-Beyond Titling: Impacts of a Multifaceted Land Governance Intervention on Land Conflict in Burkina Faso-

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Abstract

In recent years, international development programs to secure property rights have shifted from an emphasis on issuing formal property documents to a broader approach that includes institution-building, citizen participation, and recognition of customary systems. One such program was the Millennium Challenge Account funded Rural Land Governance (RLG) activity in Burkina Faso. This paper investigates the impacts of a pilot of the RLG on the incidence of land conflict using household survey panel data. We find that the RLG substantially reduced the incidence of certain types of land conflicts in the project area. In particular, the predicted incidence of land conflicts that respondents characterized as "very serious" was 2 per 1,000 households following RLG, as compared to a predicted rate of 56 per 1,000 households in the absence of the program.

I.   INTRODUCTION

The security of property rights over land is widely acknowledged as a necessary precondition for economic growth and the development (Coase 1960, North 1981). Where property rights are incompletely defined or poorly enforced, the consequent risk of land expropriation or conflict can undermine incentives to accumulate and invest. A wide literature documents the existence of insecure land rights and associated conflicts in a variety of developing country contexts, including sub-Saharan Africa (e.g. Derman et. al. eds. 2007).

Securing land rights has long been part of the development agenda for both governments and donors. Early efforts to improve the security of land rights were focused mainly on often large-scale titling programs to provide land users with formal documentation of rights, with the Swynnerton Plan in Kenya in the 1950s a notable example. While some successes have been noted in the literature, for example Thailand (Feder et. al. 1988), in African contexts these programs tended to produce disappointing results. Literature from the perspectives of both empirical economics and other social sciences documents a wide range of unsuccessful land titling programs, showing that these programs failed to lead to economic benefits, and in some cases even served to weaken tenure security and increase land conflicts (e.g. Carter and Wiebe 1990, Migot-Adholla et. al. 1994). These failures were blamed on several factors, included insufficient institutional support, implementing tenure reform in areas where informal tenure already provided adequate security, and processes that did not take into account local realities (Atwood 1990).

In light of these shortcomings, more recently many donors and governments have begun to take different approaches to interventions to secure land rights. For example, the World Bank's recent Land Tenure Policy document emphasizes "country specific solutions," highlighting the importance of institutions as well as "the need for transparency, good governance, citizen participation and recourse in the various phases of land administration" (World Bank 2011, p. 1). Similarly, the USAID Land Tenure and Property Rights Office describes its approach to programming as "testing innovative models for securing land tenure and property rights."[1] Another donor institution that has been active in this area is the Millennium Challenge Corporation (MCC), a US government agency that administers the Millennium Challenge Account (MCA), which has invested US$260m in land tenure programming since 2005. MCC's policy document describing its approach highlights support for institutions and governance, taking cognizance of customary systems, and explicitly states that "securing land rights is not only about titles" (Barthel et. al. 2012). To date, empirical studies of the impacts of these new programs have been limited, though a number of impact evaluations of recent MCC, USAID, and the World Bank projects are currently under way.

A major land tenure project in this vein was the Rural Land Governance (RLG) Activity in Burkina Faso, funded by MCA. The RLG included a combination of policy reform, support for formal land administration, and at the local level, community land use planning and dispute

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[1]United States Agency for International Development, "Usaid Mission on Land Tenure and Property Rights," (2015). http://usaidlandtenure.net/mission

resolution training. A pilot of the RLG was implemented beginning in 2011 in an area covering 17 local administrative districts called communes. The RLG sought to improve tenure security and reduce land conflict in rural areas, thereby strengthening investment incentives and leading to improved economic outcomes.

This paper provides evidence of the impacts of the RLG on reducing conflicts related to land. We find that the RLG program reduced the predicted probability of serious land conflicts in the program area from 1.53% to 0.67%, and reduced the probability of land conflicts that respondents characterized as particular severe from 0.56% to 0.02%. Given the relatively short timeframe of the analysis, we are not able to investigate the impact of the RLG on subsequent economic outcomes such as agricultural investment and productivity. However, the literature suggests that the observed improvements in conflict reduction may lead to substantial economic benefits over time. The results also highlight the importance of definitional and measurement issues in quantitative analyses of land conflict incidence, as we find no statistically significant impact of the project when we include land conflicts that respondents characterize as "not serious."

