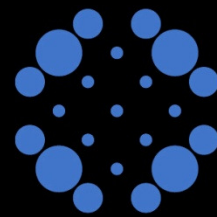# Can Land Registration and Certification Reduce Land Border Conflicts?

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Can Land Rregistration and Certification

Reduce Land Border Conflicts?

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ABSTRACT. *This paper assesses factors related to local land border conflicts and how low-cost land registration and certification has affected land conflicts during and after land registration and certification using data from northern Ethiopia. Border conflicts were more common near district centers, further away from markets, and where property rights had been redistributed more recently. A higher probability of reduction in conflicts during and after the reform was positively associated with nearness to markets, longer distance to district centers, more recent land redistribution, better quality border demarcation and plot measurement during registration, and less involvement by local elders in adjudication.* (JEL-codes: Q15).

I. INTRODUCTION

Struggles over territory are recognized to be the most pervasive form of conflicts and the largest category of causes of inter-state wars as well as intra-state conflicts and terrritorial conflicts occur most frequently between neighbors (Richardson 1960; Wright 1965; Vasquez 1995; Huth 1996; Wallensteen and Sollenberg 2000; Gleditsch 1995; 2001).

Recent hikes in oil and food prices have caused a sudden rise in demands for land also in Sub-Sahara Africa, and have spurred political instability related to international "land grabs" such as in Madagascar in a continent that until recently has been perceived as having abundant land. Despite overall land abundance very high population concentrations and land scarcities occur in parts of central, east and southern Africa. The genocide in Rwanda and recent conflicts in Kenya may also be rooted in conflicts over scarce land resources and have given new life to the neo-Malthusian view (André and Platteau 1998; Ohlsson 1999).

There are many unsettled questions and few good empirical studies of how land scarcity or abundance affect territorial disputes at the micro level. Micro-level empirical studies of land disputes include André and Platteau (1998) and Platteau and Baland (2001) who noticed that when land pressures become particularly severe, weaker categories of land rights holders may be discriminated against. This view is supported by research in Rwanda and Burundi (André and Platteau 1998) and in Kenya and Uganda (Platteau and Baland 2001). Platteau and Baland also find evidence of increasing incidence of within family land conflicts when population pressures become very severe in areas with the common practice of equal sharing of land among children, and in the sharing between parents at old age and their children on very small holdings that are insufficient to meet the needs of all. However, many of the studies on these issues suffer from selection bias due to their case study nature (Gleditsch 2001).

There are also few good empirical studies of how the security of tenure and the distribution of property rights affect land disputes. The potential role of land laws and policy in preventing conflicts over land in the short- and medium-run is insufficiently studied and documented (Cotula et al., 2004). There are also very few studies on how land reforms in form of land registration and certification affect land conflicts (Deininger and Castagnini, 2004). In Uganda Deininger and Castagnini (2004) found that female-headed households and widows are particularly affected by land reforms and that the reforms have failed to reduce the number of land conflicts. They also found signs of large negative effects of land conflicts on land productivity.

Since land certification programs now are pushed in many countries in Sub-Saharan Africa it is particularly relevant to study how these programs affect the extent of land conflicts and identify implementation rules that can reduce conflicts and enhance the positive effects on poor and vulnerable groups. In Honduras Jansen and Roquas (1998) provide evidence that a land titling program has exacerbated land conflicts by creating multiple claims to land and by

undermining existing institutions for conflict resolution. Alston, Libecap and Mueller (2000) found that a land reform expropriating land from land-rich owners and distributing it to squatters led to more conflicts in the Brazilian Amazon.

This paper assesses the relationship between land registration and certification reform and land border conflicts among neighbors in Tigray Region in Ethiopia, where this type of land reform was implemented with a remarkable speed and at a very low administrative cost (Deininger et al. 2008). The area is characterized as semi-arid, having high dependence on rain-fed agriculture, and facing severe land scarcity at the household level (Holden et al., 2009). This provides a unique opportunity to observe the dynamics of land-related conflicts, something that is explored through interviews with a sample of 400 local conflict mediators from 27 communities to assess the situation before, during and after the reform. A number of community and land reform implementation quality characteristics were used to test our hypotheses, including that land scarcity and competition for land leads to more conflicts over land and so does unclear border demarcations because they open for strategic investments by encroachers and earlier users of that land in order for them to gain or keep control over it. Furthermore we hypothesize that land reforms that lead to better demarcation of land borders and land reforms that more clearly identify and specify the land rights of users and owners contribute to reduce such conflicts. The analysis did not reveal a simple positive association between land scarcity and border conflicts while the land reform in form of registration and certification of rural land appeared to reduce land border disputes.

The paper is organized as follows: Part II gives a review of relevant literature, part III provides information about the Ethiopian land reform, part IV develops a theoretical framework, part V describes the methods used, part VI provides descriptive analysis, and part VII presents the main results before we conclude.

II. LITERATURE REVIEW

Thomas Malthus and neo-Malthusians see population growth and land degradation as potential sources of violent conflicts. The struggle for survival may involve fighting over scarce resources (Homer-Dixon 1999) and extreme environmental scarcities may eventually lead to collapse (Diamond 2005). Another view states that land scarcity leads to intensification, technical and institutional innovation, including ways to resolve conflicts in a better way. The latter view is close to the views of Boserup (1965). There is also a literature emphasizing that inequality may lead to conflicts, like the theory of relative deprivation (Gurr 1970), arguing that absolute poverty may lead to apathy and inactivity, while comparisons with those in the same society who do better may lead to actions and conflicts.

Theoretical models explaining conflicts include models developed by Hirschleifer (1987; 1988; 1989) and Grossman (1991) and following extensions of these. Most of these models are constructed as more aggregate general equilibrium models, typically focus on the importance of the conflict technology, and are mostly one-shot games. There are few examples developed at micro-level to explain the behavior of individual agents competing for the same area of land. One exception is Alston, Libecap and Mueller (2000) who developed a model to capture the interactions between squatters and landlords in the Brazilian Amazon and how they responded to land redistribution reforms. Their model was a static one-shot strategic game. Their model predicted that land redistribution enhanced violent conflicts in the Amazon, consistent with their empirical findings.

Yet another view is formulated as the resource curse hypothesis stating that an abundance of certain valuable resources leads to low growth, rent-seeking behavior and violent conflicts (Sachs and Warner 1995). The hypothesis has recently been contested by Mehlum, Moene and Torvik (2006a, 2006b) who find that institutions are decisive for the resource curse; it is only relevant when institutions are resource grabber friendly and countries with producer-friendly institutions escape the resource curse. Robinson, Torvik and Verdier (2006) argue that the political

incentives that resource endowments generate are the key to understanding whether or not they are a curse.

