make sure that group members know what this means for them.

As regards *behavioral-economic insights*, we are planning on running the field experiment developed by Tanaka, Camerer, and Nguyen (2010, hereafter TCN), which allows eliciting individual risk preferences, loss aversion, and probability weighting coefficients and which Liu (2010) uses to study technology adoption. We would do this in order to accurately control for the risk preferences of individuals when studying their behavior in the face of risk.[4] Perhaps more importantly, we would collect this information in every time period so as to study whether risk preferences, which are traditionally assumed to remain fixed over time, adjust as a result of the changing risk environment. Because this field experiment is costly, we would only run it on a randomly selected subset of group members whose size would be enough to guarantee statistical significance (List et al., 2010).

Lastly, as regards *creating contractual understanding and trust*, our partners plan is to organize campaigns of information and education about insurance and the product that will be offered. We will investigate whether it is feasible to introduce some random component in this aspect of the intervention as to facilitate its evaluation. With respect to the trust aspect of the program, our statistical analysis will consider both classical single strike point contracts and double strike point contracts. With a classical single strike point contract, payments are made when the average yield falls below the strike point and they are equal to the difference between average historical yield and the average yield realization. One the one hand, the higher the strike

[4] Bellemare and Brown (2010) show that the use of proxies for risk aversion leads to unidentified test when studying risk sharing between a principal and an agent, and intuition suggests that their result generalizes to risk sharing in other contexts.

point, the more frequent are the payments, which is key to build trust with farmers who are not accustomed to the stochastic process related to an insurance. On the other hand, the higher the price of the DARBY product, the lower the take-up. This fundamental trade-off between the frequency of the payments and the price of the contract may be eased through a double strike point design and consider two critical yield levels. As with the classical contract, the lower strike point triggers payments that are equal to the gap between historical yield and realized yield, while the higher strike point triggers payments that are equal for example to half that gap. Carter et al. show that by keeping these initial payments small, the price of double strike point contract is kept within reasonable bounds while notably increasing the frequency of payments.

Strategy for Creating Partnerships

This project will be conducted in collaboration with Planet Guarantee (PG), a French NGO that has coordinated a feasibility study to examine the possibility to offer an insurance product to cotton farmers in Mali. The co-PI has been involved in this effort and, in particular, has conducted a technical analysis based on micro-level data to investigate several types of index-based product and their values for farmers. The NGO will organize the distribution of the product, as it has found a private insurance company (Allianz Africa) and a reinsurer (Swiss RE) willing to be part of the pilot project. Collaboration with Oxfam, which has a strong local presence in Mali, is being investigated in particular to organize an education campaign to explain the functioning of the product.

Preliminary Impact Evaluation Strategy

Our research plan is to randomize the geographic rollout of the insurance contract across the eligible areas identified by the CMDT. The idea would be to randomly divide the areas where insurance might be offered into "treatment areas," where it is offered during the pilot project, and "control areas," where it is not immediately offered. As detailed above, the project is expected to have impacts on beneficiary households' welfare, on the functioning of farmers' cooperatives and on the distribution of agricultural credit. We thus intend to collect data at three levels.

First, the household survey would include households in the treatment area and households in the control area. We plan to survey households at several points in time (once before the project is launched and several times afterwards). In addition to collecting information on household demographic, wealth indicators, children's education and health, we will use survey modules that we have developed over the years to elicit credit market status from farmer directly. This approach will allow us to characterize how many farmers are price rationed, quantity rationed, and risk rationed in both treatment and control areas. Our hypothesis is that quantity and risk rationing will decrease with insurance.

Second, the cooperative survey would be addressed to all cooperative in treatment and control areas. In particular we plan to investigate the performance of the cooperative in terms of cotton production, the changes in group composition over time and the resolution of tensions relating to the joint liability clause of credit contracts.

Third, in order to assess credit market impact, we would regularly interview the lending agency in order to measure and contrast their portfolio decision across control and treatment areas.

We hope to layout a detailed research strategy in a trip to Mali in summer 2010. We plan to discuss with all implementing partners about how best to carry out a research design that will allow us to measure impacts while not interfering with the natural development of the insurance product.

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