In the remainder of the paper, we begin by providing some background on land tenure insecurity, land conflict, and agriculture in the study area, as well as a more detailed description of the RLG intervention in Section II. Section III describes the design of the study. The next two sections present our data and descriptive statistics, as well as our empirical strategy for estimating the impacts of the program. Section VI discusses the results of estimations, while Section VII provides conclusions and policy implications.

II.   BACKGROUND

Agriculture is the main economic activity in Burkina Faso, with 85% of the population engaged in cultivating crops, livestock rearing, or forestry (World Bank 2009). While cotton is the main cash crop, low-technology subsistence agriculture predominates in rural areas. Rights to land follow customary systems of allocation, with traditional chiefs and functionaries holding the authority to grant land rights. Although there exists a legal framework in place that allows for private ownership, in practice formalization and registration of land rights is rare.

A number of sources indicate that conflicts related to land in rural areas are becoming increasingly common and severe (USAID 2010). Pressures on land as a result of increasing investment in farmland by agribusinesses, civil servants, and others has been noted as a source of concern by Ouedrago (2006). In a study of Western Burkina Faso, Mathieu et. al. (2003) describe population pressures leading to land scarcity in the face of competing interests, with younger farmers and migrants increasingly calling into question the authority of traditional systems dominated by elders. Gray (2002) describes heightening tensions between groups with historical claims to an area and migrants, which often take the form of conflicts between pastoralists and sedentary farmers.

There is a wide literature on the economic consequences of insecure property rights, and the mechanisms by which strengthening property rights can improve economic outcomes. The notion of "dead capital" was popularized by de Soto (2002), who stated that the lack of formal

and secure property rights prevents land and other assets from being used as collateral to obtain loans, which could lead to profound consequences for development. Insecure property rights can also weaken investment incentives by reducing the expected payoff to certain types of investment, particularly those that are immobile or pay off over time (Besley 1995), as well as by preventing the value of investments to be recouped through future sales (Brasselle et. al. 2002). Insecure land rights may also cause cultivators to allocate resources to defend property rights that could otherwise be put to productive use, such as wasted labor (Field 2007) or by inducing inefficient investments (Sjaastad and Bromley 1997).

There is a vast narrative literature on land conflicts and disputes, but quantitative empirical studies are limited. To our knowledge, there are only three micro-level empirical studies that look at land disputes at the parcel or household level. Deininger and Castagnini (2006) consider the causes and impacts of land conflicts in Uganda. They find that widows and other female household heads are most likely to experience land conflicts, and estimate that resolving all pending disputes would increase overall agricultural productivity by between 5.5 and 11%. Also in Uganda, Mwesigye and Matsumoto (2016) find that areas with higher rates of migration and population growth experience greater incidence of land conflict, and that conflicts lead to reduced yields at the parcel level- up to 45% in the case of conflicts related to eviction. Finally, Muyanga and Gitau (2013) find that among a sample of Kenyan farmers, land disputes reduce the propensity to invest in fertilizer and perennial crops, reducing agricultural productivity for affected farmers by 13%. There are no published studies that we are aware of that estimate the impact of an intervention on land conflict incidence, as we do here.

Against this backdrop, Burkina Faso's Millennium Challenge Account program, which began in 2008, included a major effort to secure land rights in the form of the RLG. The RLG was initially implemented as a pilot activity from 2010 to 2011, with the intention of scaling the program up more widely pending the outcomes of the pilot. The analysis in this paper concerns the experiences of the RLG pilot, and uses data collected for the evaluation of the pilot.

The RLG pilot included a suite of complementary interventions geared towards securing tenure and reducing conflicts for rural smallholders. An important component was a participatory process of community land use planning, which documented and formalized existing land uses under the customary system. The process also included the preparation and validation of community land use charters to codify land uses that had been agreed upon following the community land use planning process. In addition, the RLG pilot included an institutional capacity building component to provide dispute resolution training in pilot areas to local authorities, government officials and other stakeholders. Finally, the RLG also included outreach and communications activities mainly related to the new land law, some of which were national in scope and thus extended beyond the pilot area.

