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Thanks but no thanks: A new policy to reduce land conflict

Martin Dufwenberg[a], Gunnar Köhlin[b], Peter Martinsson[b], Haileselassie Medhin[c]

[a] University of Arizona, Department of Economics, USA and University of Gothenburg, Department of Economics, Sweden
[b] University of Gothenburg, Department of Economics, Sweden
[c] University of Gothenburg, Department of Economics, Sweden and Ethiopian Development Research Institute, Ethiopia

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ABSTRACT

Land conflicts in developing countries are costly both directly and through increased land degradation. An important policy goal is to create respect for borders. This often involves mandatory, expensive interventions. We propose a new policy design, which in theory promotes neighborly relations at low cost. A salient feature is the option to by-pass regulation through consensus. The key idea combines the insight that social preferences transform social dilemmas into coordination problems with the logic of forward induction. As a first, low-cost pass at empirical evaluation, we conduct an experiment among farmers in the Ethiopian highlands, a region exhibiting features typical of countries where borders are often disputed.

Introduction

Property rights, trust, and neighborly relations are important to individuals' willingness to invest in their land and to environmental sustainability.[1] Lack of institutions that secure property rights for land has been deemed a fundamental reason why many sub-Saharan African countries remain comparatively poor (Knack and Keefer, 1995, 1997; Goldsmith, 1995; Acemoglu et al., 2001). Others, such as Deininger and Feder (2009), point out that formalization of land rights should not be viewed as a panacea and that the literature contains little rigorous analysis of cost-effectiveness and long-term sustainability of impacts. An important goal for development assistance is therefore to develop cost-effective means to

E-mail addresses: martind@eller.arizona.edu (M. Dufwenberg), Gunnar.Kohlin@economics.gu.se (G. Köhlin), Peter.Martinsson@economics.gu.se (P. Martinsson), Haileselassie.Medhin@economics.gu.se (H. Medhin).

[1] The relevant literatures in support of these claims are too numerous to attempt any serious survey; see *e.g.* Skaperdas (1992) on property rights, Besley (1995), Friedman et al. (1988), Hayes et al. (1997), Gebremedhin and Swinton (2003), Smith (2004), Deininger and Jin (2006), Goldstein and Udri (2008), and Mekonnen (2009) on the role of tenure for investments and agricultural productivity, Holden et al. (2009), Mekonnen et al. (2013) and Deininger et al. (2011) on impacts on sustainable land management, Knack and Keefer (1997) on trust, Alston et al. (2000), and André and Platteau (1998) on conflict.

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define and ensure respect for property.[2] We bring to the table a design feature of how such interventions could be implemented in a way that encourage cooperation, make the interventions cheaper, reduce conflict and prevent land degradation.

Poorly defined tenure rights can also contribute to land related conflicts. During the last decades, there has been an increase in land conflicts in sub-Saharan Africa (Peters, 2004). Interestingly, the conflict implications of the structure of land property rights have often been neglected in the design and implementation of land reform policies. It is even argued that land policy and titling programs have exacerbated conflicts (Peters, 2009). Land conflicts in rural areas can take many forms: between communities, between farmers and investors or the state, and between farmers themselves. We focus on farmer-to-farmer land conflicts. At first glance, such situations resemble dilemma games, in which individual rationality conflicts with social efficiency. One way to avoid conflict is to use state enforcement power to provide all those services that can ensure peace: detailed surveying and registration and then police, courts, judges, legal counsel, etc. With some local variations, this is the strategy now embraced by many governments and donors as part of mandatory land titling programs. It can be costly.

We consider a new proposal which may generate a good outcome at low cost. Our suggestion is not to impose state enforcement, but rather to have this be a costly option which farmers may reject if that's what everyone wants. Alternatively put, any individual can trigger state enforcement but it will not happen otherwise. We conjecture that individuals who reject the intervention signal the intention and expectation that subsequent play will conform with a cooperative pattern, and that those beliefs become self-fulfilling.[3]

The logic of the argument builds on and combines recent work in behavioral economics, on *social preferences*, and somewhat less recent work in game theory, on *forward induction*. We first argue that land-conflict games may actually not be social dilemmas. If parties care about other things than their own material gain (as recent work in behavioral and experimental economics suggests) then the situation is best thought of as a coordination game with multiple Pareto-ranked equilibria. Add to such a setting the opportunity to say thanks-but-no-thanks to state enforcement, and deductive reasoning by all parties will help them coordinate on an efficient outcome.

It would be incorrect to say that our proposal does not concern costly government intervention at all. It involves *counterfactual* costly government intervention. Intervention is feasible but shunned, and hence no actual intervention cost is incurred. In reality, the government will always need to ensure at least a minimum of legal institutions. This makes the government intervention credible. Still, by *allowing for* cooperation, the cost to these institutions could be reduced substantially. There is a well-documented allegory to such cooperation in Elinor Ostrom's design principles for long-enduring Common Pool Resource institutions and in Ostrom et al. (1992, 1990). Ostrom shows that cooperation in management is possible, and that individuals can make credible commitments and achieve higher joint outcomes without an external enforcer, given conducive institutional settings.

The formal articulation of our ideas is the first contribution of our paper. We view such arm-chair reasoning as valuable *per se*. Empirical relevance should not be taken for granted though. A second goal of our study is to take first steps toward testing the proposal in practice. To that end, we report the results from a framed field experiment run in the Ethiopian highlands.[4]

The design mixes abstract and realistic features. We rely on an experimental game directly reflecting the behavioral theory we test rather than on allotments of real land. This has the advantage of being affordable. While the game is more abstract than a true land conflict setting, the payoffs are designed to resemble those relevant in the field. In other dimensions the setup is close to that of actual developing economies. We conducted the experiment in the Amhara Region, where borders are often not well defined and often disputed. The current government has ambitions to engage in land certification procedures whereby farmers obtain formal user-right status. Our subjects are farmers from this area, and the game they play is described by drawing realistic analogies to local conditions concerning land borders and conflicting neighbors' claims. We conducted our experiments in villages with relatively high and low levels of reported land conflicts.

This study thus proposes a specific and comparatively inexpensive form of policy that may help to define land property rights and to promote respect for borders. The salient features of this policy would be the availability of a *Divider* institution and the option to by-pass this *Divider* for a cooperative solution. Such a policy is particularly relevant when the government formally owns the land but tenure rights are about to be individualized.

Ethiopia is actually a very good example of a country where such a policy is relevant. Large parts of the country have already carried out a first-stage land certification that is based on neighborly recognition of borders. Work has now started for a more elaborate second-stage land certification that includes GPS measurements of each plot and more formal registration and management of the records. The second-stage certificates include a more precise mapping of land-holdings; making them a potentially good tool to resolve land-related conflicts. But these certificates will be much more costly, more

[2] The World Bank has recently stressed the need for research that evaluates the impacts of such reforms, including their cost-effectiveness. A number of papers have evaluated the Ethiopian experience, which in general is positive. For example, Holden et al. (2009) and Deininger et al. (2011) show both an increase in soil and water conservation structures and in plot level productivity, Mekonnen et al. (2013) show an increase in tree plantation.

[3] Our proposal shares some features with the literature on voluntary environmental agreements, in that it encourages a pro-active cooperative approach and reduces conflict (Segerson and Miceli, 1998), although our context and mechanism are different.

[4] See Harrison and List (2004) for a general discussion of field experiments, Cardenas and Carpenter (2008) for an overview on experiments conducted in developing countries, and Reichhuber et al. (2009) for a previous framed field experiment run in Ethiopia.

	0	**1**	**2**	**3**	**4**
0	0, 0	0, 8	0, 16	0, 24	0, 32
1	8, 0	8, 8	8, 16	8, 24	2, 26
2	16, 0	16, 8	16, 16	10, 18	4, 20
3	24, 0	24, 8	18, 10	12, 12	6, 14
4	32, 0	26, 2	20, 4	14, 6	8, 8

Fig. 1. Monetary payoffs.

costly than what most farmers would be willing to pay for them (Bezu and Holden, 2014). What our study indicates is that a mandatory and cheap first-stage certification could deliver the desired results if accompanied by an optional second-stage certification.

Theory tells the theoretical story that backs up our policy proposal. *Experiment in the Ethiopian Highlands* describes the experimental design and results. *Discussion* offers a concluding discussion.

Theory

This section presents and theoretically justifies our policy proposal. We consider in turn the pre-policy game form, selfish preferences, social preferences, our policy proposal, forward induction, overall conclusions, and testable hypotheses.

The pre-policy game form

Imagine two neighboring farmers, each of whom owns a house. The border between the houses is not well-defined, but each farmer can lay claim to some section of land extending from his house toward his neighbor's. Land can be used for agricultural production and yield income. If a farmer lays an uncontested claim, then he gets that land at 'full value,' proportional to its size. If both farmers lay claim to some section of land, then there is loss of value due to 'conflict'; they then split only half of the value that the land would have if uncontested, so each farmer gets a quarter of full value. This situation can be formally described using a game form with features as follow:

- There are two farmers/players, called 1 and 2.
- Each farmer's strategy set equals $\{0, 1, \ldots, T\}$, where T is the total amount of land located between the farmers' houses; a player's strategy indicates how much land adjacent to his house to which he lays claim.
- If a farmer chooses x while his neighbor chooses y, then the farmer gets land value $v \cdot (x-z)+v \cdot z/4$, where v is the value of uncontested land per unit and z is the number of units of contested land: $z=\max\{x+y-T, 0\}$.

If $x+y=T$ then total land value (summed across the farmers) is maximized and equal to $v \cdot T$; if instead $x=y=T$ then total land value is cut in half and equal to $v \cdot T/2$ (so in this case the farmers get $v \cdot T/4$ each). From now on, in anticipation of the upcoming experiment, we focus on the special case where $T=4$ and $v=8$ and get the game form described in Fig. 1.

Selfish preferences

If the farmers care only about land value, the game played is given by Fig. 1. The game has a 'dilemma' structure. Strategy **4** is dominant for each player (as strategies $x=T$ and $y=T$ would have been in the general case). When both choose accordingly, they each get a payoff of 8. The outcome is inefficient, because each player would get more than 8 if each player chose **2** or **3**.