Deininger and Castagnini (2006) propose that one of the main reasons for the increasing incidence of land-related conflicts in Africa is the failure of land tenure systems to respond to the increasing land pressures and that this undermines investment incentives and land productivity. An important question is then whether policy interventions can help to reform these tenure systems such that investment and productivity effects can be enhanced by reducing land conflicts and tenure insecurity. When the government in Kenya tried to limit subdivision of holdings through its land registration system, this led to widespread evasions which undermined the whole system (Bruce 1986). Customary laws remained dominant and emphasized the equal sharing rule for family land. The same happened in Rwanda where an official decree (in 1976) prohibited sale, fragmentation and subdivision of land for holdings less than two hectares in size (Platteau and Baland 2001). Similarly, Holden and Tefera (2008) found that a large share of the land holdings that were registered for land certification in Southern Ethiopia were below the minimum holding size stipulated by the law as 0.5 ha for cereal crops and 0.25 ha for perennial crops. It is therefore far from obvious that changes in national laws have an effect or a positive (reducing) effect on land fragmentation and conflicts. Further fragmentation may even be a way to avoid within-family conflicts.

According to Bledsoe (2006, p.163) advocates of the Poverty and Social Impact Analysis (PSIA) in the World Bank are of the opinion that land reforms have caused conflicts with negative effects on the poor. At the same time Bledsoe (2006) emphasizes the very limited empirical evidence on how the poor are affected by land reforms. A study finding positive effects of land reforms is that of Firmin-Sellers and Sellers (1999) in Cameroon. In their study of the impacts of the 1974 Land Ordinance they found that very few and mainly the rich in urban and peri-urban areas obtained full titles to the land but still the first component,

provision of concrete boundary markers, was obtained by a large share of the rural farmers and this component enhanced farmers' tenure security.

These findings indicate that our study of the impacts of the recent land certification on local land conflicts in one of the poorest countries in the world is highly relevant from a land policy reform perspective and contributes to filling a knowledge gap. In the next section the background of the Ethiopian land policy reform is summarized.

III. ETHIOPIAN LAND POLICY AND REFORM

Contrary to the rest of Africa, Ethiopia does not have a colonial history. However, this does not mean that Ethiopia has not been strongly influenced by global political ideologies. The Ethiopian Land Reform in 1974 was influenced by a radical communistic ideology. Before the reform there was a diversity of tenure systems from absentee landlordism in the south of the country to the more communal *rist* system in the north. The land reform therefore caused larger changes in the tenure system in the south than in the north. The radical land reform implied that all land was made state property and user rights to land were distributed to households within communities based on needs (household size). The maximum farm size was set to 10 ha and land renting and hiring of labor were prohibited. Further land redistributions took place after that at irregular intervals to provide land to new households and to adjust farm sizes to changes in household sizes. The tenure system may therefore be seen as a safety net providing land to all rural dwellers. The use right to land was considered a strong human right that was guaranteed to all residents in a community. The reform was also a product of the 'Land-to-the-tiller' student movement and this created some tension and local variation in land allocation between 'needs' and 'ability to till' the land (Rahmato, 1984; Holden and Yohannes, 2002).

The change in government in 1991 implied a shift towards a more market-friendly policy regime. Although land remained state property, short-term land renting and hiring of labor were allowed. Land redistributions were mostly stopped, except one land redistribution in the Amhara Region in 1997 that was politically motivated to punish those that had official positions under the previous regime, and some more limited local redistributions (Ege, 1997). The new government decentralized some of the land policy responsibilities to the regional level and regional land proclamations were developed, following but not undermining the federal land proclamation. This resulted in some diversity across regions in the proclamations, implementation rules, and timing of law formulation and implementation of land registration and certification processes.

Recent Law Reforms

The relevant Ethiopian land proclamations include the Federal Land Proclamations of 1997 (FRLAUP, 1997) and 2005 (FRLAUP, 2005) and the Tigray Land Proclamations of 1997 (TRLAUP, 1997) and 2006 (TRLAUP, 2006). More detailed regulations for the Tigray Region have also been introduced in 2007 (TLR, 2007). Similar regional proclamations and regulations also exist for the other major regions of the country.

The proclamations maintain that all land is state land but provide members of a community user rights to land for unlimited time. In fact, all these proclamations emphasize the right to access land for all adult persons living in rural communities. At the same time these new proclamations have introduced regulations against subdividing farms beyond a minimum size (0.25 ha = 1 tsimdi)[i] such that landlessness is a growing problem in an increasing number of communities where land scarcity is high. The small farm sizes and dry climate in Tigray has made most households net buyers of food and they have become dependent on supplementary income and social safety nets in form of food-for-work projects and free food distributions.

Implementation in Tigray

Land registration was organized by Tigray People's Liberation Front (TPLF) already during the civil war from 1988 as a basis for land redistributions. At that time they provided a white paper to the owner with information about the name of the holder, family size, soil fertility status, parcel size in local units, boundary information on the parcel and neighbors of the parcels. This information was, however, not included in a central registry.

The land registration and certification that we study here was started in 1998 and focused only on cultivated land in Tigray. The aim was to minimize conflicts, increase tenure security and to upgrade the certificates and create registries (Nega and Atakilt, 2006). Four different forms were used in the process. Form 1 was used for collection of data in the field, Form 2 was the registry book where the information was recorded at community (tabia[ii]) level (a copy of this book was also kept at woreda level), Form 3 was the land certificates given to the landholders, and Form 4 was to be used for land transactions. It was the Bureau of Agriculture and Natural Resources that was responsible for the implementation. Organizational committees were established at woreda and tabia levels. At tabia level they typically consisted of the local agricultural development agent, the tabia leader and elders from the community who had experience from participation in earlier land redistributions. In addition technical support was provided by youth that had been trained for six months (Haile et al., 2005). For more detailed description of the process we refer to Haile et al. (2005) and Nega and Atakilt (2006). By 1999 more than 80% of the landholders in Tigray had received land certificates.

Ideally plot borders were identified and more clearly demarcated where this was needed under the presence of all relevant neighbors (our study shows that the quality of this process varied). Plot border conflicts were attempted settled as part of the process. No maps of the plots were made. Households were then given the land certificates (Form 3) that were a one-page sheet

with the name of the household head, the list of plots that the household owned, the size of the plot, the land quality, the name of the location of the plot and the names of the neighbors of each plot.