The design of the RLG program thus reflects the more recent trends in property rights programs. Rather than a large-scale land titling effort, the RLG emphasizes institution strengthening and participatory approaches to establishing land rights that take cognizance of customary systems. Elbow (2013) describes the approach of the RLG as indicative of a break from previous top-down approaches to land administration in Burkina Faso that had brought formal and informal systems into conflict.

III.   DATA AND DESCRIPTIVE STATISTICS

The household survey data used in this paper was collected in 2010 and 2012 as part of a Millennium Challenge Account impact evaluation. The survey instrument was designed to capture detailed information pertaining to the experience of land conflicts. In addition, the survey collected a range of information on characteristics and activities at the household, individual, village, and plot levels. The sample consists of 1,923 households over 377 villages. These households have some form of land tenure over a total of 4,352 parcels, and the survey identifies 6,712 adults of whom 3,072 are the primary decision-makers over at least one plot. While the survey is not designed to be nationally representative, it is designed to be a representative sample spanning 34 pre-selected communes, an administrative unit in Burkina Faso. These communes were selected to include a broad range of agro-ecological and demographic conditions found in Burkina, encompassing approximately 25% of the country's total area.

Table 1 summarizes some of the baseline characteristics of the sample. Households tend to be poor and agricultural, with an average cash income of $415 and 89.2% engaged in some form of agricultural production. The most common crops are cereal grains, particularly millet, corn, and sorghum. Fruit and vegetable production is substantial, while the principal cash crop is cotton. Adult literacy is 9.5%. Each household owns an average of 2.31 parcels, with a mean parcel size of 1.62 hectares. Acquisition of land is mainly through inheritance, with land markets virtually non-existent: less than 1% of parcels were acquired by sale or rental.

In the study area, the household head allocates land among members of the household, each of which has day-to-day decision-making authority over the parcels that they have been allocated for cultivation. In our parcel-level analysis, we thus associate each parcel with the cultivator rather than with the household head. In our sample, 65.9% of the parcels are cultivated by the household head, while 34.6 % are cultivated by women, primarily the wives of household heads.

The survey also includes a module that retrospectively collects detailed information on land-related conflicts involving the household members, spanning five years in total. For each reported conflict, the survey asks a number of questions related to the characteristics of conflicts including primary actors of conflicts, causes of conflicts, and year in which the conflict started. Then the respondents were asked to assess the severity of the conflict, followed by the levels of actions they took, and the estimated cost of the conflict. The survey also collected information on the arbiter, conflict resolution if there was any, and if the respondents were satisfied with such resolutions. These questions were developed following preliminary fieldwork in the study area to identify relevant issues.

During the five-year period, respondents report 580 conflict incidents, involving 382 households which is equivalent to 16.3% of total households in our sample. These conflicts are categorized into three groups: non-serious and very-serious conflicts, based on respondents' self-assessment.[2] Figure 1 illustrates the trend in conflicts over time: non-severe conflicts appear to decrease over

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[2] The question about conflict severity is phrased as follow: "Comment qualifies-vous ce conflict?" If the respondents choose "Pas grave" or "Peu grave," we categorize those conflicts as "non-serious." The the respondents choose "Tres grave", those conflicts are then labelled as "very-serious."

time, while the proportion of "very serious" conflicts seem to increase over time. However, we do observe that except for the spike in 2010-2011, the total number of households experiencing conflicts, regardless of the severity, decreases over time, as shown in Figure 2. In conformity with Figure 1, Figure 2 also shows that the proportion of households experiencing very serious conflicts is increasing larger than the non-serious ones.