Social preferences

A possibility for a better outcome arises if the farmers do not just care for land value. This is compelling in light of the literature on social preference, which argues (with reference to societal and experimental data) that humans often harbor objectives other than own material gain. In response, theorists developed a variety of models.[5] In general, predictions may differ depending on exactly which model is considered, but this is largely not the case with our games. In the name of good pedagogy, we therefore concentrate on the simplest model that can do the job: 'Rawlsian' maximin preferences. This is a model without strength-of-preference parameters. In Appendix A we show that, with various twists, the key insights largely carry-over to many other more commonly cited models, namely with inequity aversion (Fehr and Schmidt, 1999; Bolton and

[5] See Fehr and Gächter (2000), Sobel (2005), or Fehr and Schmidt (2006) for reviews and insightful commentary.

	0	**1**	**2**	**3**	**4**
0	0, 0	0, 0	0, 0	0, 0	0, 0
1	0, 0	8, 8	8, 8	8, 8	2, 2
2	0, 0	8, 8	16, 16	10, 10	4, 4
3	0, 0	8, 8	10, 10	12, 12	6, 6
4	0, 0	2, 2	4, 4	6, 6	8, 8

Fig. 2. Maximin preferences.

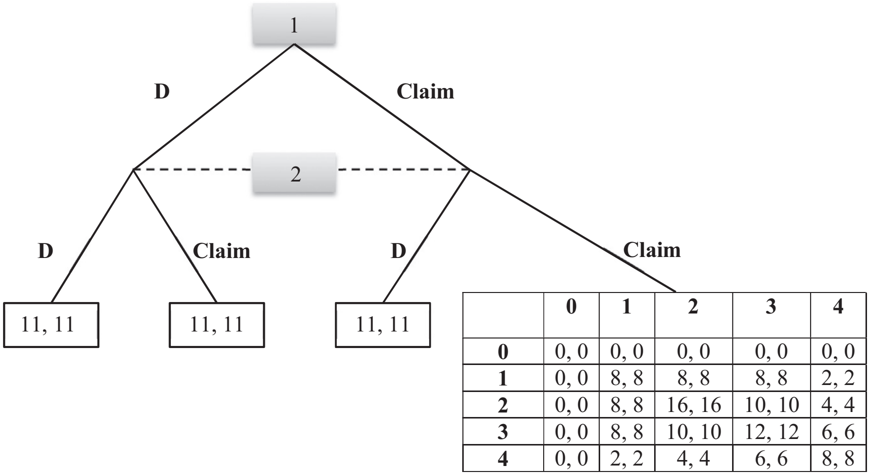

Fig. 3. Divider game with maximin preferences.

Ockenfels, 2000) or concern for the least well-off (Charness and Rabin, 2002). The insights do not extend to models of altruism or with selfish players.

With maximin preferences a player's utility equals the lowest material payoff of either player. We get the game in Fig. 2. Strategy profiles (**2**, **2**), (**3**, **3**), and (**4**, **4**) are Nash equilibria. The no-conflict profile (**2**, **2**) is thus viable, but things have improved only so much as the high-conflict profile (**4**, **4**) is an equilibrium too that cannot be ruled out. The farmers face a coordination problem.

The no-intervention-agreement proposal

We now present our policy proposal, which, according to a theory to be specified, rules out the high-conflict outcome. Augment the game of Fig. 2 with a new option ***D***: each farmer may call on a '*Divider*' who for a fee 10, shared equally by the farmers, enforces the (**2**, **2**) profile. The *Divider* represents a government (which sends out a team of policemen, judges, and behavioral contract-theorists). Then add a twist: If *neither* farmer chooses ***D*** – interpretation: they 'agree' to forgo the *Divider* intervention – then they play the game described earlier. We get the game in Fig. 3.

Forward induction

What behavior should be expected? Consider the following chain of arguments:

(i) No rational player would reject ***D*** and follow up with **0, 1**, or **4**; doing so is never better than choosing ***D***, and may be worse.
(ii) If the proper subgame (following two *Claim* choices) is reached, each player should figure out (i) and thus expect the co-player to choose **2** or **3** rather than **0**, **1**, or **4**.
(iii) It then makes no sense to choose ***D***. Why? ***D*** gives a utility of 11, but a player can guarantee himself no less, and maybe more, by rejecting ***D*** and then, if the subgame is reached, randomizing between **2** and **3**. Namely, in the subgame, making choice **2** with probability p and choice **3** with probability $1-p$, yields an expected payoff that exceeds 11 as long as $½ < p < 5/6$.
(iv) The prediction is thus that the players enter the subgame and choose **2** or **3**.

	D	0	1	2	3	4
D	11, 11	11, 11	11, 11	11, 11	11, 11	11, 11
0	11, 11	0, 0	0, 0	0, 0	0, 0	0, 0
1	11, 11	0, 0	8, 8	8, 8	8, 8	2, 2
2	11, 11	0, 0	8, 8	16, 16	10, 10	4, 4
3	11, 11	0, 0	8, 8	10, 10	12, 12	6, 6
4	11, 11	0, 0	2, 2	4, 4	6, 6	8, 8

Fig. 4. Normal form Divider game with maximin preferences.

	D	0	1	2	3	4
D	11, 11	11, 11	11, 11	11, 11	11, 11	11, 11
0	11, 11	0, 0	0, 8	0, 16	0, 24	0, 32
1	11, 11	8, 0	8, 8	8, 16	8, 24	2, 26
2	11, 11	16, 0	16, 8	16, 16	10, 18	4, 20
3	11, 11	24, 0	24, 8	18, 10	12, 12	6, 14
4	11, 11	32, 0	26, 2	20, 4	14, 6	8, 8

Fig. 5. Monetary payoffs in the divider game.

Game theorists call the chain (i)–(iv) a forward induction argument; past choices tell stories about predicted future choices, which in turn affects initial choices. There is no universally accepted definition of forward induction and different scholars proposed a variety of solution concepts to capture its spirit.[6] We opt for the simplest solution concept that generates (i)–(iv), arguably (following Ben-Porath and Dekel, 1992) iterated elimination of weakly dominated strategies (IEWDS) applied to the (reduced) normal form of the game in Fig. 3, here presented in Fig. 4.

IEWDS eliminates, in turn, first strategies **0**, **1** and **4** (which are weakly dominated by ***D***) then strategy ***D*** (which is weakly dominated by the mixed strategy described in (iii) above), so that finally **2** and **3** survive. Note also that, if we go back to the '*No-Divider* Game' (Fig. 2) and apply IEWDS, then strategy **4** cannot be ruled out; strategies **2**, **3**, and **4** all survive IEWDS in that game.

There is an experimental literature which examines the empirical relevance of forward induction.[7] The evidence is mixed but designs differ so much from ours one could hardly translate conjectures anyway. Most studies concern battle-of-the-sexes games where forward induction generates asymmetric payoffs, so there is tension between what is best for different players in contrast to our symmetric setting. Cooper et al. (1992) and Blume and Gneezy (2010) use symmetric games, but the former add an asymmetry via their outside option and the latter focus on cognitive limitations that lack counterpart in our setting. No previous study considered forward induction based on social preferences.

Overall conclusions

Our example highlights several insights. First, the old inefficient profile (**4, 4**) is no longer viable; we rule out the full-conflict outcome. Second, the outcome is better than the outcome with mediated intervention, in the sense that each player can guarantee himself more than 11, by mixing across **2** and **3** as described under (iv) above. Third, the option for mediated intervention is not used, yet the fact that it *could have been used* crucially shaped the analysis. If the ***D*** choice were not available we would be back to the game in Fig. 2, with its live possibility of the high-conflict equilibrium (**4**, **4**).

Fourth, our policy proposal is gratis. Let us elaborate. Engaging the divider-option will cost 10 (or 5 for each farmer). We interpret this as an administratively set fee, charged to the farmers by the agency that implements the divider-option. This fee is merely a transfer from farmers to the agency. It is not the real cost of the intervention incurred by the agency if it has to implement the divider-option. That real cost – say it is X – is completely independent of what the farmers are charged, and could be a huge number (X»10). If our theory works, the cost X is never incurred though. Since the prediction is that the farmers will say "no thanks," the divider-option is not implemented. We here abstract away from costs other than X that may be incurred just by approaching the farmers with decision forms (offering the choice whether or not to go for ***D***). We would think of such costs as negligible. The essential insight is rather that if our proposal works then neither do the farmers pay the fee of 10 nor is X is incurred by the agency.

[6] Kohlberg and Mertens (1986); van Damme (1989); Ben-Porath and Dekel (1992); Battigalli and Siniscalchi (2002); Asheim and Dufwenberg (2003); Govindan and Wilson (2009); Man (2012); Battigalli and Friedenberg (2012).

[7] Blume and Gneezy (2010); Brandts et al. (2007); Brandts and Holt (1995); Cachon and Camerer (1996); Cooper et al. (1992, 1993; Huck and Müller (2005); Muller and Sadanand (2003); Shahriar (2014); Evdokimov and Rustichini (2014).

These insights are robust in two senses. First, other fees than 10 could be used: any fee strictly between 8 and 14 would allow strategies **2** and **3** to survive IEWDS, like before; any fee strictly between 0 and 8 would see only strategy **2** survive. It may be interesting to explore the empirical relevance of the exact choice the fee, but we do not do so in this paper. Second, the main conclusions carry-over to many parameter constellations within Fehr and Schmidt's and Bolton and Ockenfels' models of inequity aversion or Charness and Rabin's model with concern for the least well-off; we elaborate in Appendix A.

Testable hypotheses

The upcoming experiment compares behavior in games with and without the divider-option, referred to as no-*Divider* and *Divider* treatments. The presentation of monetary payoffs (see the next section for details) involved 'vivid' versions of the corresponding normal form representations; keep Fig. 1 in mind as relevant for the no-*Divider* game, and Fig. 5 as relevant for the *Divider* game:

The exact theoretical predictions, given by IEWDS, is that all subjects choose **2**, **3**, or **4** in no-*Divider* treatment (Fig. 2), and that all subjects choose **2** or **3** in the *Divider* treatment (Fig. 4). In practice, we test a series of weaker or modified statements H1-H6. These largely match the steps of the IEWDS procedure and allow that the theory may be taken as supported to a degree even if it captures the action in the data approximately.

