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The insurance role of collective fields in extended household: an obstacle to individualization of farm production?

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Summary

Extended agricultural households in West Africa often combine collective and individual fields. Over the last decades, the importance of the latter is increasing leading to greater individualization of land holdings. While family members equally share the proceeds of collective plots, individual production accrues to individual members. In this context, we ask how individualization affects risk-sharing within households. More precisely we analyze the efficiency/risk-sharing trade-off of collective production. Indeed since collective production is shared among family members, it plays an insurance role. However it is subject to serious free-riding problems. We show that the trade-off may vanish when we take into account direct transfers between family members. As individualization increases incentives to engage in income transfers, these transfers may compensate the loss of the insurance value of collective production.

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LA FERDI EST UNE FONDATION RECONNUE D'UTILITÉ PUBLIQUE. ELLE MET EN ŒUVRE AVEC L'IDDRI L'INITIATIVE POUR LE DÉVELOPPEMENT ET LA GOUVERNANCE MONDIALE (IDGM). ELLE COORDONNE LE LABEX IDGM+ QUI L'ASSOCIE AU CERDI ET À L'IDDRI. CETTE PUBLICATION A BÉNÉFICIÉ D'UNE AIDE DE L'ÉTAT FRANÇAIS GÉRÉE PAR L'ANR AU TITRE DU PROGRAMME « INVESTISSEMENTS D'AVENIR » PORTANT LA RÉFÉRENCE « ANR-10-LABX-14-01 »

I. Introduction

In this brief we describe the organization of extended agricultural households in West Africa and report the results of a theoretical investigation of the insurance role of collective fields in these households. The stylized facts motivating our analysis are based on family farms in Southern Mali. These farms are typically organized around extended households and combine collective and individual plots. Members of the household equally share the proceeds of collective plots (often in the form of collective meals), while individual plots are autonomously managed by individual members. It appears that over a couple of generations, private plots have become more prevalent and extended households have tent to split into smaller units. In this context, we ask whether this individualization of collective production is necessarily detrimental to intra-family insurance agreements.

More specifically we analyze the efficiency/risk-sharing trade-off of collective production. Since collective production is shared among family members, it plays an insurance role. However, collective production is subject to serious free-riding problems leading to an inefficient level of labour allocation. The individualization of production obviously solves the latter problem but may be detrimental to the sharing of risks that collective production allows (hence the trade-off). Our main contribution is to show that the trade-off may vanish when we take into account direct transfers between family members. As individualization may increase incentives to engage in voluntary income transfers, the loss of the insurance value of collective production may be compensated. Our analysis is the first attempt to simultaneously consider the two insurance mechanisms: collective production plagued by free-riding and income transfers hampered by limited commitment.

The remainder of the brief is structured as follows. Section 2 describes the organization of extended agricultural households in West Africa (based on surveys of cotton farmers in Mali) and provides evidence for the existence of free-riding in collective production in this context. Section 3 describes the set-up of our theoretical analysis and its main conclusion. Finally section 4 draws lessons from the study.

II. Extended agricultural household and collective production in Mali

In the following, we focus on evidence from Mali, where in 2006 and 2007, we conducted a systematic household survey on a random sample of 502 households belonging to 50 different villages in the districts of Koutiala, San, and Sikasso. This section mainly draws from two empirical papers that extensively describe the local context (Goetghebuer, Guirkinger, Platteau 2013 and Guirkinger Platteau 2014).

Extended households prevail in the area (as in many parts of rural West Africa). These households traditionally extend both vertically (married sons continue to live with their father) and horizontally (brothers of the head, their wives and children are part of the household). In our sample 50% of household heads live with at least one brother and 51% with at least one married son. Only 20% have neither brothers nor married sons around (strictly speaking, they are nuclear households).[1] Polygamy further contributes to large household sizes as it concerns 59% of the household heads. On average, the sample households count 10.6 individuals above 12 with a maximum family size of 33.

Members of these complex households farm together collective fields under the authority of a patriarch (the head) and share (at least

1. In the traditional family organization married sons stay with their father (patrilocal residence) and their children grow up in the same compound. Family splits typically occur in horizontally extended households when brothers of the head decide to separate upon adulthood and marriage of their own children (with whom they then form a common compound).

some) collective meals. This does not preclude the existence of private plots cultivated by male members. In our sample, we observe these plots in about one fourth of the households. When these plots exist it is noticeable that all male members above a certain age have received a private plot.[2] When present, male private plots occupy 8.7% of total farm area on average, with a maximum of 58.6%. Interestingly, the practice of granting private plots to men seems to be spreading: when asked whether male members had individual plots while they were cultivating under the authority of the former head, current heads answered "yes" in only 20% of the cases.