Our data shows that the majority of land conflicts occur with other residents of the village outside of the family (68.8%), followed by conflicts with migrants (17.6%), among family members (7.4%), and with authorities (6.3%).In terms of the causes of land conflict, most of them are attributed to disputes over rights of use and damage caused by animal (23% and 20% respectively). In particular, there are notable differences in the reported severity of different types of conflicts. While the conflicts over use rights and boundaries were often reported as "not serious," an overwhelming proportion of conflicts over inheritance and damage caused by animals was reported as "very serious."

Table 2 offers some insights into how conflict severity differs: female-headed households tend to experience more serious conflicts. Among conflicts over land boundary, 44.4% of conflicts involving female household heads are "very serious," while only 5.3% are non-serious. Similarly, among conflicts over damage by animals, 42.1% of conflicts involving female household heads are "very serious," while only 24.4% are non-serious. On the other hand, male-headed-households are more likely to engage in conflicts over inheritance. It's worth noting that given 75% of the households reported having conflicts are male-headed as a result of the overpresentation of the male-headed households in our sample, the figures showing only 57.9% and 55.6% of male-headed households experiencing conflicts over damage caused by animal and land boundary show a significant shift in distribution between the male and female-headed-household groups. Additionally, conforming to our prior -- "very serious" conflicts involving migrants are more likely to be over right of use.

While there seems to be no obvious correlation between the source of non-serious conflicts and income levels, we observe that most of the "very serious" conflicts over inheritance, right of use, and boundary occur in poorer and middle-income households (3rd and 4th income quartiles). 21.4% of "very serious" conflicts over damage caused by animals and 26.3% of conflicts over rights of use fall into the group of households in the highest income quartile. One possible explanation is that the poorest households neither have land worth taking nor possess enough resources to initiate a conflict while the wealthiest households are able to defend themselves, hence less likely to face serious threats. Hence, we tend to see more serious conflicts occurring in the middle-income households.

Table 3 shows the distribution of identity of disputants, disaggregated by gender, income level, immigration status, and conflict severity. The data reveals that key conflict disputants differ by income level. Approximately 75% of non-serious and 50% of "very serious" conflicts with authorities are with households in the two highest income quartiles. One might argue that only wealthy households have the resources to engage in conflicts with powerful actors such as authorities. Top income households are also more likely to engage in "very serious" conflicts while low income households are more likely experience "very serious" conflicts with family members. Unsurprisingly, 81.4% of conflicts with native villagers involve migrant households

(who do not always live in the village) but only 11.9% of them are rated as "very serious." On the opposite, fewer conflicts with authorities involve migrants but once they do, 33% of them are "very serious."

IV. METHODOLOGY

Our analysis focuses on the impacts of the RLG in terms of incidence of land conflict. The timeframe of data collection was such that the endline survey took place less than one year after the conclusion of implementation. Thus, the timeframe is not sufficient to investigate the impacts on longer-term outcomes such as investment decisions and agricultural productivity directly. However, as we discuss later in the paper, we can relate our findings to the existing literature to gain some sense of the magnitude of the impact.

The sample consists of 1,886 households for which valid interviews were completed, with 1,050 treatment households located in the project area and 836 households comprising a comparison group drawn from non-project areas. As the program did not follow a randomized design and the availability of administrative data was limited, the comparison areas were identified through a process of consultation with a group of local agriculture and land experts. For each of the 17 administrative districts in which the program was implemented, the experts were asked to identify the district that was the closest match in terms of agro-ecological conditions, general living standards, and prevailing tensions and issues related to land tenure. The comparison group was then sampled from the 17 comparison administrative districts. Both the treatment and comparison samples followed two-stage sampling approach whereby villages were randomly selected from eligible districts, and then households were randomly selected from within the sampled villages.

Our empirical approach is to estimate the causal impact of the RLG program on the probability that a household experiences a land conflict in a given year in a difference-in-difference framework. Our econometric model thus employs panel data methods in the context of a binary response dependent variable. Our preferred specification is a random effects probit (REP) model, as Hausman tests fail to reject the null hypothesis that random effects is appropriate, and the marginal effects provide an estimate of the magnitude of the coefficients. For robustness, we also estimate fixed effects specifications using the conditional logit (CL) model proposed by Chamberlain (1980). The sign and statistical significance of the coefficients provides a useful robustness check, although the magnitude of the estimated coefficients in this model does not have a straightforward interpretation.