H1 : Few subjects choose **0** or **1** in either treatment.

Choices **0** and **1** are weakly dominated under maximin (and most other) preferences, hence eliminated in the first round of IEWDS.

H2 : Fewer subjects choose **4** in the *Divider* treatment than in the no-*Divider* treatment.

In the *Divider* treatment, **4** is weakly dominated under maximin preferences, hence eliminated alongside **0** and **1** in the first round of IEWDS. With many other preferences **4** gets eliminated in the second round of IEWDS; see Appendix A and the discussion there for details. By contrast, in the no-*Divider* game choice **4** survives IEDWS (under any model considered).

H3 : Few subjects choose ***D*** in the *Divider* treatment.

Once **0**, **1**, and **4** have been eliminated, ***D*** is eliminated by IEWDS under maximin (and many other) preferences.

H4 : More subjects choose **2** or **3** in the *Divider* treatment than in the no-*Divider* treatment.

This hypothesis captures benefits if the forward induction argument is empirically valid. We test it conditional on subjects not choosing ***D***, as well as unconditionally.

H5 : The ratio of the numbers of subjects choosing **2** rather than **3** is higher in the *Divider* treatment than in the no-*Divider* treatment.

This hypothesis is not implied by IEWDS; both **2** and **3** survive that procedure and the relative likelihood is not pinned down. However, conceivably, adding the divider option triggers 'cooperative thinking' beyond what IEWDS otherwise implies, and this hypothesis furnishes a test.

H6 : Subjects who believe the co-player chooses x tend to choose x themselves, for x=**2**, **3**, **4**.

Our theory combines two ideas, concerning social preferences and forward induction. Even if the latter were not empirically relevant, the former may be, and this hypothesis admits a relevant test. (As we describe below, our design involves belief-elicitation.)

Experiment in the Ethiopian highlands

What is the empirical relevance of the ideas developed in the previous section? To shed light on this issue, we ran a framed field experiment in a setting which befits our story, and where there would be large potential gains if the proposal worked well. We first describe the site and the design, and then present the results.

Study site, design details and procedure

The experiment was conducted in eight *kebeles* (villages) in the East Gojam and South Wollo zones of the Amhara Region in the Ethiopia.[8] The region is located in the Ethiopian Highlands, an area severely affected by land degradation. The main

[8] Ethiopia consists of 11 regional states, which are divided into sub-regions called zones; the zones are divided into districts (*woreda*). The districts are divided into sub-districts (*kebele*), which are in turn constructed of local communities, called *got*. To simplify for the reader, we call the kebeles villages in this paper, which is the closest equivalent. Our sample villages are selected from an existing panel survey that covers 14 randomly selected villages in the

form of livelihood in the region is small-scale crop cultivation and this is a practice that has been adopted for many centuries. After the demise in 1974 of one of the longest existing feudal systems in the world, land in Ethiopia was nationalized. The region has since undergone frequent redistributions aimed at bringing more equitable allocation of lands of different quality. The process of redistribution was characterized by a lack of accurate measurement and demarcation. These factors created a situation where most people possess highly fragmented land, sharing poorly defined borders with numerous people, a fertile ground for land disputes (Wan and Cheng, 2001). A steady population growth, coupled with land laws prohibiting sale and exchange of land, thereby discouraging migration, exacerbate this problem.[9] The contested land in such an environment is typically not the whole land holding but rather marginal land along a vaguely defined border, similar to the theoretical model we developed in *Theory*. However, it is conceivable that the negative effects of the conflict could extend beyond the border line *per se*, for example by imposing transaction costs, and eroding tenure security. The conflict could also contribute to land degradation by limiting land management investments by households. Border conflicts among neighbors could also have adverse effects on social values like trust and reciprocity important for other domains of life. Thus, clear definition of borders has considerable efficiency benefits in such an environment.

Our experimental design builds on the theoretical model and the parameterization as described in the previous section. In the experiment, we used the area unit of *tilms*, which is a local land size unit in the region. One hectare corresponds approximately to 30–40 *tilms* depending on the land type and local tradition. The average land ownership in the region where we conducted our experiments is approximately 1.27 ha per household (CSA, 2009). We set the contested land to be four *tilms*, which corresponds to approximately 5% of the total household farm size. These parameters are chosen to reflect local conditions.

We relied on a between-sample design. Subjects were randomly and anonymously matched in pairs. We had two treatments: one without the *Divider* option and with material payoffs as in Fig. 1 (called *no-Divider treatment* hereafter), and another with the *Divider* option and with material payoffs as in Fig. 5 (called *Divider treatment* hereafter). In the no-*Divider* treatment, subjects could claim any integer number of *tilms* in the range from **0** to **4**. In the *Divider* treatment, the subjects could choose to call for a *Divider*, resulting in a definite income, or claim any number of *tilms* in the range **0** to **4**. The players decide simultaneously whether to choose the *Divider* or claim *tilms*. In line with the description in *Theory*, the *Divider* rules even if it is only chosen by one of the farmers.

The experiment was conducted in Amharic, the local language spoken in the region. Because a large fraction of the subjects were illiterate, the experiment was orally described. To visualize our examples, we used posters (as in, *e.g.*, Henrich et al., 2001). First the experiment was explained in general terms. Then, by using posters, the outcomes and payoffs of *all* possible scenarios were illustrated. On the main poster we had drawn four boxes in the middle of two houses describing the four *tilms* that were contested. We filled the boxes with colored slides to represent the claims by the households. We used different colors for the two households. When there was an overlapping claim over a box, *i.e.*, a *tilm*, it was filled by both colors; resulting in a third color indicating that it is land under conflict. Besides the animated main poster, we had static posters of each outcome to show the monetary pay-off, with real bank notes stapled on to show how much money each farmer would earn in a specific combination of claims by both farmers. The instructions were read repeatedly and all combinations of outcomes were discussed. To make sure that everyone understood the game, subjects were also given the opportunity to ask questions in private. Then, everyone was provided with a decision sheet carefully designed in a manner similar to the posters, limiting the relevance of the ability to read and write for making decisions. Players were then instructed to put a sign that indicates their choice. In the no-*Divider* treatment, players could claim **0**, **1**, **2**, **3** or **4** (*tilms*). In the *Divider* treatment, players could either call for the *Divider* or claim **0**, **1**, **2**, **3** or **4**.

The power of our policy proposal relies on players harboring both social preferences and beliefs, and on those beliefs having certain properties. The importance of beliefs follows from the forward induction argument, as reflected in the comments in *Theory* regarding what players are expected to figure out. It is conceivable that the argument fails not because subjects lack social preferences, but because they do not hold the necessary beliefs. We therefore also collected some data on the subjects' beliefs. After the completion of the decision stage, each player was provided with another form intended to capture his/her belief about the co-player's decision. This form was similar to the decision sheet. Note that no player knew about this stage of the experiment beforehand and the procedure was explained after all decisions were completed. To incentivize belief elicitation, players were told they would earn an additional 5 Birr[10] if they guessed their co-player's decision correctly.

In each of the eight villages, 60 households were selected randomly for the two treatments of the experiment from a provided village list. That is, we had 15 anonymous pairs for each of the two treatments in each village. We had 16 experiment sessions in total, two for each village, with a total of 240 subjects for each treatment, respectively.[11] Two subjects (one from each treatment) decided to quit the experiment in the middle and one subject in the *Divider* treatment

(*footnote continued*)
region. After ranking the 14 villages based on farmer-to-farmer land conflict prevalence data from the survey, we selected the top four (which we call 'high-conflict' villages) and the bottom four (which we call 'low-conflict' villages) for our experiment. The classification is therefore relative.

[9] Farmers have holding rights, which means they can 'own' the land as long they are cultivating it and can bequeath it to their children, who will continue to hold the land if they cultivate it. Such laws limit market-based consolidation of land and decrease the probability of migration: farmers who choose to leave their villages get no value from their land as they lose their holding rights.

[10] Birr is the local currency in Ethiopia. 1 USD was about 13 Birr during the time of the experiment.

Table 1
Choices and beliefs in the No-*Divider* treatment ($n=239$).

	Own choice	Belief of co-player's choice				
		0	**1**	**2**	**3**	**4**
0	0	*0*	*0*	*0*	*0*	*0*
1	2	*0*	*0*	*1*	*1*	*0*
2	103	*0*	*0*	*67*	*18*	*18*
3	54	*0*	*2*	*17*	*22*	*13*
4	80	*0*	*0*	*33*	*19*	*28*

Table 2
Choices and beliefs in the *Divider* treatment ($n=238$).

	Own choice	Belief of co-player's choice					
		D	**0**	**1**	**2**	**3**	**4**
D	73	*27*	*0*	*0*	*20*	*14*	*12*
0	0	*0*	*0*	*0*	*0*	*0*	*0*
1	0	*0*	*0*	*0*	*0*	*0*	*0*
2	92	*7*	*0*	*0*	*69*	*11*	*5*
3	29	*3*	*0*	*1*	*18*	*6*	*1*
4	44	*4*	*0*	*0*	*21*	*12*	*7*

declined to make a decision. Thus, our data consists of 239 observations for the no-*Divider* treatment and 238 observations for the *Divider* treatment.[12]

In order to avoid contagious effects in our experiment by word-of-mouth communication between subjects of the two different sessions in a village, we had to make sure that they did not meet. On the other hand, we wanted to use the same experimenter in all sessions, which means that we could not run the two treatments simultaneously. We therefore had to hold two sequential sessions in a way that subjects who had participated in the first session did not meet subjects for the second session. Before the first session finished, we gathered all the subjects for the second session in an adjacent room and served refreshments until the subjects of the first session had left the compound. Each experimental session took 3–4 h, most of the time devoted to explaining the game.

