Can Land and Food Entitlement Reduce Conflict: Evidence from Violence Prone Eastern DR Congo

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Abstract

Entitlement of land and food is often identified as primary drivers of conflict and instability. In the this study, we attempt to investigate whether property entitlement and access to food can reduce individual conflict in a violence prone impoverished society. We use survey data from 2258 households of North Kivu, Democratic Republic of Congo. Employing propensity score matching based quasi-experimental design, we show that both land claims and access to food can reduce the level of conflict in the surveyed households.

Problem Statement

Can food and land entitlement decrease conflict in violent areas of Democractic Republic of Congo?

Research Approach and Data

- We have conducted household surveys of 2300 small stake holder farmers from 40 groupments in Beni, Lubero, and Rushuru regions of North Kivus DR Congo.
- The sampling methodology was designed to ensure each village in the selected regions has equal selection likelihood. We implemented a grid based sampling methodology. Each region was divided into 5kmx5km squares.
- We gathered information on household and farm level characteristics, asset information, land access and entitlements, food entitlement and security, social conflict, access to markets and knowledge, social cohesion, empowerment and voice, etc.
- The dependent variable is conflict events and intensity.
- The choice variables are: Land claim documentation and Food security.
- The control variables are: household income, size, land claim types, education, market access, social cohesion, membership in cooperatives, social empowerment, groupment, territory, and village.

Estimation Procedure

1. An RCT would have been ideal but would difficult to employ and unethical, so we use a quasi-experimental design.
2. We use two econometric approaches: nearest neighborhood propensity score matching and the doubly robust estimator.
3. We validate the quality, uncounfoundedness and overlapping assumptions of our matching estimates.

- Propensity score is the probability of a unit (households in this study) being assigned to a particular treatment (i.e., having land entitlement and food security) given a set of observed covariates (Rosenbaum and Rubin, 1983).
- Propensity scores are used to reduce selection bias by equating groups based on these covariates. Suppose that we have a binary treatment T (T=1 if entitlement, or 0 otherwise), an outcome Y (no conflict), and background variables X (Rosenbaum, P. R., & Rubin, D. B. (1983).
- The propensity score is defined as the conditional probability of treatment given background variables:

$$P(x) = \Pr(T = 1|X = x)$$

Results from OLS and Doubly Robust Estimation (DRE)

	(1) OLS Land	(2) DRE Land	(3) OLS Food	(4) DRE Food
Dependent Variable: Conflict Level				
Land Entitlement	-0.300***	-0.269***	-0.315***	-0.302***
	(0.0669)	(0.0569)	(0.0788)	(0.0974)
Food Security	-0.129**	0.0650	-0.163**	-0.273***
	(0.0625)	(0.0650)	(0.0669)	(0.0712)
Household Size	0.0421***	0.0610***	0.0494***	0.0482***
	(0.0143)	(0.0122)	(0.0131)	(0.0155)
Income	-8.30e-09***	-4.50e-08	-9.33e-09	-2.86e-08
	(1.04e-09)	(5.91e-08)	(7.71e-09)	(7.43e-08)
Education	0.0153**	0.0178**	0.0147**	0.00969
	(0.00736)	(0.00709)	(0.00749)	(0.00929)
Fear of Expropriation	0.456***	0.359***		
	(0.0775)	(0.0751)		
Secure Transfer Rights	0.0350	-0.299***		
	(0.0931)	(0.0804)		
Social Cohesion	0.0759	0.473***	0.0973	0.0625
	(0.0700)	(0.0763)	(0.0736)	(0.0859)
Cooperative Membership	0.0204	-0.101	-0.00698	0.105
	(0.0806)	(0.0653)	(0.0762)	(0.0865)
Constant	1.142***	0.917***	1.338***	1.456***
	(0.282)	(0.326)	(0.315)	(0.384)
Observations	1,494	1,258	1,494	1,261
R-squared	0.198	0.183	0.145	0.153
Controls	YES	YES	YES	YES

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

Cloumns 1 and 2 show the effect of having land entitlement on the level of conflict faced by households, using OLS (col 1) and Doubly Robust Estimator (col 2). Both results show that land entitlement has a significant effect in reducing conflict faced by households. Column 3 and 4 show the effect of being food secure on the level of conflict faced by households using OLS (col 3) and the Doubly Robust Estimator (col 4). Once again, both estimations show that being food secure has a significant negative effect on the level of conflict faced. The Doubly Robust Estimator combines a matching technique with a linear regression to estimate results. For the sake of brevity, not all control variables are shown in the Table above.