The REP model is:

$$y_{it}^* = \beta(\delta_5 * T_i) + \gamma' \delta_t + \theta T_i + c_i + \varepsilon_{it}$$
$$y_{it} = 1[y_{it}^* > 0]$$
$$Pr(y_{it} = 1 | \delta_t, T_i, c_i) = f(\beta_1(\delta_4 * T_i) + \beta_2(\delta_5 * T_i) + \gamma' \delta_t + \theta T_i + c_i)$$

Where:
y_{it} is the probability that household i has experienced a conflict at time t,
δ_t is a vector of time dummy variables,
T_i is a dummy equal to one for households in the treatment area,

c_i is a household specific randomly distributed error term (the random effect), and
ε_{it} is a random error term, and
β, γ, and θ are parameters to be estimated.

The parameter of interest is β, the coefficient on the interaction term between treatment status and the post-intervention time period.

Following the same notation, the CL model is given by:

$$Pr(y_{it} = 1) = \frac{e^{\alpha_i + \beta(\delta_5 * T_i) + \gamma' \delta_t}}{1 + e^{\alpha_i + \beta(\delta_5 * T_i) + \gamma' \delta_t}}$$

Where:
α_i is a household-level fixed effect,

We use three alternative definitions of the dependent variable. While the project is intended to reduce the kinds of more serious land conflicts that lead to productivity losses, events that respondents define as "land conflicts" may encompass more minor incidents as well that may be unaffected by the program and attenuate the findings. As discussed above, for each conflict the survey includes the respondent's characterization of the severity of the conflict as "very serious," "somewhat serious," or "not serious." Thus, for each of the models above, we estimate specifications using a) all conflicts, b) excluding "not serious" conflicts, and c) including only "very serious conflicts."

V.   ESTIMATION RESULTS

Tables 6, 7, and table 8 show the estimation results for the three different definitions of the dependent variable. Table x shows that when the dependent variable is defined to include all land conflicts, we do not find an impact of the program. The sign of the treatment effect is negative as expected, but not statistically significant for either post-treatment year or modelling specification. Table x presents the results when "not serious" conflicts are excluded, and in this case the coefficient on the second-year treatment effect are negative and statistically significant with p-values of .05 and .06 in the REP and CL models respectively. Finally, in Table X we estimate the models using only "very serious" conflicts. Here, the first and second year treatment effects are statistically significant in both models at $p < .01$ in all cases. The results imply that the RLG program had a significant impact on reducing conflicts over land, but only those types of conflicts that respondents viewed as particularly serious.

To interpret the magnitude of the impacts, we use the REP results to calculate the household-level predicted probabilities of land conflict both with and without the program for the statistically significant treatment effects. Using table x, the predicted probability of a serious or very serious conflict in the treatment group in the second post treatment year is 0.25%; excluding the treatment effect the predicted probability is 0.76%. For very serious conflicts only, RLG reduces the predicted probability of a conflict from .002% to .00078% in the first post-treatment year, and .0036% to .00012% in the second. Thus, the overall predicted rate of very serious

conflicts over the two years falls from 56 per 1,000 households to 2 per 1,000 households as a result of the RLG program.

VI.   PARALLEL TRENDS TEST

Our difference-in-difference framework requires the assumption of "parallel trends," i.e. that the trend over time in the outcome variable would have been identical for the treatment and comparison groups in the absence of the intervention. Particularly given our non-experimental comparison group as well as our lack of control variables, it is useful to investigate this assumption further. While the parallel trends assumption cannot be directly tested, the fact that our data includes multiple pre-treatment periods means that we can compare pre-treatment trends in the outcome variables. Following Autor (2003), as a placebo test we estimate our models with our treatment group dummy interacted with each of the year dummy variables. The hypothesis of parallel trends in the pre-treatment period is supported if we find coefficients that are statistically indistinguishable from zero in the pre-treatment periods.