Conflict Mediation

Conflict mediation has traditionally been handled by local conflict mediators that have been appointed by each of the parties in the conflict. If this form of mediation failed, the parties could bring their case to the local social court (at village (tabia) level). If they were not happy with the outcome there, they could take their case to the woreda (district) court, and even to higher courts.

IV. THEORETICAL MODELS:
LAND CONFLICT INVESTMENT AND LAND REFORM

Basic ideas

We construct models which capture how increasing land scarcity and unclear land rights affect investment in conflicts over contested land and how insecure property rights may increase the extent of encroachment into land that is less tenure secure. In such an environment investment in taking control over contested land may be a way to increase both current and future income from scarce land resources. Such conditions may make it privately optimal to invest in land conflicts while from a society perspective it is a negative or at best a zero-sum game. For society then it should make sense to invest in securing property rights in order to reduce conflicts and to mobilize resources for more productive investments. This may be done by creating disincentives for investment in conflicts by reducing their expected returns.

We start out by constructing a simple theoretical model of a land user household (R) that finds it profitable to encroach and produce on land that is also claimed by its neighbor. The household has an endowment of A^{Ro} own land and a labor endowment of T^R. Part of the labor endowment, L^{Ra}, is used for production of output $q^{Ro} = q^{Ro}\left(A^{Ro}, L^{Ra}\right)$ on this land. The household invests part of its time, L^{Rc}, to gain control over an additional area of contested land, A^c, using L^{Rca} of its labor endowment for production of output $q^{Rc} = q^{Rc}\left(A^c\left(L^{Rc}\right), L^{Rca}\right)$ on this contested land. This investment in taking control over the contested land is also assumed to increase the probability θ that the household can use it for production in the current period and to increase the probability ξ that this land can be controlled by the household in the future. The potential land that is open for land grabbing is $\overline{A}_0^c$ and its size is a function of past land policies, their implementation, and local cultural norms, summarized in the vector ψ_0, therefore

$$A^c = A^c\left(\overline{A}_0^c\left(\psi_0\right), L^{Rc}\right), 0 \le A^c \le \overline{A}_0^c, A^c_{\overline{A}_0^c} > 0, A^c_{L^{Rc}} > 0, A^c_{L^{Rc}, L^{Rc}} < 0.$$

Assume that a land reform policy, ψ_1, may be introduced by the government, having three effects; it reduces the current access to contested land[1], $\overline{A}^c = \overline{A}^c\left(\psi\right)$, such that $\overline{A}^c_\psi < 0$, it reduces the probability of keeping the contested land in the future[2], $\xi = \xi\left(L^{Rc}, \psi\right)$, assuming $\xi_{L^{Rc}} > 0, \xi_\psi < 0, \xi_{L^{Rc}, L^{Rc}} < 0, \xi_{L^{Rc}, \psi} < 0$ and it reduces the probability of succeeding with occupation of the land in the current period; $\theta = \theta\left(L^{Rc}, \psi\right)$, assuming that

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[1] This achieved through clearer border demarcation.
[2] This is done by providing land certificates to owners, with specific information about their land size, through clear border demarcation with neighbours as witnesses on where the borders are located, and by providing better land administration support through establishment of local Land Administration Committees. Although the encroacher may be influential these policy interventions may have real impacts on the likelihood of his success and he will have to spend more resources to succeed both with the short-run occupation and with obtaining more long-run rights to the occupied land.

$\theta_{L^{Rc}} > 0, \theta_{\psi} < 0, \theta_{L^{Rc},L^{Rc}} < 0, \theta_{L^{Rc},\psi} < 0$. The standard concavity assumptions for production and utility functions with inputs being complements are invoked.

A Bellman equation is used to capture this investment problem. Time period subscripts for the first period are dropped to simplify the notation, except in the case of $\overline{A}_0^c$ and ψ_0, as we want to discuss the importance of these initial conditions.

$$V^R(A^R, T^R) = \underset{L^{Ra}, L^{Rc}, L^{Rca}}{Max} \left[U^R \left\{ \begin{array}{l} pq^{Ra}\left(L^{Ra}; A^{Ro}\right) \\ +\theta\left(L^{Rc}; \psi_0\right) pq^{Rc}\left(A^c\left(L^{Rc}; \overline{A}_0^c(\psi_0)\right), L^{Rca}\right) \\ +w^R\left(T^R - L^{Ra} - L^{Rc} - L^{Rca}\right) \end{array} \right\} \\ +\beta^R V_1^R\left\{A^{Ro} + \xi\left(L^{Rc}, \psi_0\right) A^c\left(L^{Rc}; \overline{A}_0^c(\psi_0)\right), T^R\right\} \right]$$

where w^R is the wage rate (opportunity cost of time), and $\beta^R = \dfrac{1}{1+\delta^R}$ is the discount factor.

The Kuhn-Tucker conditions, allowing for corner solution for land encroachment, follow:

$$V^R_{L^{Ra}} = U^R_Y \left\{ pq^R_{L^{Ra}} - w^R \right\} = 0$$

$$V^R_{L^{Rc}} = U^R_Y \left\{ \theta_{L^{Rc}} pq^{Rc} + \theta pq^{Rc}_{A^c} A^c_{L^{Rc}} - w^R \right\} + \beta^R V_{1_{A_1^R}}^R \left\{ \xi_{L^{Rc}} A^c + \xi A^c_{L^{Rc}} \right\} \le 0 \perp L^{Rc} \ge 0$$

$$V^R_{L^{Rca}} = U^R_Y \left\{ \theta pq^{Rc}_{L^{Rca}} - w^R \right\} \le 0 \perp L^{Rca} \ge 0$$

In the case of an interior solution the second of these first order conditions states that the household invests time in encroachment up to the point where the marginal expected return to encroachment, taking into account current and future discounted expected benefits from accessing this extra land, are equal to the opportunity cost of labor. In other words, conflict investment is a potentially profitable activity for the encroacher. It is more profitable the higher the probability is that he can have a short-term return and the higher this return is, and is higher the higher the probability that he can keep the land in the future and the higher the discounted expected future value of the land.