Propensity Score Matching Results

The table shows the final result from nearest neighborhood matching, with replacement. Based on the results, we may claim that households that have land entitlement and households that are food secure are less prone to conflict than similar households without land and food security respectively. The results are consistent with our previous estimates.

VARIABLES	(1) PSM Land	(2) PSM Food
Treated	-0.265***	-0.245***
	(0.0648)	(0.0651)
Constant	1.095***	1.084***
	(0.0421)	(0.0418)
Observations	1,494	1,494
R-squared	0.011	0.009

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

Treatment Assignment (land entitlement)	Common Support On support
Untreated	865
Treated	629
Total	1494

629 households with land claims are matched with 865 similar households without land claim

Variable	Sample	Treated (land title)	Controls	Difference	S.E.	T-stat
Conflict Level	Unmatached	.829888712	1.09479769	-.264908976	. 064820565	-4.09
	ATT	.829888712	1.063593	-.233704293	.137624949	-1.70
	ATU	1.09479769	.916763006	-.178034682		
	ATE			-.201472557		

Table shows that we cannot reject the hypothesis that the treatment and control groups are similar after matching on land entitlement.

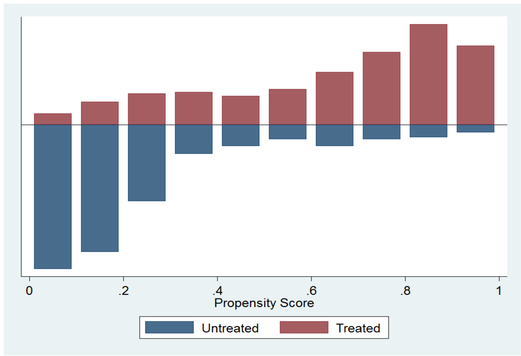
Treatment Assignment (food security)	Common Support On support
Untreated	881
Treated	615
Total	1496

615 households who claim to be food secure are matched with 881 similar households who are not food secure

Variable	Sample	Treated (food security)	Controls	Difference	S.E.	T-stat
Conflict Level	Unmatached	.83902439	1.08513053	-.246106143	.065022325	-3.78
	ATT	.83902439	1.21138211	-.372357724	.11040463	-3.37
	ATU	1.08513053	.847900114	-.23723042		
	ATE			-.292780749		

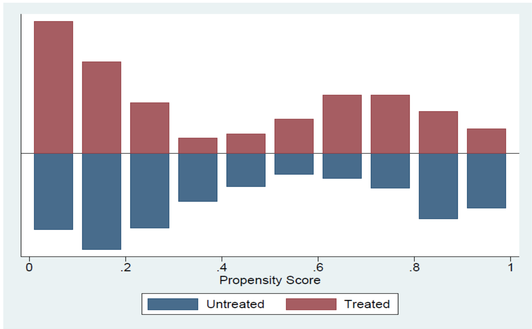
Table shows that we can reject the hypothesis that the treatment and control groups are similar after matching based on food security.

Visual Representation of Matching Quality



Graph for matching on Land Entitlement

Graph shows that the Common Support Assumption of PSM holds since there is an overlap of the propensity scores of the treated and untreated households.



Graph for matching on Food security

Graph shows that the Common Support Assumption of PSM holds since there is an overlap of the propensity scores of the treated and untreated households.

Conclusion

Based on our estimation, we conclude that households that have secure land entitlements and households that are food secure face lesser conflict in society compared to other similar households who differ only in their land and food entitlement respectively.

By employing a variety of Propensity Score Matching techniques, we hope to overcome the bias that may have aroused from households that may have been self-selected into receiving entitlement. PSM helps to match and compare households that had a similar propensity to receive entitlement, based on a variety of background characteristics such as income, education, market access, social power, etc. As a result we may conclude from our study that the reduced intensity of conflict faced by households with and without land or food entitlement is due to the having the entitlement.

A policy implication of this may be that ensuring land and food entitlement to impoverished households in regions threatened by persistent war and social conflict may be effective in reducing conflict in these regions.

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