Results

The data from the treatments are summarized in Tables 1 and 2. The second columns in each table present the distribution of choices in each treatment. The remaining columns of the tables show how own choice is related to belief about the choice made by the co-player. For example, in Table 1 where there is not a *Divider* option, among those 103 who claim **2**, 67 thought that their partner would do so as well, while 18 thought that their partner claimed **3** and 18 thought that their partner claimed **4**. Our hypotheses tests mainly rely on straightforward comparisons of the frequencies in Tables 1 and 2, but we also undertake some regression analysis.

H1 (=few subjects claim **0** or **1** in either treatment) is basically a test of rationality. It gets clear support from our results: in the no-*Divider* treatment, no subject claimed **0** and only two subjects claimed **1**; in the *Divider* treatment, no subjects claimed **0** or **1**. Also, only three subjects believed their co-player would go for such payoff-dominated choices. This is a clear indication that our subjects had a good understanding of the game.

H2 (=fewer subjects claim **4** in the *Divider* treatment than in the *no-Divider* treatment) indicates that the incidence of high-conflict choices decreases in the *Divider* treatment compared to the *no-Divider* treatment. The basic idea is that, if the outside policy option triggers forward induction in the *Divider* treatment, players should move away from claiming **4**, as this is a best response only for a claim of **0** and **1** by the other player, given the *Divider* option. This is also what we find – the proportion of players who claimed **4** is 15 percentage points lower in the *Divider* compared to no-*Divider* treatment. A two-

[11] In addition to experimental decisions, we also collected some socio-economic data of the subjects and their households. To ensure that the observed difference in behavior between treatments is caused by our difference in treatments per se rather than confounded factors, we provide the descriptive statistics of the main characteristics of the subjects separated by treatments together with the results of a two-sample Wilcoxon rank-sum test comparison across the treatments in Table B1 in Appendix B. As can be read from the test statistics, there are no significant differences between the treatments indicating that randomization has been successful.

[12] Note that the decisions of the anonymous co-players of those who dropped out or declined to decide are valid. Payoffs of for the pair-less subjects were calculated by taking their beliefs as their co-player's decision.

sample proportion test shows that this difference is statistically significant (p-value < 0.001 for both one-sided and two-sided tests).

H3 (= few subjects choose ***D*** in the *Divider* treatment): The marked reduction in the incidence of high-conflict claims is not enough to prove that the forward induction is working, as some of those who have moved away from claiming **4** may have chosen the *Divider* itself. Indeed, 30.7% of the players in the *Divider* treatment chose the *Divider*. Contrary to the prediction of the forward induction argument, a null hypothesis that this is not significantly greater than zero is rejected at 1% level significance.

H4 (= more subjects claim **2** or **3** in the *Divider* treatment than in the no-*Divider* treatment): The test of H3 indicated that a significant portion of the subjects 'got stuck' in the middle of the forward induction argument and failed to forgo the outside option. But it is important to notice that the majority of players did not choose the *Divider*. Hence, we can still test whether our policy proposal had an effect on behavior by comparing the choices among the players in the no-*Divider* treatment and the players who carried through with the forward induction and opted out of the *Divider* option in the *Divider* treatment. We therefore compare the proportion of claims of **2** or **3** between the no-*Divider* treatment and the *Divider* treatment *conditional* on opting out of the *Divider*. 73.3% of the subjects who rejected ***D*** choose **2** or **3**, while 65.6% did so when there was no option to go for ***D***. A simple two-sample proportional test shows that this difference is statistically significant at 5% level (p-value = 0.05). We therefore cannot reject the null hypothesis that the presence of the *Divider* option had an effect on behavior in the direction predicted by our theory despite the fact that not everyone rejected it.

H5 (= the ratio of the numbers of subjects claiming **2** rather than **3** is higher in the *Divider* treatment than in the no-*Divider* treatment): The direct prediction of our theory is that high-conflict claims (*i.e.*, **4**) decrease when subjects are offered a *Divider* and reject it to make a claim. Our theory, though, does not discriminate between the no-conflict claim of **2** and the 'low-conflict' claim of **3**. Such distinction is important in reality, as it can be argued that the efficiency gains of moving away from low-conflict to no-conflict are significant (indeed, perhaps more than the gain from moving away from high-conflict to low-conflict). H5 therefore tests the possibility that our policy proposal resulted in more claims of **2** than **3**. Out of the subjects who claimed **2** or **3** in each treatment, 11% more subjects claimed **2** than **3** in the *Divider* treatment compared to the *no-Divider* treatment. This difference is highly statistically significant. We can therefore conclude that the presence of the *Divider* option resulted not only in a significant reduction of high-conflict claims, but also in a significant increase of no-conflict claims.

The above conclusions on the tests of H1–H5 are based on a simple two-sample proportional test. While we believe that this provides a neat comparison of choices across the two treatments, it is arguably too simple. We therefore check the robustness of our key results employing some regression analysis that controls for some socio-demographic characteristics of our subjects such as gender, age, literacy level, wealth, etc. This would in particular allow us to address a concern raised by an anonymous referee that a 'gender effect' might confound our treatment effects, provided that there was a higher proportion of women subjects in the *Divider* treatment compared to the *no-Divider* treatment (Table B1). Table 3 summarizes results from a number of probit regressions related to some of the hypotheses above. The general picture is consistent with the results based on simple proportion tests, with the notable difference that a direct test of H4 – pooling claims of **2** and **3** together – does not get support from the regression analysis.

We also investigate the potential 'gender effect' on its own right in a number of ways. By using a Fischer exact test, we test the hypothesis that there was no significant difference in the distribution of claims among women and men in both treatments and we cannot reject this hypothesis at conventional significance levels (p-value = 1.00 for *no-Divider* treatment and p-value = 0.71 for the *Divider* treatment). Ordered-probit regression results also show that there was no significant difference in the choice pattern of women and men in the *no-Divider* treatment (p-value = 0.90). In the *Divider* treatment, probit regressions show that women were not more likely to choose the *Divider* than men (p-value = 0.77). Moreover, ordered-probit regression of those who skip the *Divider* option also shows that there was no significant difference between the behavior of women and men (p-value = 0.29). We have excluded the (only two) dominated choices (= **1**) from the above comparisons.

H6 (= subjects who believe the co-player claim x tend to claim x themselves, for x = **2, 3, 4**): We find evidence along these lines in our experiment. In the no-*Divider* treatment, almost half of the players (47.5%) who believed that their co-player would claim **4** also claimed **4** themselves. This proportion is much higher compared to the beliefs for those who claimed **2** (a difference of 16.9 percentage points, two-sided p-value < 0.01 and one-sided p-value = 0.03) and **3** (a difference of 25.4 percentage points, both two-sided and one-sided p-values < 0.01). H6 does not get full support in the *Divider* treatment for the very reason that a significant proportion ~~al~~ of players chose the *Divider*, contrary to the prediction of the theory (and outside the scope of the hypothesis itself). It is however worth noting that most of the players who believed their co-player would claim **4** chose the *Divider*, and all other claims were significantly less likely. This result indicates that a portion of those who did not complete the forward induction process did not believe that the presence of the *Divider* was enough to entice their co-players toward cooperation. The rational choice was then for them to impose the *Divider* themselves. This does not necessarily imply that they did not have friendly intentions themselves. But in line with H6, we find that players who expected the other player to go for an equal split in the *Divider* treatment were also significantly more likely to for an equal split themselves.[13]

[13] Overall, 47% of our subjects correctly guess their co-player's choice.

Table 3
Probit regressions analyzing the effect of *Divider* treatment on conflict.

	High conflict[a]	High conflict[b]	No or low conflict[c]	No-conflict[d]	No-conflict[e]
Divider treatment[a]	−0.496***	−0.309**	0.173	0.300**	0.315*
Control variables	Yes	Yes	Yes	Yes	Yes
N	477	319	404	404	280
Related hypothesis	*H2*	*H2/H4*	*H4*	*H.4/H5*	*H5*

Note: In the regression *** denotes significant at 1% level, ** significant at 5% level and * significant at 10% level. In the regression we use the following control variables: gender, age, literacy level, household size, region.

[a] The dependent variable takes value 1 if claim is **4** and **0** otherwise.

[b] The dependent variable takes value 1 if claim is **4** and **0** if claim is **2**.

[c] The dependent variable takes value 1 if claim is **2** or **3** and **0** otherwise; choices of ***D*** are excluded from regression.

[d] Dependent variable takes value of 1 if claim is **2** and **0** otherwise; choices of ***D*** excluded from regression.

[e] Dependent variable takes value if claim is **2** and **0** if claim is **3**.

The belief data also give some insight into how this policy innovation could reduce conflict. By comparing beliefs and choices across treatments, we can better understand what 'type' of player is more likely to be affected by the intervention. We can differentiate between two broad types of players who end up choosing conflict. First, we have those who go for conflict and also believe the co-player will go for conflict. If a player believes that the co-player will claim **4**, then the rational response is to claim **4** – with or without social preferences (see Figs. 1 and 2) in the *no-Divider* treatment and despite the fact that the player himself might prefer cooperation. The second type of player goes for conflict even though he believes the co-player will go for an equal split. This is consistent with an absence of social preferences (see the differences in payoffs between Figs. 1 and 2). It can be said that the latter have limited 'friendly tendencies' compared to the former. Our expectation is that the first type, which responds to the threat of conflict but does not seek conflict, will be given the opportunity to cooperate in the *Divider* treatment, while the conflict prone might still attempt to claim **4**.

Looking at the last columns of Tables 1 and 2 sheds some light on this: the proportion of players who claimed **4** and also believed the co-player would go for **4** is significantly lower in the *Divider* treatment. When there was a *Divider*, the majority of those who claimed **4** are those who believed the co-player would go for **2**. That is, the presence of the *Divider* affected the behavior of players of the first type, those who respond to conflict but do not seek it. In other words, the decline in conflict arose because the presence of the *Divider* helped those with friendly attitudes to cooperate.