Of particular interest is to assess the effects of the implementation of policies that aim to reduce land conflicts through clearer identification of property rights. Based on the model assumptions these policies reduce the area that is contested and reduce the probability that an encroacher will be able to retain that land in the future. Assuming an interior solution, the following comparative static result for the impact of such a policy on the labor the encroacher invests in encroachment is:

$$
\frac{dL^{Rc}}{d\psi} = |H|^{-1} \left\{ U^R_Y pq^{Ra}_{L^{Ra},L^{Ra}} - \left\{ \begin{array}{l} \left[\left(U^R_Y p\right)^2 \left(\theta_\psi q^{Rc}_{L^{Rca}} + \theta q^{Rc}_{L^{Rca},A^c} A^c_{\overline{A}^c} A^c_\psi\right)\left(\theta_{L^{Rc}} q^{Rc}_{L^{Rca}} + \theta q^{Rc}_{L^{Rca},A^c} A^c_{L^{Rc}}\right) \right] \\ \\ \left[\begin{array}{l} U^R_Y p\left(\theta_\psi q^{Rc}_{A^c} A^c_{L^{Rc}} + \theta \overline{A}^c_\psi \left[q^{Rc}_{A^c,A^c} A^c_{\overline{A}^c} A^c_{L^{Rc}} + q^{Rc}_{A^c} A^c_{\overline{A}^c,L^{Rc}} \overline{A}^c_\psi \right]\right) \\ + U^R_{Y,Y}\left\{\theta_{L^{Rc}} pq^{Rc} + \theta pq^{Rc}_{A^c} A^c_{L^{Rc}} - w^R\right\}\left\{\theta_\psi pq^{Rc} + \theta pq^{Rc}_{A^c} A^c_{\overline{A}^c} \overline{A}^c_\psi\right\} \\ \\ +\beta^R \left\{ \begin{array}{l} V^R_{1 A_1}\left(\xi_{L^{Rc},\psi} A^c + \xi_{L^{Rc}} A^c_{\overline{A}^c} \overline{A}^c_\psi + \xi_\psi A^c_{L^{Rc}} + \xi A^c_{L^{Rc},\overline{A}^c} \overline{A}^c_\psi\right) \\ +V^R_{1 A_1,A_1}\left\{\xi_{L^{Rc}} A^c + \xi A^c_{L^{Rc}}\right\}\left\{\xi_\psi A^c + \xi A^c_{\overline{A}^c} \overline{A}^c_\psi\right\} \end{array} \right\} \end{array} \right\} \times \\ \\ U^R_Y \theta pq^{Rc}_{L^{Rca},L^{Rca}} \end{array} \right\} \right\}
$$

Although ambiguous this expression is highly likely to be negative, given the assumptions. Therefore policies that reduce tenure insecurity and specify clearer property rights should reduce incentives to invest in land encroachment. Other results (not shown here) are; less time will be invested if the opportunity cost of time is higher and more time will be invested when the discount factor is higher (discount rate is lower) and the initial resource endowment is higher.

We now turn to the other side of the land conflict, the poor household (P) being encroached upon by the wealthier encroacher (R). This household has experienced that part of its land has

been occupied and it is therefore currently unable to use it for production[3]. It still has some other land to produce on and can spend part of its time to fight to get back the land it has lost. The probability of getting back the land is expected to increase with the time spent fighting to get it back, or in other words, the probability of losing the land is expected to be reduced with time invested in fighting for it[4], $\xi = \xi\left(L^{Pc}, \psi\right), \xi_{L^{Pc}} < 0, \xi_{L^{Pc}, L^{Pc}} > 0, \xi_{L^{Pc}, \psi} < 0$, and similarly for the probability of loss of first period control and benefits from the land; $\theta = \theta\left(L^{Pc}, \psi\right)$, $\theta_{L^{Pc}} < 0, \theta_{L^{Pc}, L^{Pc}} > 0, \theta_{L^{Pc}, \psi} < 0$[5]. Otherwise, the same assumptions apply as in the previous model. The Bellman equation for the poor and tenure insecure household can be stated as:

$$V^{P}(A^{P}, T^{P}) = \underset{L^{Pa}, L^{Pc}, L^{Pca}}{Max} \left[\begin{array}{l} U^{P} \left\{ \begin{array}{l} pq^{Pa}\left(A^{Po} - A^{c}\left(\psi_{0}\right), L^{Pa}\right) \\ \left[1 - \theta\left(L^{Pc}; \psi_{0}\right)\right] pq^{Pc}\left(A^{c}\left(L^{Pc}; \overline{A}_{0}^{c}\left(\psi_{0}\right)\right), L^{Pca}\right) \\ + w^{P}\left(T^{P} - L^{Pa} - L^{Pc}\right) \end{array} \right\} \\ + \beta^{P} V_{1}^{P} \left\{ A^{Po} - \xi\left(L^{Pc}, \psi_{0}\right) A^{c}\left(L^{Pc}; \overline{A}_{0}^{c}\left(\psi_{0}\right)\right), L^{Pca}, T^{P} \right\} \end{array} \right]$$

with the following Kuhn-Tucker conditions:

$$V^{P}{}_{L^{Pa}} = U^{P}{}_{Y}\left\{ pq^{P}{}_{L^{Pa}} - w^{P} \right\} = 0$$

$$V^{P}{}_{L^{Pc}} = U^{P}{}_{Y}\left\{ -\theta_{L^{Pc}} pq^{Pc} + [1-\theta] pq^{Pc}{}_{A^{c}} A^{c}{}_{L^{Pc}} - w^{P} \right\} - \beta^{P} V_{1}{}^{P}{}_{A_{1}} \left\{ \xi_{L^{Pc}} A^{c} + \xi A^{c}{}_{L^{Pc}} \right\} \le 0 \perp L^{Pc} \ge 0$$

$$V^{P}{}_{L^{Pca}} = U^{P}{}_{Y}\left\{ [1-\theta] pq^{Pc}{}_{L^{Pca}} - w^{P} \right\} \le 0 \perp L^{Pca} \ge 0$$

The second term states that the household invests time in fighting to get back the contested land up to the point where the marginal expected future return from the lost land is equal to the marginal utility opportunity cost of time, or it gives up initially because the probability of succeeding with getting it back is too low.

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[3] It may lack resources to farm the land efficiently and may therefore also have rented out the land to the encroacher who may want to take more permanent control over the land.

[4] The first step may be direct negotiation with the encroacher, the next may be to involve local conflict mediators, or to go further to local or higher courts. The policy reform in form of land registration and certification should strengthen the rights of such poor households.

[5] This implies that investment in fighting to keep the land reduces the probability of loss but the marginal change in the probability of loss with increasing effort increasing, and the probability of loss is decreasing when introducing a policy that enhances the tenure security of poor households.