The coefficients for "all serious" and "very serious only" conflicts using each of our three modeling specifications are plotted in Figure X. 2007-8 is used as a base, with the interaction terms between the treatment dummy and the 2008-9 and 2009-10 dummies reflecting the pre-treatment placebo variables. None of the coefficients on the placebo variables are statistically different from zero, which indicates that we cannot reject the null hypothesis that changes in conflict incidence over time did not differ between the treatment and comparison groups in the years prior to the project. These results provide a strong argument in favor of our identification strategy.

VII.   CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Our results show that the RLG program resulted in a substantial reduction in the incidence of serious land conflicts in the area where the program was implemented. Further research on other programs is needed, but these findings suggest that newer approaches to formalizing property rights may be more effective than previous land titling programs that neglected customary and institutional factors, with potentially considerable economic benefits.

These results also have implications for future studies seeking to measure the incidence of land conflict and relate it to economic outcomes. While we did not find an impact of the project on the total incidence of events that respondents defined as a "land conflict," we did find a significant impact on the incidence that respondents characterized as more serious land conflicts. Thus, surveys measuring land conflict must pay careful attention to how the term is defined. An improvement on the approach in our data would be to allow for a more nuanced characterization of the different types of events that could potentially be defined as "land conflicts."

Two caveats should be borne in mind in interpreting these findings. First, our analysis should not be interpreted as attempting to capture the full range of benefits of the RLG program. The follow-up survey was conducted only one year after the program had been implemented, and thus would underestimate the effect of the program if the conflict reduction impacts unfold over longer period of time. Similarly, it is important to bear in mind the benefits of the RLG are not limited to reduction in land conflict only. Improving tenure security even among land users who

are not directly affected by land conflicts also strengthens investment incentives, and should result in further economic benefits. Using the baseline data from this study, Linkow (2016) finds that perceived tenure insecurity reduces agricultural productivity by an estimated 8.9%, suggesting a substantial scope for further benefits of the RLG in this regard.

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Table 1. Summary Statistics

Household level	Statistics
Annual Household Income	$US 415
	(1,145)
Non-Agricultural Income	81.4%
Household Size	8.48
	(5.15)
No. of Parcels	2.31
	(0.85)
Own Cattle	29.7%
Female Headed Households	6.8%
Migrant Households	16.5%
Ever Experienced Land Conflict	19.2%
Household Head's Parents from Same Village	75.5%
Plot/Cultivator Level:	
Parcel Size, Hectares	1.62
	(2.26)
Length of Tenure, Years	15.24
	(13.68)
Quality: Sloped Terrain	6.5%
Quality: Lowland Terrain	20.4%
Acquired Through Inheritance	46.1%
Acquired Through Allocation by Household Head	23.2%
Acquired Through Gift/Allocation by Traditional Authority	20.5%
Acquired by Purchase/Rental	0.2%
Value of Output per Hectare	$12.68
	(189.48)
Literacy of Cultivator	13.0%
% of Cultivators who are Household Heads	65.9%
% Female Cultivators	34.6%
Age of Cultivator	44.36
	(15.58)

Standard deviations in parentheses

Table 2: Sources of Non-Conflicts by Gender, Income Distribution, and Immigration Status

	Non-serious conflicts				Very serious conflicts			
	Inheritance 8%)	Right of use (4%)	Damage by animal (6%)	Boundary (9%)	Inheritance (15%)	Right of use (31%)	Damage by animal (23%)	Boundary (11%)
Gender								
Female	18.80%	32.30%	24.40%	5.30%	16.70%	24.00%	42.10%	44.40%
Male	81.30%	67.70%	75.60%	94.70%	83.30%	76.00%	57.90%	55.60%
Income								
1st quartile	28.60%	27.10%	28.00%	28.60%	14.30%	21.10%	14.30%	37.50%
2nd quartile	28.60%	27.10%	16.00%	25.00%	28.60%	21.10%	42.90%	12.50%
3rd quartile	28.60%	28.60%	28.00%	14.30%	57.10%	31.60%	21.40%	50.00%
4th quartile	14.30%	17.10%	28.00%	32.10%	0.00%	26.30%	21.40%	0.00%
Migration								
Not always live in the village	12.50%	19.00%	8.30%	13.70%	0.00%	8.30%	0.00%	0.00%