We also analyzed the data for the high and low conflict villages separately (Table B1 in Appendix B). In the no-*Divide*r treatment, we find significantly that a higher proportion of subjects claimed 4 in high-conflict villages compared to low-conflict villages. Moreover, claims of **2** were significantly lower in the high-conflict villages compared to the low-conflict villages when there was no *Divider*. These results can be seen as indicators of external validity for our experiment. When the *Divider* is introduced, we do not find a significant difference in behavior between high- and low-conflict villages. Thus, the positive impact of introducing a *Divider* was larger in villages with relatively higher prevalence of land conflicts. Our policy proposal seems to work better where it is needed the most.

Discussion

We considered a land-conflict game where selfish players, who desire to get as much for themselves as possible, would be destined for costly conflict. A key initial observation is that social preferences may transform the situation into a coordination game. There is hope in this insight alone; if players coordinate on a 'good' equilibrium, they avoid the conflict. The second key idea is to boost the prospect of this outcome further, drawing on the logic of forward induction. We propose a policy which modifies the game so that players can elect to enforce a cooperative outcome at a cost. The game theoretic prediction is that they would *not* elect this option and instead coordinate on a good outcome more surely than had the *Divider*-option never been available.

The costs of land conflict in developing countries are huge, so the potential gains of this policy could be vast. Holden et al. (2011), drawing on a sample of 400 mediators who had mediated 18,620 conflicts in the Highlands of Ethiopia, find that more than half of the conflicts were land-related and almost 20% of them were border conflicts. Almost half of the 1530 conflicts that were referred to courts were border conflicts. Such experiences have therefore precipitated millions of hectares of agricultural land to fall under various kinds of reforms in Africa and elsewhere. The costs of these interventions, and of the potential related conflicts, are high and difficult to carry both for farmers, for governments, and for international aid agencies. Policies such as the one proposed here are therefore particularly relevant in such settings, where the first steps are being taken to formalize individual user rights to what has previously been either government owned or communally managed land.

Our theoretical results indicate a way to benefit from a design where interventions are made available on a voluntary basis, as opposed to the mandatory programs that are now the norm. Current mandatory certification schemes could fairly easily be adjusted to accommodate such cooperative solutions. The proposal also illustrates how, in principle, policy intervention does not have to be actively managed. One may think of it as allowing for, or promoting, voluntary participation in an outcome with friendly relations. Neighbors facing potentially costly conflict are aided not through hands-on intervention but through counterfactual intervention which could have occurred but did not. When farmers actively express that they do not want the intervention, this coordinates them to cooperate.[14]

To test the empirical relevance of our proposal, we ran an experiment in the Amhara Region of Ethiopia – a natural setting where people have experienced land conflict. We find strong support for the first idea (social preferences generate a coordination game). Players who believe others cooperate often cooperate themselves. We find only guarded support for the second idea (forward induction). The subset of players who discard the costly-*Divider* option choose, and believe a co-player will choose, the most cooperative strategy to a larger degree than when the *Divider* option was not available in the first place. The prevalence of high-conflict outcomes is dramatically reduced, especially in areas with high levels of land conflicts, although we did not nearly obtain full coordination on the best possible outcome (in particular because more subjects than predicted by the theory chose to call for the *Divider*).

We did not make it easy on our subjects. They were offered opportunities neither to learn through repeat experience nor via pre-play communication.[15] The design allowed *two* choices that were consistent with forward induction (**2** and **3**), possibly making the argument less transparent. The game we used to model the conflict situation has two stages (Fig. 3), but subjects interact in a perhaps less transparent version corresponding to a reduced normal form game (Fig. 4). The task was rather abstract, involving labeled choices and payoffs on posters rather than real land. For all these reasons, our experiment represents but a start for serious empirical testing. We hope it inspires follow-up research that modifies features of our design and possibly relies on stronger field components. In addition, it is natural to reflect on the following rather extreme aspect of our proposal: At face value, it assumes that, once the parties reject the *Divider* option, then no outside protection is offered whatsoever. Intuitively, that would seem to make rejecting the *Divider* a rather risky proposition. In practice, the policy can be expected to be coupled with alternative measures, say involving some limited police and court protection even if the *Divider* option is rejected by all.

An empirical indication of the potential for our policy is given by Bezu and Holden (2014). As we mentioned in the introduction, land administration agencies in Ethiopia are promoting a more elaborate "second-stage" certification process. Bezu and Holden implemented a Contingent Valuation survey to elicit farmers' willingness to pay for such more formal certificates using panel data collected in 2007 and 2012. They found that not only was the willingness to pay for such certificates very low (only 0.05 USD) but it had also decreased substantially during this period while land values had increased significantly in the same time period. This has relevance for our study since it shows that the perceived benefit by farmers may not be commensurate with a costly specification of land rights.[16] However, our study also implies that such a low willingness to pay should not be taken as indication of the second-stage certificates' redundancy. As with the *Divider* option in this paper, it is possible that the *availability* of second-stage certificates affects behavior positively even if farmers do not actually get them for their land. We would therefore argue that a cost-effective way of implementing of second-stage land certification would be to have the high-tech mapping of land holdings as an option that farmers can get at a cost, rather than attempting to provide it to everyone.

We would be happy if a lasting impact of our study were to influence the thinking of scholars and policy makers who care about sustainable development: Is what at first glance seems to be a social dilemma really a coordination game? Could a policy involving voluntary participation promote a desired outcome – with low conflict and sound environmental management – at lower cost than that of comprehensive government intervention? We have shown, for a specific context that the answers are yes in theory and maybe in practice. We hope to inspire thinking about, and inquiry in regard to, the relevance of these questions more generally. Our specific context may serve as an inspiring metaphor in this connection.

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[14] We thank one of the reviewers for encouraging us to emphasize that it is, of course, vital that such coordination is perceived to be compatible with government regulation. This is seldom a problem since there is strong historical precedence in many countries for informal recognition of land rights, not least when it comes to usufruct rights. In the case of Ethiopia, the methodology used in the "first-stage" land certification was exactly to have neighbors agree on their shared borders. There is therefore a strong sense that such arrangements are compatible with formal land legislation.

[15] We take a recent study by Evdokimov and Rustichini (2014) to indicate that such measures may increase the chance that subjects latch on to forward inductive reasoning. E&R elicit subjects' thought processes directly, and document lots of individual heterogeneity and that experience matters. They do not explore pre-play communication, but given that some subjects get the forward induction argument while others do not it seems natural to conjecture that those who get the argument might enlighten the others if they could discuss.

[16] Deininger and Feder (2009) review the cost of land certification in different countries and note that excessive costs often are the result from lobbying by survey professionals.

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Appendix A : Other theories of social preferences

The insights of *Theory* extend, with some twists, to substantial parameter regions of the models of Fehr and Schmidt (F&S), Bolton and Ockenfels (B&O), and Charness and Rabin (C&R),[17] but not with much force to models of altruism and not at all with selfish players. We now justify these claims:

F&S

In a two-player game, the utility of player $i=1, 2$ who gets x (Birr) when the co-player gets y equals $x-\alpha_i \cdot \max\{y-x, 0\}-\beta_i \cdot \max\{x-y, 0\}$, where $0 \leq \beta_i \leq \alpha_i$ and $\beta_i < 1$. *Mutatis mutandis*, we get the game in Fig. A1 where we only describe 1's payoffs; by game form symmetry, 2's payoffs is the mirror image (replacing the player index).

In the first round of IEWDS, **0** and **1** get eliminated regardless of α_i and β_i as they are (weakly) dominated by *D*. If $\beta_i \geq 21/32$, **4** is eliminated in the first round too as it is dominated by ***D***. Otherwise, if $\beta_i \geq 5/16$, strategy **4** is eliminated in the next round (dominated by ***D***). Once for each player **0**, **1**, and **4** are eliminated, if $\beta_i \leq 7/8$, ***D*** is eliminated as it is dominated by 3. If $\beta_i > 7/8$, ***D*** cannot be eliminated and the procedure stops. We note a few idiosyncrasies: (i) If $5/16 \leq \beta_i < 21/32$, one more elimination round is used than with maximin preferences. (ii) Unlike with maximin, if ***D*** is eliminated this is because a pure rather than a mixed strategy dominates it. (iii) There is an upper bound ($\beta_i \leq 7/8$) for how inequity averse players can be to allow elimination of ***D***. (iv) Given that $\beta_i \leq \alpha_i$, the nature of IEWDS depends only on β_i, not on α_i. (v) The procedure does not require α_i and β_i to be commonly known between the players; a sufficient condition for all described eliminations to go through is that $5/16 \leq \beta_i \leq 7/8$, $i=1,2$.

B&O

A simple version says that the utility of $i=1,2$ who gets x when the co-player gets y equals $x-\gamma_i \cdot |x-(x+y)/2|$, where $0 \leq \gamma_i < 1$. Note that $x-\gamma_i \cdot |x-(x+y)/2| = x-\gamma_i \cdot |(x-y)|/2 = \gamma_i' \cdot |(x-y)|$, where $\gamma_{i'} = \gamma_i/2$. Note that $x-\gamma_i' \cdot |(x-y)| = x-\gamma_i' \cdot \max\{y-x, 0\}-\gamma_i' \cdot \max\{x-y, 0\}$. Hence, in two-player games, B&O's model works like the F&S model with $\alpha_i=\beta_i$, a case covered above.

C&R

Consider that the utility of $i=1,2$ who gets x when the co-player gets y equals $(1-\lambda_i) \cdot x+\lambda_i \cdot [\delta_i \cdot \min\{x, y\}+(1-\delta_i) \cdot (x+y)]$. The case in the main text is $\lambda_i=\delta_i=1$, while C&R assume that $0 \leq \lambda_i < 1$ and $0 \leq \delta_i \leq 1$. We show that our insights continue to hold if $3/7 \leq \lambda_i < \delta_i = 1$. Again, describing only player 1's payoffs, we get the game in Fig. A2.