Based on the interior solution the following results can be derived from the model; the household will use less time fighting for the land the more land it has, the higher the opportunity cost of time, the lower the time endowment, and the lower (higher) the discount factor (discount rate). Furthermore, a policy that increases the probability the household will get back the land will usually also reduce the time the household will have to spend to fight to get back the land as seen from the following model result:

$$\frac{dL^{Pc}}{d\psi} = \mid H \mid^{-1} U^{P}{}_{Y}\, pq^{Pc}{}_{L^{Pa},L^{Pa}}\beta^{P}\left\{V^{P}_{1\ A_{1}}\left(\xi_{L^{Pc},\psi}A^{c}+\xi_{L^{Pc}}A^{c}{}_{\psi}\right)-V^{P}_{1\ A_{1},A_{1}}\left(\xi_{\psi}A^{c}+\xi A^{c}{}_{\psi}\right)\xi_{L^{Pc}}A^{c}\right\}<0$$

However, if the household moves from a corner solution before the reform, where it even does not try to get back the land, to an interior solution after the reform, which gives it more hope to get back the land, the reform will trigger more conflicts over such contested land because the policy has empowered the poor household and made it stand up for its rights. The household may still have to struggle to get back its land as law enforcement is not likely to come by itself. If a law reform involves strengthening of a judicial system for conflict resolution, it could also contribute to make the court system busier. This may not be a sign of more conflicts in general, however, but could rather be a reflection of an improved formal system to deal with conflicts.

Aggregate effects

These simple theoretical models may be used to deduce aggregate effects for communities where only a small fraction of households engage in encroachment on others and are being encroached by others. In other words, they are used to assess the factors affecting the frequency of land border conflicts and changes in this frequency among rural land users. It is argued that there are links between the factors increasing or decreasing investments in encroachment and protection against encroachment, the probability of such investments and

the fraction of households being involved or frequency of such conflicts taking place. It is proposed that these conflict investment probabilities are positively related with conflict frequencies in a random sample of households and communities. Based on this the following reduced form models and hypotheses for determinants of the frequency and change in frequency of conflicts during and after land registration and certification are derived:

$$F_0 = F_0\left(\overline{A}^R, \delta^R\left(\overline{A}^R\right), w, p^D, A^c\left(\psi_0\right); c_0\right)$$

$$\triangle F = f\left(\overline{A}^R, \delta^R\left(\overline{A}^R\right), w, p^D, A^c\left(\psi_0\right), \psi_1; c_0\right)$$

where F_0 is the initial frequency of conflicts, $\triangle F$ is the change in frequency of conflicts during or after the land reform, $\overline{A}^R$ and δ^R are the land owned and the discount rate of the wealthy in the community, w is the opportunity cost of time, p^D is the population pressure, A^c is the extent of contested area in the community, ψ_0 is the initial land policy conditions, ψ_1 is the new policy reform and c_0 represents other conditioning community characteristics. This model is fit to our case study area and data available from local conflict mediators on the frequency of land border conflicts before, during and after the land registration and certification reform in Tigray region in northern Ethiopia. A few modifications were made to capture as many as possible of the relevant variables, using indicator variables.

$$F_0 = F_0\left(\overline{A}^R, w\left(m^D\right), p^D\left(d^D\right), A^c\left(\psi_0\left(y^{RD}, b^A\right)\right); c_0\right)$$

$$\triangle F = f\left(\overline{A}^R, w\left(m^D\right), p^D\left(d^D\right), A^c\left(\psi_0\left(y^{RD}, b^A\right)\right), \psi_1^Q\left(k^B, a^{MQ}\right); c_0\right)$$

m^D is the distance to nearest market as a proxy variable for average opportunity cost of time, d^D is the distance to the district (woreda) centre and is used as a proxy for population pressure, ψ_0 is the initial land policy conditions including the year of the last land distribution $\left(y^{RD}\right)$ and the clarity of plot border demarcation before the reform $\left(b^A\right)$, ψ^Q is the quality of

the land reform as indicated by whether community (kushet) borders were demarcated during land registration $\left(k^B\right)$ and the reliability of plot size measurements $\left(a^{MQ}\right)$. These models are estimated while controlling for other community characteristics $\left(c_0\right)$ in order to test the following hypotheses:

H1: *Neo-malthusian hypothesis*: The poorer the community the higher the frequency of land conflicts and the frequency of conflicts increases over time due to population growth and is higher where population pressure is high. The farm size per capita of the wealthy in the community is used as an indicator of resource scarcity. The hypothesis implies that there area more conflicts where the relatively wealthy in the community have less land and conflict frequency increases over time.

H2: *The resource curse hypothesis*: The more land the wealthy households in the community have, the more conflicts in the community. This can be because there are more resources to fight for and the capacity to invest in conflicts is higher the more resources they have. This is the opposite of hypothesis H1. The land endowment per capita of the conflict mediators is used as an indicator of the land wealth of the wealthy in the community.

H3: The higher the opportunity cost of time (better market opportunities) the less conflicts. Distance to market is used as an indicator variable for opportunity cost of time and should be positively correlated with frequency of land conflicts.

H4: There are more conflicts close to the district (woreda) centers due to high population pressure related to urban expansion leading to more competition for land. The land registration and certification did not include urban land and rural land exposed to urban expansion is not well protected.

Initial policy conditions:

H5: Unclear initial land border demarcation (fuzzy borders) is positively correlated with frequency of conflicts.

H6a: The more recently the last land redistribution took place the clearer land borders and the less conflicts, vs.

H6b: More recent land redistributions are associated with a higher level of and an increase in frequency of conflicts.

Land registration and certification:

H7: The better quality of land registration and certification the fewer conflicts during and after the registration and certification. Indicators of the quality of the reform:

H7a: Demarcation of community (kushet) borders during registration leads to a higher probability of a reduction in conflicts,

H7b: More accurately measured plot sizes during registration lead to a higher probability of a reduction of conflicts during and after registration and certification, and

H7c: Local participation by elders in adjudication increases the probability of a reduction in the frequency of land conflicts during and after registration and certification. This hypothesis rests on the assumption that local participation enhances the quality of the process[6].

The hypotheses were tested by using the data from local conflict mediators.