Table 3: Identity of Disputant by Gender, Income Distribution, Immigration Status, and Severity

	Non-serious conflicts				Very serious conflicts			
	Native villagers (74%)	Authorities (5%)	Migrants (16%)	Family members (55%)	Native villagers (58%)	Authorities (6%)	Migrants (21%)	Family members (15%)
Gender								
Female	27.4%	18.2%	11.1%	11.1%	30.9%	0.0%	33.3%	9.1%
Male	72.6%	81.8%	88.9%	88.9%	69.1%	100.0%	66.7%	90.9%
Income								
1st quartile	27.8%	25.0%	36.0%	14.3%	27.3%	0.0%	0.0%	16.7%
2nd quartile	25.2%	0.0%	24.0%	28.6%	15.2%	50.0%	10.0%	66.7%
3rd quartile	26.0%	50.0%	24.0%	14.3%	33.3%	0.0%	70.0%	0.0%
4th quartile	20.9%	25.0%	16.0%	42.9%	24.2%	50.0%	20.0%	16.7%
Migration								
Not always live in the village	15.0%	7.4%	7.0%	12.5%	11.9% 33,3%		0.0%	0.0%

Table 4: Treatment Effect on Incidence of Land Conflict, Including "Not Serious" Conflicts

	(1) Random Effects Probit	(2) Conditional Fixed Effects
1st Year Treatment Effect	-0.0891	-0.1387
	(0.17)	(0.36)
2nd Year Treatment Effect	-0.2675	-0.5006
	(0.17)	(0.37)
2008-09	0.3035**	0.6258**
	(0.09)	(0.20)
2009-10	0.0337	0.0692
	(0.10)	(0.21)
2010-11	0.0531	0.1098
	(0.14)	(0.31)
2011-12	0.0850	0.1683
	(0.14)	(0.30)
Treatment Group	0.1945*	
	(0.09)	
Constant	-2.5645***	
	(0.12)	
Observations	9,430	1,095

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Treatment Effect on Incidence of Land Conflict Excluding "Not Serious" Conflicts

	(1) Random Effects Probit	(2) Conditional Fixed Effects
1st Year Treatment Effect	-0.2177	-0.4080
	(0.18)	(0.39)
2nd Year Treatment Effect	-0.3786**	-0.7586*
	(0.19)	(0.41)
2008-09	0.3096**	0.6492**
	(0.11)	(0.22)
2009-10	0.0791	0.1752
	(0.11)	(0.24)
2010-11	0.1775	0.3896
	(0.15)	(0.33)
2011-12	0.1731	0.3896
	(0.15)	(0.33)
Treatment Group	0.1852	
	(0.10)	
Constant	-2.7836***	
	(0.15)	
Observations	9,430	870

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1*

Table 6: Treatment Effect on Incidence of Land Conflict, "Very Serious" Conflicts Only

	(1) Random Effects Probit	(2) Conditional Fixed Effects
1st Year Treatment Effect	-0.9139** (0.34)	-1.9896** (0.75)
2nd Year Treatment Effect	-0.9760** (0.32)	-2.2048** (0.71)
2008-09	0.3048 (0.20)	0.6274 (0.43)
2009-10	0.0279 (0.22)	0.1124 (0.47)
2010-11	0.7253** (0.28)	1.6908** (0.63)
2011-12	0.8991*** (0.27)	2.0958*** (0.61)
Treatment Group	0.5357* (0.22)	
Constant	-4.1272*** (0.40)	
Observations	9,430	275