On private plots, management decisions including the choice of crop and supervision of effort belong to the landholding member, yet the allocation of labor time between collective fields and individual plots is fixed by the head. Our data show that in the rainy season 38% of plot managers are free to work on their own field every day before and after their collective labor duty. The others are allowed to spend only one to two days per week on their individual plot. In the dry season, when competition between the collective field and individual plots is less acute, about 90% of plot managers are allowed to work on their plot every day.

Even if strict rules govern the timetable for work on the collective field, the head is unable to control labor effort. It is revealing that in our study area almost half of the plot managers admit that they tend to give priority to cultivation of their individual plot at the expense of collective production. This is confirmed by household heads who complain that individual plot holders tend to relax their effort on the collective field, thereby causing yields to fall. For example, one of them said that "more effort is applied to the individual plots and when members work on the collective plot, they are tired". Another one complained that when they work on the collective field, his sons "are prone to keep energy in reserve for their individual plots". This sort of statements suggests that the granting of individual plots exacerbates the problem of free riding on the collective field.

We have devoted an entire paper to establishing the existence of free-riding in collective production empirically (Goetghebuer, Guirkinger, Platteau, 2012). This paper shows that yields on individual plots are significantly higher than yields on the collective plot, especially for care-intensive crops (e.g., rice, peanuts). It is intuitive that care-intensive crops are more sensitive to the level of effort applied to their production since their yields critically depend on the *quality* of labor. This result holds in a multivariate framework when we compare plots with similar characteristics planted to similar crops within the same household. We argue that free-riding plagues collective production, at least when care-intensive crops are grown.

It thus appears that individual plots are farmed more efficiently than collective plots. It implies that individualization of field cultivation and family organization would contribute to increasing overall agricultural production. Many interviewed farmers however mention that the distribution of private plots comes at a cost of lower family cohesion. This argument was most often developed by family head who decided against the granting of individual plots. They explained that individualization fosters discord and reduces "solidarity" in the family. This is related to the fact that individualization of production implies (at least partial) individualization of consumption. While in purely collective farms (with no male individual plots) the subsistence of all members is fully ensured by collective

2. Even more households give individual plots to women (71% of households surveyed in 2007). There are important differences between men's and women's individual plots. First, women's plots are significantly smaller than men's plots and are a more traditional practice. Second women are expected to use their private plots - called garden plots - mainly to produce ingredients of the collective meals. No such requirement is imposed on the male members who keep their private production for their private use. Finally, women owning an individual plot are generally freed from the duty to work on the collective field, so that there is less direct competition in effort allocation between collective and private plots as far as they are concerned.

production, when private plot exist, their holders have to cover (part of) their own expenses. This results in greater disparity across members' consumption and also greater individual fluctuations. The question thus arises as whether individualization of farm production comes at a cost of lower risk sharing within the family. In the next section, we present a theoretical model developed to investigate this question.

III. A theoretical analysis of the efficiency risk-sharing trade-off of collective production

The complete analysis of this question is reported in provided in Delpierre, Guirkinger and Platteau, (2013). Here we describe the main elements of the model set up and summarize our conclusions.

We consider an extended household where each member is endowed with the same amount of land and productive time, provided the member is not sick in the period considered. Land is divided between collective and private fields (the same individualization rate apply to each member). The inputs to production are labour and land and the production function (identical on private and collective fields) is subject to constant returns to scale. In each growing season, a subset of household members is sick and unable to work.[3] If they work, household members allocate freely their time between collective production, their private field and a wage activity.

Household members, whether sick or not, consume an equal share of collective production. In addition, they consume: the sum of the production of their individual plot (if they were able to work), the product of the rental of this plot (if they were not able to work) and the transfers they may give to or receive from other members. There are thus two risk-sharing mechanisms in this context: the sharing of collective production and inter-personal transfers.

Since the proceed of collective fields is equally shared among members while labour is applied not cooperatively, free-riding emerges, leading to a sub-optimal application of effort on collective fields. Furthermore, since transfers are non-enforceable, they need to be incentive compatible. More specifically a healthy member can always choose between: a) making a transfer and continue to be part of the household or b) renege on his transfer and leave the household for ever, without land.[4] This outside option defines a maximum level of incentive compatible transfers.