V. METHODS

Data Collection: Interviews of Local Conflict Mediators

The large variation in practices in local social courts (at tabia level) as to whether they handled land-related conflicts, the types of land-related cases they dealt with, and the poor records kept in these courts, caused us to instead implement a survey of local land conflict mediators who appeared to have a much more uniform role in relation to local land conflicts. These local land conflict mediators were typically the first local informal institution to deal with the conflicts if mediation among the partners themselves failed. The parties themselves

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[6] On the other hand, if local participation was associated with self-interested actions, the effect could go in opposite direction.

appointed conflict mediators that they trusted to get help to resolve the conflicts. Our record of conflicts based on structured interviews of more than 400 conflict mediators in close to 100 communities or sub-villages(kushets) in 27 villages (tabias) in 9 districts (woredas) covering the 5 zones in Tigray Region should therefore give valuable insights into the types of conflicts and the impacts of land registration and certification on border conflicts. Most of these conflict mediators have many years of experience and represent the best institutional memory of the pattern and changes in local conflicts. Although they do not keep written records we regard their information as very reliable because it is based on their personal experience and they have little reason to give biased answers as the survey did not in any way emphasize the quality of work of these conflict mediators themselves. Also by sampling five conflict mediators from each sub-village this should give a more reliable picture of the pattern and changes in land-related conflicts in each sub-village. Responses from conflict mediators from the same village appeared also to be very consistent. We think that their information is more reliable as judgments of changes in conflicts over time within the village than that of households who may form opinions about conflict patterns based on rumors in the village rather than based on own experiences. In reality these data should be as reliable as typical household survey data on e.g. household income or expenditure collected as "observed data" based on recall from household members.

The sample of villages (tabias) was not random within these districts (woredas) but was a selection of tabias with a high frequency of conflicts forwarded to woreda courts. These tabias may therefore be potentially "problem tabias" where something may have gone wrong in the land registration and certification process or where the inherent problems were particularly difficult and providing challenges for the new land administration system that has been established at woreda, tabia and kushet levels. The survey may therefore effectively reveal cases where land registration and certification could have aggravated conflicts and also

possibly assess whether registration and certification may have reduced conflicts in communities where such conflicts are more severe and therefore more likely to be brought to the woreda court level.

Analytical Methods

Descriptive statistics were combined with regression models to assess the relationships between community characteristics, the land reform process and quality characteristics, and changes in the frequency of conflicts and other indicator variables. Random effects probit and ordered logit (proportional odds) models were used. We refer to general textbooks like Long and Freese (2006) and Rabe-Hesketh and Skrondal (2005) for more details on these methods.

VI. DESCRIPTION OF CONFLICT MEDIATORS AND DATA

Characteristics of Conflict Mediators

All local conflict mediators were men. Their mean age was 57 years and ranged from 29 to 89 years. On average they had been conflict mediators for 22 years. Forty-four percent of them had been directly involved in earlier land redistributions in their communities. They were heads of households and typically belonged to the wealthy and respected households in their communities. Their average farm size was about 1 ha and ranged from zero to 5 ha. Ninety-three percent of them had land certificates and on average they have 3.9 plots of land. In addition they rented in 1.7 plots and rented out 0.3 plots, indicating that they were more likely to be tenants than landlords in the local land rental market. This also reflects that they are wealthier in form of non-land resources, making them able to rent in additional land. They had on average 1.75 oxen, 1.4 cows, 2.6 sheep, 3.6 goats, and 1.1 equines. Sixty-nine percent of them had a house with corrugated iron roof, 58 percent had a radio and 6 percent a bicycle. Eighty-six percent of them confirmed to have access to credit for farm inputs and 73 percent

confirmed to have access to credit for buying animals, while 67 percent demanded credit the last year. All this reflects that they were among the wealthier households in their communities.

Local Land Conflicts and Mediation

Table 1 gives an overview of the total number of conflicts that they have mediated by type of conflict. More than 50% of all local conflicts were land-related and about 8.2 percent of the conflicts that have been mediated by local conflict mediators went to the woreda courts. A large share (46.5 percent) of these land-related conflicts that went to the woreda courts were border conflicts.

Table 2 provides information about what types of conflicts that were considered the most difficult and the second most difficult conflicts to deal with for the conflict mediators. Border conflicts came out as the most difficult followed by divorce-related cases and inheritance-related cases.

Table 3 relates the changes in conflicts during the land registration and certification with the conflict situation after registration and certification. The majority (58.4%) of the conflict mediators indicated that the number of conflicts was lower during registration and certification than before, while 27.7 and 13.9 percent indicated that there was no change or an increase respectively in conflicts during the reform as compared to before the reform. This tendency was even stronger for their assessment after the reform vs. before the reform, 68.3 percent indicated a reduction in conflicts, 20.2 percent no change and 11.5 percent an increase in conflicts. The table also cross-tabulates the assessment of change in conflicts during and after the reform, 51.8 percent of the mediators considered the number of conflicts to have been reduced both during and after the reform. Only 30 (7.9%) stated that the number of conflicts increased during and decreased after the registration and certification. And only 16 (4.1%) responded that there was an initial reduction in conflicts followed by an increase in

conflicts at a later stage. Therefore it appears that the land reform has reduced the number of disputes in most of the communities studied.

Below we study how community characteristics and the quality of the land reform possibly have affected or are correlated with these changes in frequency of disputes in order to test the hypotheses.

VII. RESULTS

Frequency of Border Conflicts before the Reform

Table 4 presents the variables included in the regression models and shows that 85% of the conflict mediators considered border conflicts to be common before the land reform was introduced. In Table 5 this variable has been used as the dependent variable in a probit model to assess determinants of the frequency of border conflicts. Border conflicts were found to be significantly (at 5% level) more common in areas close to the woreda center. This supports hypothesis H4 that there are more conflicts where there is more competition for land like it would be expected to be close to a district center. The second significant (at 1% level and with a positive sign) variable was the 'year of the last land redistribution', implying that border conflicts were more common in locations where the last land redistribution took place more recently. This finding is in line with hypothesis H6b that land redistributions may exaggerate land conflicts but here is a possibility of reverse causality as land redistribution could also have been a response to land conflicts.

Impacts of Land Registration and Certification on Border Conflicts

The models in Table 6 present the results from village random effects ordered logit models with district fixed effects. The dependent 'change in conflict' variables were ordered as follows; 1=less conflicts; 2=no difference; and 3=more conflicts. The first two models in Table 6 are for change in conflicts during the reform and the last two models are for change in

conflicts after the reform. The difference between the first two models of determinants of change in conflicts during land registration and certification was that in the first model the indicator variables for the quality of the land reform were left out to see whether the inclusion of these variables had any significant effects on the other included variables.