In the first round of IEWDS, **0** and **1** are eliminated regardless of λ_i, dominated by ***D***. If $\lambda_i \geq 9/16$, **4** is then eliminated, dominated by ***D***. If $\lambda_i < 9/16$, 4 can be eliminated if some mixed strategy assigning probabilities p to **2**, q to **3**, and $1-p-q$ to ***D*** weakly dominates **4**. This requires that $(1-p-q)11+p16+q(18-8\lambda_1) \geq 20-16\lambda_i$ and $(1-p-q)11+p10+q12 \geq 14-8\lambda_i$ and $(1-p-q)11+p4+q6 \geq 8$, with one of those inequalities strict. Careful scrutiny reveals that this is possible if $\lambda_i > 3/7$, and the dominating strategy may be chosen such that $p=3/7$ and $q=0$ (this is readily verified by inserting these numbers in the inequalities). Suppose $\lambda_i > 3/7 <$ for $i=1,2$, so that **0**, **1**, and **4** have been eliminated for both players. If $\lambda_i \leq 7/8$, ***D*** is eliminated as is dominated by **3**. If $\beta_i > 7/8$, ***D*** can be eliminated if a mixed strategy assigning probabilities p to **2** and $1-p$ to **3** weakly dominates ***D***. This requires that $p16+(1-p)(18-8\lambda_i) \geq 11$ and $p10+(1-p)12 \geq 11$, with one of the inequalities strict, which is possible if $\lambda_i > 2/3$. Since $3/7 < 2/3 < 7/8$, it is thus always possible to eliminate ***D*** once **0**, **1**, and **4** are gone.

So, our forward induction arguments goes through if the players are sufficiently sensitive to concern for the least well off. What if they care about total payoffs, the other facet of C&R's model, captured by $\delta_i < 1$? The forward induction argument may break down. Rather than give details, suffice it to note that this is implicitly illustrated below, as the case where $\lambda_i=1$ and $\delta_i=0$ is a special case of the analysis of altruism to follow.

[17] Forward induction arguments are also conceivable also within psychological game-based models – *e.g.* reciprocity theory (Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006) or guilt aversion (*e.g.* Battigalli and Dufwenberg, 2009; see especially sections 2 and 5 in that article). Since a proper analysis of psychological games raises technical and other issues, we shall not address those themes in this paper.

	D	**0**	**1**	**2**	**3**	**4**
D	11, 11	11, 11	11, 11	11, 11	11, 11	11, 11
0	11, 11	0, 0	$-8\alpha_1$	$-16\alpha_1$	$-24\alpha_1$	$-32\alpha_1$
1	11, 11	$8-8\beta_1$	8, 8	$8-8\alpha_1$	$8-16\alpha_1$	$2-24\alpha_1$
2	11, 11	$16-16\beta_1$	$16-8\beta_1$	16, 16	$10-8\alpha_1$	$4-16\alpha_1$
3	11, 11	$24-24\beta_1$	$24-16\beta_1$	$18-8\beta_1$	12, 12	$6-8\alpha_1$
4	11, 11	$32-32\beta_1$	$26-24\beta_1$	$20-16\beta_1$	$14-8\beta_1$	8, 8

Fig. A1. F&S preferences of player 1.

	D	**0**	**1**	**2**	**3**	**4**
D	11	11	11	11	11	11
0	11	0	0	0	0	0
1	11	$(1-\lambda_i)8$	8	8	8	2
2	11	$(1-\lambda_i)16$	$16-8\lambda_i$	16	10	4
3	11	$(1-\lambda_i)24$	$24-16\lambda_i$	$18-8\lambda_i$	12	6
4	11	$(1-\lambda_i)32$	$26-24\lambda_i$	$20-16\lambda_i$	$14-8\lambda_i$	8

Fig. A2. C&R preferences of player 1 ($\delta_i=1$).

	D	**0**	**1**	**2**	**3**	**4**
D	$11+11a_1$	$11+11a_1$	$11+11a_1$	$11+11a_1$	$11+11a_1$	$11+11a_1$
0	$11+11a_1$	0	$8a_1$	$16a_1$	$24a_1$	$32a_1$
1	$11+11a_1$	8	$8+8a_1$	$8+16a_1$	$8+24a_1$	$2+26a_1$
2	$11+11a_1$	16	$16+8a_1$	$16+16a_1$	$10+18a_1$	$4+20a_1$
3	$11+11a_1$	24	$24+8a_1$	$18+10a_1$	$12+12a_1$	$6+14a_1$
4	$11+11a_1$	32	$26+2a_1$	$20+4a_1$	$14+6a_1$	$8+8a_1$

Fig. A3. Divider game with altruistic or selfish players.

Altruism and selfishness

Assume that the utility of $i=1,2$ who gets x when the co-player gets y equals $x-a_i\cdot y$, where $a_i\geq 0$. Selfishness is the special case where $a_i=0$ while $a_i=1$ matches C&R's model with $\lambda_i=1$ and $\delta_i=0$. Describing only 1's payoffs we get the game in Fig. A3.

If $a_i>11/21$ then **0** is the unique best response to **4**, **1** is the unique best response to **3**, **2** is the unique best response to **2**, **3** is the unique best response to **1**, and **4** is the unique best response to **0**. Hence IEWDS eliminates none of these strategies, and no forward induction argument can get going. If instead $1/3<a_i\leq 11/21$ then **0** can be eliminated (dominated by ***D***), followed by elimination of **4** (dominated by **3**), and elimination of ***D*** (dominated by **3**). Thereafter **1** is the unique best response to **3**, **2** is the unique best response to **2**, and **3** is the unique best response to **1**, implying that no more eliminations are possible. At best, this is a kind of luke-warm form of forward induction; while **4** is ruled out the meek choice of **1** is not and if both players make it some land would not be used at all. Finally, if $a_i\leq 1/3$ then each of the strategies **0**, **1**, **2**, **3** is dominated by **4**; after eliminating **0**, **1**, **2**, and **3**, one can then eliminate **4** as it is dominated by ***D***. Again, the forward induction argument does not work.

Appendix B : Additional tables and figures

See Appendix figure (Fig. B1).
See Appendix Tables (Tables B2 and B3).

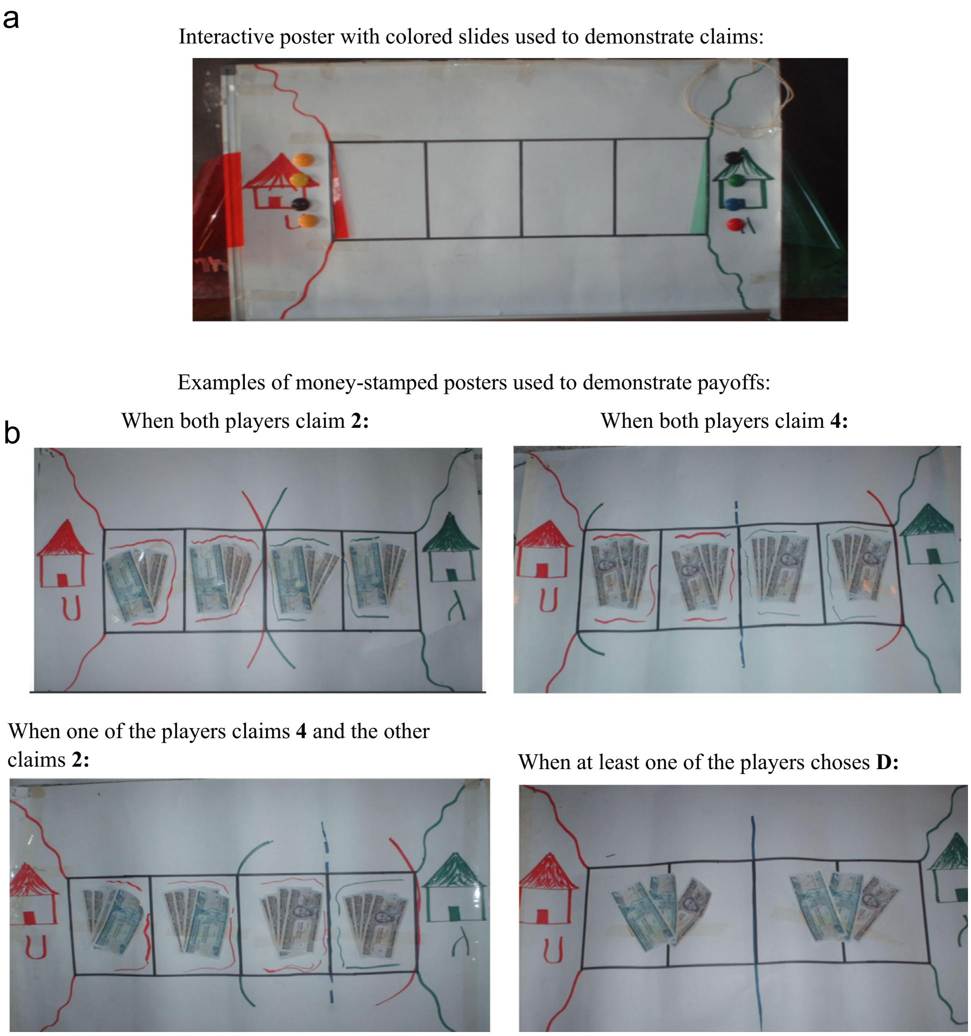

Fig. B1. Posters used in the experiment. (a) Interactive poster with colored slides used to demonstrate claims. (b) Examples of money-stamped posters used to demonstrate payoffs.

Table B1
Descriptive statistics.

Variable	*No Divider* treatment Mean (Std. Dev.)	*Divider* treatment Mean (Std. Dev.)	*P-value**
Gender (*1=male; 0=female*)	0.82 (0.38)	0.75 (0.43)	*0.06*
Age (years)	48.31 (12.58)	46.93 (12.21)	*0.23*
Literacy level (*1=can read and write=1; 0=otherwise*)	0.30 (0.40)	0.30 (0.46)	*0.98*
Household size	5.37 (2.05)	5.44 (2.00)	*0.94*
Land holding size (*ha*)	1.15 (0.53)	1.20 (0.56)	*0.30*
Number of parcels	4.27 (2.78)	4.26 (2.49)	*0.77*
Land certificate (*1=yes; 0=no*)	0.66 (0.47)	0.71 (0.45)	*0.24*
Value of livestock (*Birr*)	5730.86 (5028.83)	5524.86 (4570.79)	*0.93*
Trust to other villagers[a]	2.31 (1.21)	2.35 (1.16)	*0.49*

* H_0: No difference between Divider and No-Divider. We used Wilcoxon rank-sum test for continuous variables and a proportion test in case for binary variables.