Finally we explicit the timing of the game before turning to analysis of individualization in this context:

1. Nature draws a subset of healthy members.
2. Members choose either to stay within the family farm and to abide by the insurance agreement or to leave with the output of their private parcel at the end of the season.
3. Members non-cooperatively allocate their work effort
4. Members who had chosen to, leave the household with the output of their private parcel. The other members consume the sum of their private output and their share of the collective output adjusted for the transfers they make or receive.

With this framework we examine the impact of individualization on efficiency and risk sharing. It is easy to show that individualization always increases total production and thus efficiency. The analysis of its impact on insurance is more complex. As established in the existing literature on cooperatives, in the absence of income transfers, individualization necessarily harms risk-sharing since collective production

3. More specifically, a household member's time endowment is drawn from a Bernoulli distribution.

4. We also explore the alternative outside options of leaving the household with the total individual land endowment or just the private plot.

decreases. With income transfers the result is ambiguous. Indeed incentives to transfer may increase as a result of privatization! Indeed as household production becomes more efficient, the value of staying in the household increases relative to the outside option. Simultaneously however, the immediate gain from deviation also increases (as the member leaves with his private production), leading to an ambiguous impact of privatization on incentive to transfer. Finally, individualization may or may not reduce the extent of risk-sharing.

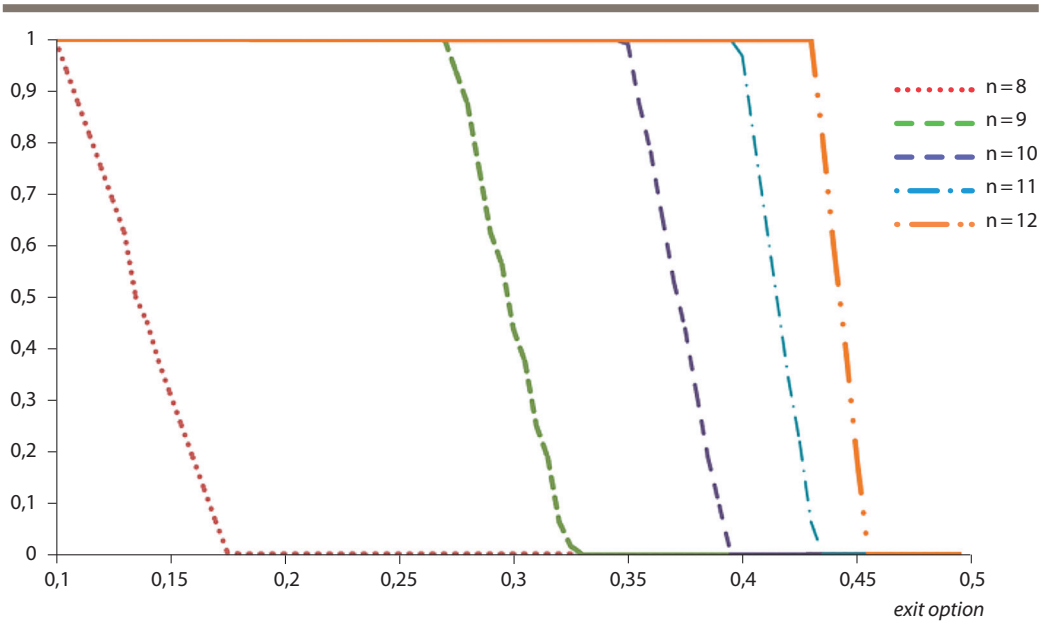
We show that privatization is less likely to harm risk-sharing if :

1. the household size is large
2. the household outside option is low
3. the discount factor is high.

Figure 1 illustrates the results of a numerical simulation and shows the optimal privatization rate for various family size and level of reservation utility.[5] It reveals that an increase in the value of the exit option decreases the optimal privatization rate while an increase in family size increases it.

5. For details on functional forms and parameter see Delpierre, Guirkinger, Platteau (2013).

Figure 1. Effect of the exit option on the optimal privatization rate for various family sizes, n.



IV. Conclusion

When the only source of insurance is the sharing of a collective output and when collective production entails inefficiency, a classic trade-off between efficiency and risk-sharing emerges. Our theoretical investigation shows that this trade-off may however vanish when private and voluntary transfers are possible between co-workers. In other words it is possible that land individualization bring both efficiency and insurance benefits. Whether or not this is the case depend strongly on the empirical context. In present-day rural West Africa for example, population tends to be growing and market integration to be increasing, bringing new income opportunity. Our model suggests that these two forces have opposite impact on the above mentioned trade-off.

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