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure x. Parallel Trends Placebo Test Coefficients
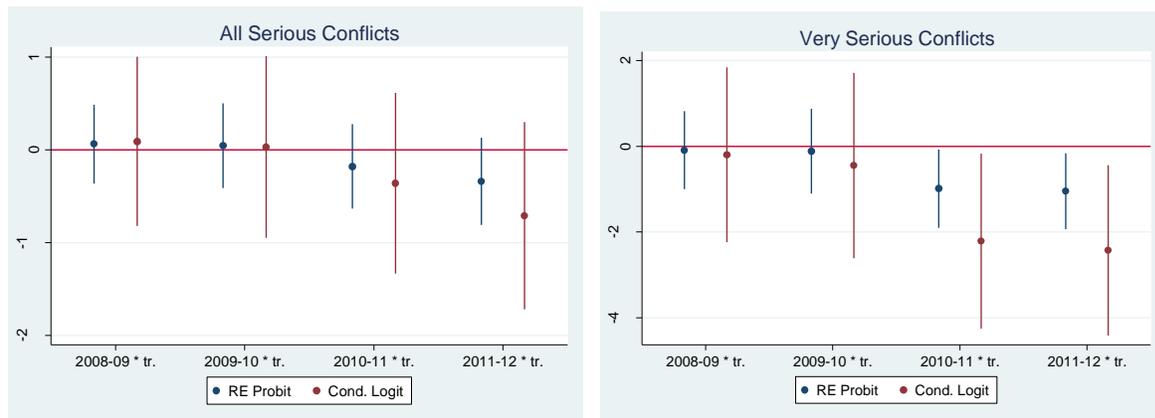
Error bars indicate 95% confidence intervals

Figure 1: The number of conflicts over time, by level of severity

The number of conflicts over time by severity

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Severe conflicts	21.1%	18.9%	34.4%	27.9%	38.2%
Non-severe conflicts	79%	81.1%	65.6%	72.1%	61.8%

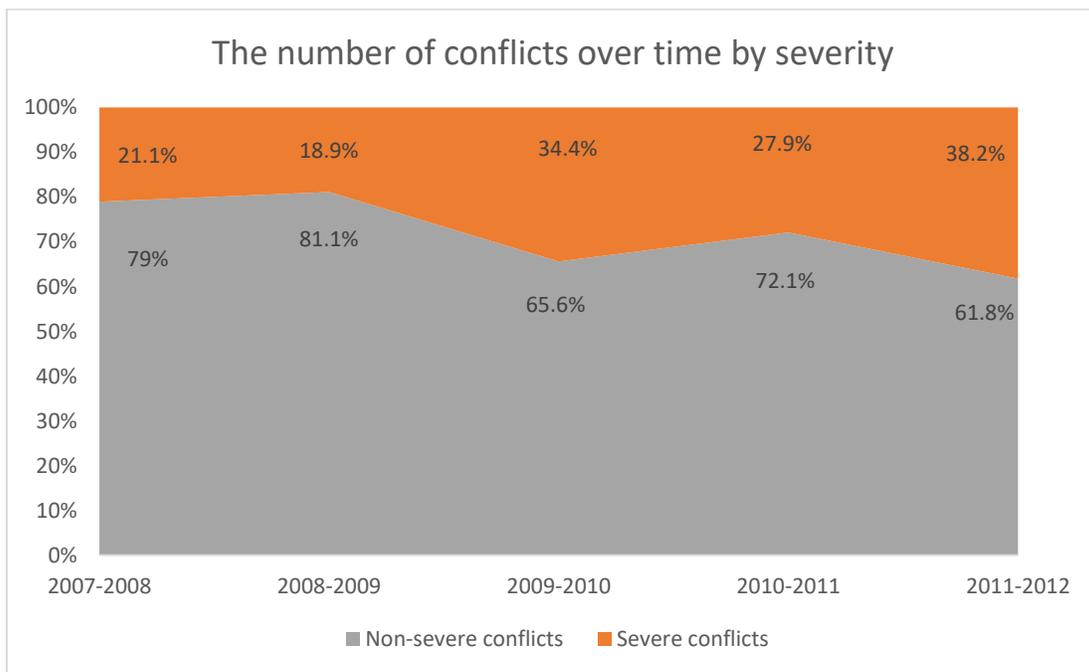■ Non-severe conflicts   ■ Severe conflicts

Figure 2: Households Experiencing Land Conflicts over Time by Level of Severity