The results show that there was significantly (1% level) more likely to be a reduction in conflicts far from woreda centers. Consequently, land registration and certification appeared less able to initially reduce conflicts where land pressure was high, like near woreda centers, where such conflicts also were found to be more common. Such conflicts may be related to urban expansion as urban areas were not included in the registration and certification reform. Households living near the edge of an urban area were more likely to experience land expropriations for various public and other purposes. The finding implies that hypothesis H4 cannot be rejected.

The 'distance to market' variable was significant at 5% level and with a positive sign in both models, signaling a stronger reduction in conflicts near markets, perhaps due to the higher opportunity cost of labor near markets in line with hypothesis H3.

The 'year since last land redistribution' variable was significant in both models (at 5 and 1% levels) and it had a negative sign. Keeping in mind that border conflicts were more common where the last land redistribution took place more recently, it appears that the initial effect of the land registration and certification has been to remedy this possible negative effect of land redistributions. Alternatively, land registration and certification was more successful in reducing disputes where there has been more recent land redistribution for other reasons. Hypothesis H6a that more recent land redistributions are associated with clearer land borders and less conflicts is rejected by the finding that more recent land redistribution was associated with border disputes being more common. Furthermore, the 'quality of border demarcation

before reform' variable was insignificant. It is therefore possible that land conflicts that arose during the last land redistribution were resolved during the land registration process.

To further assess the impact of the quality of the land registration and certification, three additional variables were included in the second model in Table 6. It can be seen that the kushet (village) border demarcation variable was significant (at 10% level) and with a negative sign, in line with hypothesis H7a. On the other hand, the 'elders involved in adjudication' variable was significant (at 5% level) and with a positive sign, indicating that their involvement was associated with less reduction in border disputes, leading us to reject hypothesis H7c. It is possible that the self-interests of the elders overshadowed the participation effect.

The last two models in Table 6 assess the determinants of change in land conflicts after land registration and certification. The difference between these two models is that the second model also includes the 'change in conflicts during registration and certification' variable. Since no instruments were available to predict this variable, models were run with and without it to assess its recursive residual effect since all the variables that could be used to predict it were also included.

A main difference in the results as compared to the determinants of land conflicts during land registration and certification is that the farm size per capita variable is significant (at 5 and 0.1% levels) in the two models and with positive sign. This leads us to reject the neo-malthusian hypothesis (H1) in favor of hypothesis H2 that the land wealth of wealthy households in the community is positively associated with a higher probability of an increase in conflicts or lower probability of a reduction in conflicts after the reform.

The 'distance to woreda center' and 'market access' variables were highly significant (0.1% levels) and with the same sign as in the previous models for change in conflicts during the

reform, giving further credit to the related hypotheses. The same was also the case for 'the year of the last land redistribution' variable (significant at 0.1 levels and with negative signs). The land reform quality variables provided some additional and stronger results. The 'kushet border demarcation' variable was highly significant (0.1% level) in both models and with a negative sign, giving further support to hypothesis H7a. Furthermore, the 'unreliability of plot size measurements' variable was significant at 10 and 1% levels and with positive signs, implying that more reliable plot measurements were associated with a higher probability of a reduction in conflicts after land registration and certification, in accordance with hypothesis H7b. The 'involvement of elders in adjudication' variable was also highly significant (0.1% levels) in both models and with positive signs, leading us to reject hypothesis H7c. The involvement of local elders in the land registration and certification process is associated with a higher probability of an increase or a lower probability of a reduction in land conflicts. This may be because their self-interests have biased the work and this has led to more conflicts. Anecdotal evidence from one community where they had exchanged elders across communities during the process in order to benefit from their experience while removing their self-interest motives indicate awareness of the problem and even provision of a simple remedy to it that appeared to have been quite successful.

Finally, there is a highly significant positive association between the change in conflicts during and after land registration and certification. This may be interpreted in two ways. Areas with more persistent conflicts or rising conflict levels tend to continue in the same direction, like near woreda centers even though woreda land administrations are located nearby. Alternatively, better quality land registration reduces conflicts fairly immediately and this has long-term effects in the same direction.

VIII. CONCLUSION

This study of the relationship between community characteristics and land conflict levels before, during and after the low-cost land registration and certification reform that was implemented in Tigray region of Ethiopia in the late 1990s has revealed that the number of border conflicts during and after the reform were more likely to have decreased than increased. This effect was stronger the higher the quality of the implementation process in terms of plot border demarcation and plot size measurement while on the other hand the involvement of local elders in this had the opposite effect.

The study revealed no significant evidence in support of the neo-Malthusian hypothesis but found support for the resource curse hypothesis as the positive effects of the land reform were weaker where the wealthy in the community had a larger land endowment. Conflicts were more common near district centers where also the land reform had been less successful in reducing the number of conflicts during and after the reform. The reform did not cover urban land and the expansion of urban centers into the surrounding rural communities leads to more conflicts that the reform did not address properly. Better market access on the other hand appeared to reduce conflicts as it may have reduced land pressure and have provided better off-farm opportunities. The study has therefore revealed that the low-cost land registration and certification has been successful in reducing the number of border disputes in many communities. It has also revealed certain weaknesses of the reform that require geographically targeted follow up reforms in locations where the implementation process was poor and in peri-urban areas where land pressure and demands for land for public and other non-agricultural purposes are high.

The lessons from this low-cost approach to land registration and certification may also be relevant for other poor countries where population densities are high and land conflicts are severe and an increasing problem. Growing land scarcity and the new race for land for food and bio-fuel production potentially threatens the tenure security of poor and vulnerable

populations. Legal empowerment through land registration and certification based on strengthened pro-poor land laws can be an important policy tool to protect their rights and reduce the probability of future land conflicts. However, this requires further scrutiny.

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TABLE 1

OVERVIEW OF CONFLICTS MEDIATED BY LOCAL CONFLICT MEDIATORS AND THE CONFLICTS THAT WERE FORWARDED TO DISTRICT (WOREDA) COURTS

Types of conflicts	Total number of conflicts	% of all conflicts	Number of conflicts to woreda courts	% of land conflicts in woreda courts
All conflicts	18620	100.0		
All land-related conflicts	9705	52.1	1530	100.0
Border conflicts	3630	19.5	711	46.5
Ownership/inheritance conflicts	1870	10.0	284	18.6
Divorce-related conflicts	2603	14.0	353	23.1
Land redistribution conflicts	1155	6.2	98	6.4
Land rental contract conflicts	678	3.6	84	5.5
Conflicts involving violence	1300	7.0	220	14.4
Cases that went to woreda courts	1530	8.2	1530	100

TABLE 2

THE MOST DIFFICULT CONFLICTS TO DEAL WITH

Type of conflict	Most difficult conflict	Second most difficult conflict
Border conflict	170	61
Ownership/inheritance conflict	67	130
Divorce-related conflict	88	112
Land redistribution conflict	13	19
Land rental contract conflict	7	11

The table shows the number of conflict mediators that consider the type

of conflict as the most or second most difficult conflict to deal with.