[a] Respondents were asked to give their opinion on the statement ‘most people in my village can be trusted’ on a 5 point scale that ranged from *agree strongly* (1) to *disagree strongly* (5).

Table B2
High vs low conflict villages (% of choices).

	High conflict areas			Low conflict areas			Pooled		
Choice	*No Divider*	*Divider*	*Divider* excluding ***D*** choices	*No Divider*	*Divider*	*Divider* excluding ***D*** choices	*No Divider*	*Divider*	*Divider* excluding ***D*** choices
D	Na	30.0%	Na	Na	31.4%	Na	Na	30.7%	Na
1	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.8%	0.0%	0.0%
2	**33.3**%	40.0%	57.1%	**52.9**%	37.3%	54.3%	**43.1**%	38.7%	55.8%
3	26.7%	10.8%	15.5%	18.5%	13.6%	19.8%	22.6%	12.2%	17.6%
4	**39.2**%	19.2%	27.4%	**27.7**%	17.8%	25.9%	**33.5**%	18.5%	26.7%
N	120	118	84	119	120	81	239	238	165

Table B3
Actions and beliefs.

Choice	No-Divider treatment			Divider treatment		
	Action (%)	Belief (%)	*P*-value	Action (%)	Belief (%)	*P*-value
D	–	–		30.7	17.2	< 0.01
0	0	0	–	0	0	–
1	0.8	0.8	1.0	0	0.4	–
2	43.1	49.4	0.19	38.7	53.9	< 0.01
3	22.6	25.1	0.61	12.2	18.1	0.07
4	33.5	24.7	0.05	18.5	10.5	0.03

Appendix C : Experimental instructions (translated from Amharic)

General guideline (for both treatments)

Good morning (good afternoon). Thank you very much for coming. Today you will be part of a study. My name is Haileselassie Medhin and I am responsible for this study. The others here are trained by me to help me to carry out the study. The study is designed as a game where participants play to earn real money. You are therefore here to participate in games which give you real money. What you do in the games will not be told to anyone and it is only me who will know what you did.

The games can take up to two hours. If anyone cannot stay for this long, we kindly request him/her to inform us now. All of you will receive 5 Birr for coming here to compensate you for your time spent here. But to get more money you have to make decisions in the games I am about to present. [*Repeat*]

Before we start let me say a few things regarding what we will do and the rules we need to follow.

As I mentioned earlier, your decisions in the games will give you real money. The games are not very difficult. The amount of money you will make depends on your decisions as well as on decisions by others. [*Repeat*]

The money you will make is not our own money. It is given to us from a research foundation. The information we get from the games will be used only for academic research purpose and it is not a part of any development or aid program. We know that most of you came here without any information about the games we are going to conduct. Of course, you have the right to leave at anytime during the experiment, but in such case you will only be paid the 5 Birr for showing-up. We hope you will stay for the entire games.[*Repeat*]

In order to understand each game properly, listen carefully to the rules and examples I read for you. Asking questions aloud, talking to each other, and looking at the answer of other persons are strictly forbidden. If these rules are not respected, our research will be invalid. Thus, we will terminate the games and none of you will make any more than the 5 Birr for coming here. If you have questions during the experiment please raise your hand and we will come to you. [*Repeat*]

No-Divider treatment

The game

Now we will start the game. I want each one of you to remember that the amount of money you will gain from the game depends on the decisions that you as well as another person will take in the game. As you know, it is very important to understand the rules in order to do well in any game. This game is no exception. Playing this game will not be difficult as long as you listen carefully to the rules that I am going to explain to you. You do not need to know how to write or how to read to understand the game. Just listen to me carefully. I want each one of you to understand the game before you play it. So, do not worry, I will repeat the rules again and again as much as you want. I will also show you a practical example on how the game is played and talk to each one of you privately to make sure that all of you understand the game. [*Repeat*]

Now I will start explaining the rules of the game that you are going to play. The game will be played by pairs of farmers. The farmers in each pair will be called 'A' and 'B'. For this purpose, each one of you is paired with another farmer who is also in this room. But none of you can identify who the person you are paired with is. Only I know this and I will not tell anyone during the experiment or at any time after the experiment. [*Repeat*]

Assume that you are farmer A, and the person with whom you are matched is farmer B. This means that each pair will have one farmer called 'A' and one farmer called 'B'. If you want you can assume that you are farmer B and the person with whom you are matched is farmer A. To be farmer A or B does not have any difference in the outcome of the game. But it is very important that each one of you know that you are paired with another farmer who is in this room. [*Repeat*]

Remember that the game is played between the pair of farmer A and farmer B. This means that the game will be played between you and the person with whom you are matched. Whenever I talk about farmer A and farmer B, you have to remember that I am talking about you and the person with whom you are matched. [*Repeat*]

The game concerns land division. Imagine that over and above the land that farmer A and farmer B have land certificate for (*Show poster and point at house A and B*), there are 4 tilms of land between A and B, and the border is unclear (*Point at the 4 tilms*). Each farmer has the same arguments why they feel they have the right to this land but none of them have any ownership certificate to justify that the land belongs to them. [*Repeat*]

The game will proceed as follows. Each farmer in a pair will choose between different options on how he/she wants to the 4 tilms of land to be allocated between him/her and his/her pair. After both farmers have made their choices, I will compare the choices and determine the amount of money each farmer had gained according to the rules. The amount of money that each farmer gets depends on how much of the 4 tilms the farmer secures after the game and the way he/she secures it: without any conflict with his/her pair or with conflict with his/her pair. After we have finished, I will call you one by one to a neighboring room. There I will hand to each one of you the total amount of money you earned from this experiment in an envelope. [*Repeat*]

Now I will explain to you the different options each farmer can choose from, how a farmer makes a choice and how payment is calculated.

Each farmer can claim whatever size of land they want from the 4 tilms. Their choices are made independently from each other so they do not know what option the other one has chosen. As you can see on the poster, there are 4 squares [*point*]. Each square represents one tilms [*point*]. Framer A start to claim tilms from here [*point*] and farmer B from here [*point*]. Each farmer can claim any amount of tilms from 1 to 4 [*Show by pointing from to 1–4 tilms*]. [*Repeat*]

For example, farmer A may choose to claim 3 tilms and farmer B may choose to claim 4 tilms. Or both could choose 2 tilms and share the land equally. Or A could choose 2 tilms and B could claim all the 4 tilms. Or A could claim 1 tilm and B could claim 2 tilms etc…. [*Repeat*]

After looking at the decision of the two farmers, I will pay them according to the following rules.

If both farmers A and B claim 2 tilms each, this means they are willing to share the land equally [*point*]. They are both paid 16 Birr each, which means 8 Birr for each tilm. [*Repeat*]

If the sum of their claim exceeds the total available 4 tilms of land, then it means there are overlapping claims or a conflict of ownership in all or part of the 4 tilms [*Show an overlapping claim in a 3 $\times$ 3 example*]. After looking at the claims, I will separate the land with conflict of ownership and the land without conflict of ownership.

That means the value of a tilm secured without any conflict of ownership is 8 Birr while the value of a tilm secured after conflict of ownership is 4 Birr. [*Repeat*]

Land gained after conflict brings less money than the same amount of land gained without conflict. This is because, if we think about what happens in the real world, land gained after conflict will bring less income because it is not usually cultivated until the conflict is resolved and the conflict costs money and time. [*Repeat*]

Let me first go through some examples.

For example, let us say farmer A claims 2 tilms and farmer B claims 2 tilms [*use poster*]. As you can see, each farmer secures the 2 tilms they claimed without any ownership conflict [*point*]. Since a tilm with no ownership conflict is worth 8 Birr, farmer A gets 16 Birr. Similarly, farmer B also gets 16 Birr. [*Repeat with money stamped poster*]

Let's see another example. If farmer A claims 3 tilms and farmer B claims 4 tilms [*use poster*], all the 3 tilms that A has claimed are under ownership conflict [*point*]. After equal division, A gets 1.5 tilm and B gets 1.5 tilm [*point*]. Since land gained after conflict resolution pays only 2 Birr tilm, farmer A is paid 4 Birr. Farmer B has already secured 1 tilm without any conflict, for which he is paid 8 Birr. He/she has an additional 1.5 tilm he gained after the conflict is resolves, for which is paid 6 Birr. Therefore farmer B is paid a total amount if 14 Birr while A is paid 6 Birr. [*Repeat with money stamped poster*]

Here is another example. Assume that A claims 1 tilm and B claims 2 tilms [*show poster*]. As you can see, both secure what they claimed without any ownership conflict [*point*]. There is even 1 tilm land none of them claimed in which none of them will be paid for [*point*]. A is paid 8 Birr for the 1 tilms that he secured and B is paid 16 Birr for the 2 tilms that he secured without any ownership conflict. [*Repeat with money stamped poster*]

Again, let's look at the following example. Let's say both farmers A and B claim 4 tilms [*show poster*]. This means that all the 4 tilms are under overlapping claim [*point*], or simply under ownership conflict. After this conflict is resolved, both will get 2 tilms of land each [*point*]. Given the rule that land gained after conflict brings 4 Birr per tilm, both A and B will take 8 Birr each. [*Repeat Example using money stamped poster*]

Let's look at one more example. Let's say farmer A claims 4 tilms, and farmer B claims 2 tilms. As you can see, there are 2 tilms of land with over-lapping claims [*point*]. Hence, this land will be divided equally [*point*]. Farmer A will gain 8 Birr from the first tilm and 8 Birr from the second tilm[*point*]. The last two tilms are divided equally between the two farmers. Thus both farmers get 1 tilm each and gain 4 Birr each. Farmer A will in total gain 8+8+4 Birr (*Point at the tilms on poster*) and this is 20 Birr. Farmer B will get 4 Birr for the 1 tilm that he secured after the division of the 2 tilm land with overlapping claim [*show overlap on the poster*]. [*Repeat with money stamped poster*]

In order to make sure that you understood the rules of the game correctly, let me ask you a practice question.