TABLE 3

EFFECT OF LAND REGISTRATION AND CERTIFICATION ON THE NUMBER OF BORDER CONFLICTS

DURING AND AFTER THE LAND REGISTRATION AND CERTIFICATION

		Situation after the registration and certification			
	Change	Less conflicts	No change	More conflicts	Total (%)
Situation	Less conflicts	198	9	16	223 (58.4)
during	No change	33	65	8	106 (27.7)
registration and	More conflicts	30	3	20	53 (13.9)
certification	Total (%)	261 (68.3)	77 (20.2)	44 (11.5)	382 (100)

TABLE 4

_{VARIABLE} D_{ESCRIPTION}

Variable	Obs	Mean	Std. Dev.	Min	Max
Border conflicts after reform	392	1.44	0.69	1	3
Border conflicts during reform	388	1.56	0.73	1	3
Border conflicts before reform	387	0.85	0.36	0	1
Distance to woreda capital	388	17.71	19.26	1	78
Distance to market	388	7.94	5.04	0	20
Farm size per capita	388	0.62	0.52	0	7
Border demarcation before reform	394	1.87	0.81	1	3
Year of last land redistribution	403	1992.66	6.25	1982	1999
Kushet borders demarcated during reform	403	0.52	0.50	0	1
Elders involved in adjudication	388	0.69	0.46	0	1
Unreliability of plot size measurements	385	1.98	0.92	1	4

TABLE 5

VARIABLES RELATED TO INITIAL FREQUENCY OF BORDER CONFLICTS

Variables	Conflicts before reform
Farm size per capita	-0.011 (0.14)
Distance to market	-0.022 (0.02)
Year of last land redistribution	0.080 (0.03) ***
Border demarcation before reform	0.11 (0.14)
Distance to woreda capital	-0.028 (0.01) **
_Iworeda_2	0.216 (0.41)
_Iworeda_3	0.229 (0.34)
_Iworeda_4	0.689 (0.45)
_Iworeda_5	-0.342 (0.35)
_Iworeda_6	1.018 (0.50) **
_Iworeda_7	0.361 (0.41)
_Iworeda_9	0.194 (0.44)
Constant	-158.77 (50.73) ***
Prob > chi2	0.000
Number of observations	313
Log likelihood	-122.479
Chi2	36.016

** and*** means significant at 5 and 1% levels

TABLE 6

VARIABLES RELATED TO CHANGE IN CONFLICTS DURING AND AFTER LAND REGISTRATION AND CERTIFICATION

Variables	Change during reform	Change during reform	Change after reform	Change after reform
Border conflicts before reform	-0.513	-0.431	-0.261	0.086
	(0.42)	(0.43)	(0.72)	(0.82)
Distance to woreda capital	-0.012***	-0.025***	-0.028****	-0.018****
	(0.00)	(0.01)	(0.01)	(0.00)
Distance to market	0.088**	0.153**	0.149****	0.107****
	(0.04)	(0.06)	(0.03)	(0.02)
Farm size per capita	-0.342	-0.31	0.484**	0.543****
	(0.40)	(0.39)	(0.22)	(0.14)
Border demarcation before reform	0.106	0.069	-0.171	-0.227
	(0.27)	(0.25)	(0.28)	(0.30)
Year of last land redistribution	-0.096**	-0.092***	-0.133****	-0.129****
	(0.04)	(0.03)	(0.04)	(0.03)
Kushet borders demarcated during reform		-1.303*	-1.920****	-1.889****
		(0.71)	(0.43)	(0.34)
Unreliability of plot size measurements		0.111	0.510*	0.664***
		(0.32)	(0.30)	(0.25)
Elders involved in adjudication		0.924**	1.732****	1.319****
		(0.44)	(0.38)	(0.23)
Border conflicts during reform				1.885****
				(0.52)

_Iworeda_2	3.487****	3.042****	-0.979	-3.702***
	(0.62)	(0.64)	(0.71)	(1.26)
_Iworeda_3	1.146*	0.782	-0.424	-1.121**
	(0.59)	(0.51)	(0.58)	(0.52)
_Iworeda_4	-0.869	-0.872	1.278**	1.523****
	(0.67)	(0.78)	(0.63)	(0.40)
_Iworeda_5	1.772**	1.650*	-1.754	-2.423*
	(0.87)	(0.85)	(1.09)	(1.32)
_Iworeda_6	-0.51	-1.563	-3.433****	-4.100****
	(0.78)	(1.05)	(0.88)	(0.96)
_Iworeda_7	2.005***	1.441*	-0.499	-1.368*
	(0.64)	(0.82)	(0.74)	(0.74)
_Iworeda_8	1.646**	0.327	-0.603	-1.989*
	(0.71)	(1.26)	(1.18)	(1.09)
_Iworeda_9	1.701*	0.629	-0.706	-1.549**
	(0.93)	(0.96)	(0.84)	(0.73)
_cut11_cons	-189.728**	-181.96***	-263.91****	-252.75****
	(75.96)	(68.77)	(77.2)	(54.64)
_cut12_cons	-187.72**	-179.95***	-261.93****	-250.47****
	(75.86)	(68.65)	(77.04)	(54.43)
tabia_cons	0.261	0.00	0.00	0.00
	(0.30)	(0.01)	(0.00)	(0.00)
Number of observations	343	313	317	309
Log likelihood	-266.975	-246.187	-198.367	-165.933

Dependent variable: 1=less conflicts; 2=no difference; and 3=more conflicts
*, **, *** and **** means significant at 10, 5, 1 and 0.01% levels.

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[i] The Tigray Land Proclamation 27/2006 introduces a new maximum farm size of 2 ha (8 tsimdi) which may open for new redistributions although it states that the restriction does not apply to those who legally obtained larger farm sizes. The new detailed regulation and the decision to redistribute land of migrants that have been away for more than two years even though they do not have permanent jobs, show that land redistributions again are high on the political agenda. The new proclamations also state explicitly that sustainable land management is a condition for security of user rights to land.

[ii] A tabia is the same as a peasant association or municipality and typically consists of 3-4 kushets or communities.