If farmer A claims 4 tilms and farmer B claims 3 tilms, how much money will farmer A gain? [*Repeat*]

Think over the answer and you will tell me when I come around to each of you. Then I will explain the correct answer to all of you later. [*Repeat*]

[*Farmer A=14 Birr and Farmer B=6 Birr*]

[*Check for answers privately – note who provided a correct and incorrect answer*]

[*If necessary go through the whole thing again*]

Remember that there are 4 tilms of land that currently do not have borders to be shared between you and the person with whom you are matched. Both of you have the same arguments why the land should belong to you. You can claim whatever size of land you want.

Now we will distribute the decision sheet, where you will put your decision on which alternative you want each round game.

[*Distribute Decision Sheet*]

[*Show Decision Sheet*] You can claim any amount of tilms you like. Please claim the amount you want by putting a mark on the box below the number of your choice. I will approach each one of you and help you put your choice.

[*Decision time: Approach everyone and record their choice. Don't give any additional information. Repeat what is said above if required*]

[*Collect Decision Sheet*]

Now I will ask you to guess what you think your pair has decided. You will be paid 5 Birr if it happens that you have made the correct guess about your pair's decision.

[*Distribute Decision Sheet*]

[*Decision time: Approach everyone and record their choice. Don't give any additional information. Repeat what is said above if required*]

[*Collect Decision Sheet*]

I will now match your choice with that of the person with whom you are matched right away. Then I will calculate how much money you earned according to the rules that I stated to you earlier. Then I will call each one you into the other room and pay you the total amount of money that you earned including the 5 Birr you get for coming here, and you will go home.

Thank you all very much for participating in this game.

Divider treatment

The game

Now we will start the game. I want each one of you to remember that the amount of money you will gain from the game depends on the decisions that you as well as another person will take in the game. As you know, it is very important to understand the rules in order to do well in any game. This game is no exception. Playing this game will not be difficult as long as you listen carefully to the rules that I am going to explain to you. You do not need to know how to write or how to read to understand the game. Just listen to me carefully. I want each one of you to understand the game before you play it. So, do not worry, I will repeat the rules again and again as much as you want. I will also show you a practical example on how the game is played and talk to each one of you privately to make sure that all of you understand the game. [*Repeat*]

Now I will start explaining the rules of the game that you are going to play. The game will be played by pairs of farmers. The farmers in each pair will be called 'A' and 'B'. For this purpose, each one of you is paired with another farmer who is also in this room. But none of you can identify who the person you are paired with is. Only I know this and I will not tell anyone during the experiment or at any time after the experiment. [*Repeat*]

Assume that you are farmer A, and the person with whom you are matched is farmer B. This means that each pair will have one farmer called 'A' and one farmer called 'B'. If you want you can assume that you are farmer B and the person with whom you are matched is farmer A. To be farmer A or B does not have any difference in the outcome of the game. But it is very important that each one of you know that you are paired with another farmer who is in this room. [*Repeat*]

Remember that the game is played between the pair of farmer A and farmer B. This means that the game will be played between you and the person with whom you are matched. Whenever I talk about farmer A and farmer B, you have to remember that I am talking about you and the person with whom you are matched. [*Repeat*]

The game concerns land division. Imagine that over and above the land that farmer A and farmer B have land certificate for (*Show poster and point at house A and B*), there are 4 tilms of land between A and B, and the border is unclear (*Point at the 4 tilms*). Each farmer has the same arguments why they feel they have the right to this land but none of them have any ownership certificate to justify that the land belongs to them. [*Repeat*]

The game will proceed as follows. Each farmer in a pair will choose between different options on how he/she wants to the 4 tilms of land to be allocated between him/her and his/her pair. After both farmers have made their choices, I will compare the choices and determine the amount of money each farmer had gained according to the rules. The amount of money that each farmer gets depends on how much of the 4 tilms the farmer secures after the game and the way he/she secures it: without any conflict with his/her pair, with conflict with his/her pair or through a mediator. After we have finished, I will call you one by one to a neighboring room. There I will hand to each one of you the total amount of money you earned from this experiment in an envelope. [*Repeat*]

Now I will explain to you the different options each farmer can choose from, how a farmer makes a choice and how payment is calculated.

Each farmer can choose between different options on how he/she would like to divide these 4 tilms of land. Their choices are made independently from each other so they do not know what option the other one has chosen. [*Repeat*]

The options that each farmer has are the following: to call a mediator who will divide the 4 tilms of land equally or claim whatever size of land they want from the 4 tilms. As you can see on the poster, there are 4 squares [*point*]. Each square represents one tilms [*point*]. Framer A start to claim tilms from here [*point*] and farmer B from here [*point*]. In case of help from a mediator, the land is divided equally [*Show the equal split*]. In the case an mediator has not been called, each farmer can claim any amount of tilms from 1 to 4 [*Show by pointing from to 1–4 tilms*]. [*Repeat*]

That means each farmer can either call a mediator or claim whatever amount they want. For example, farmer A may choose to claim 3 tilms and farmer B may choose to call a mediator. Or both could choose 2 tilms and share the land equally without calling a mediator. Or A could choose 2 tilms and B could claim all the 4 tilms. Or A could choose to call a mediator and B could claim 2 tilms etc. [*Repeat*]

After looking at the decision of the two farmers, I will pay them according to the following rules.

If both farmers A and B claim 2 tilms each, this means they are willing to share the land equally without the need for a mediator [*point*]. They are both paid 16 Birr each, which means 8 Birr for each tilm. [*Repeat*]

If both of them choose to call a mediator, a mediator comes and divides the land equally and both will get 2 tilms each [*point*]. They will then be paid 11 Birr each. If one of them chooses to call a mediator and the other claims whatever amount he/she wants, a mediator still comes and they share the land equally – and they are paid 11 Birr each. That means, if one them chooses to call a mediator, they are both paid 11 Birr regardless of what the other has chosen. The reason that the amount paid is lower than 16 Birr is due to travel costs, salary etc for the mediator. [*Repeat*]

If none of them choose to call a mediator and the sum of their claim exceeds the total available 4 tilms of land, then it means there are overlapping claims or a conflict of ownership in all or part of the 4 tilms [*Show an overlapping claim in a 3×3 example*]. After looking at the claims, I will separate the land with conflict of ownership and the land without conflict of ownership.

That means the value of a tilm secured without any conflict of ownership is 8 Birr while the value of a tilm secured after conflict of ownership is 4 Birr. [*Repeat*]

Land gained after conflict brings less money than the same amount of land gained without conflict. This is because, if we think about what happens in the real world, land gained after conflict will bring less income because it is not usually cultivated until the conflict is resolved and the conflict costs money and time. [*Repeat*]

Let me first go through some examples when nobody has chosen the mediator.

For example, let us say farmer A claims 2 tilms and farmer B claims 2 tilms [*use poster*]. As you can see, each farmer secures the 2 tilms they claimed without any ownership conflict [*point*]. Since a tilm with no ownership conflict is worth 8 Birr, farmer A gets 16 Birr. Similarly, farmer B also gets 16 Birr. [*Repeat with money stamped poster*]

Let's see another example. If farmer A claims 3 tilms and farmer B claims 4 tilms [*use poster*], all the 3 tilms that A has claimed are under ownership conflict [*point*]. After equal division, A gets 1.5 tilm and B gets 1.5 tilm [*point*]. Since land gained after conflict resolution pays only 2 Birr tilm, farmer A is paid 4 Birr. Farmer B has already secured 1 tilm without any conflict, for which he is paid 8 Birr. He/she has an additional 1.5 tilm he gained after the conflict is resolves, for which is paid 6 Birr. Therefore farmer B is paid a total amount if 14 Birr while A is paid 6 Birr. [*Repeat with money stamped poster*]

Here is another example. Assume that A claims 1 tilm and B claims 2 tilms [*show poster*]. As you can see, both secure what they claimed without any ownership conflict [*point*]. There is even 1 tilm land none of them claimed in which none of them will be paid for [*point*]. A is paid 8 Birr for the 1 tilms that he secured and B is paid 16 Birr for the 2 tilms that he secured without any ownership conflict. [*Repeat with money stamped poster*]

Again, let's look at the following example. Let's say both farmers A and B claim 4 tilms [*show poster*]. This means that all the 4 tilms are under overlapping claim [*point*], or simply under ownership conflict. After this conflict is resolved, both will get 2 tilms of land each [*point*]. Given the rule that land gained after conflict brings 4 Birr per tilm, both A and B will take 8 Birr each. [*Repeat Example using money stamped poster*]

Let's look at one more example. Let's say farmer A claims 4 tilms, and farmer B claims 2 tilms. As you can see, there are 2 tilms of land with over-lapping claims [*point*]. Hence, this land will be divided equally [*point*]. Farmer A will gain 8 Birr from the first tilm and 8 Birr from the second tilm[*point*]. The last two tilms are divided equally between the two farmers. Thus both farmers get 1 tilm each and gain 4 Birr each. Farmer A will in total gain $8+8+4$ Birr *(Point at the tilms on poster)* and this is 20 Birr. Farmer B will get 4 Birr for the 1 tilm that he secured after the division of the 2 tilm land with overlapping claim [*show overlap on the poster*]. [*Repeat with money stamped poster*]

In order to make sure that you understood the rules of the game correctly, let me ask you a practice question.

If farmer A claims 4 tilms and farmer B claims 3 tilms, how much money will farmer A gain? [*Repeat*]

Think over the answer and you will tell me when I come around to each of you. Then I will explain the correct answer to all of you later. [*Repeat*]

[*Farmer A=14 Birr and Farmer B=6 Birr*]

[*Check for answers privately – note who provided a correct and incorrect answer*]

[*If necessary go through the whole thing again*]

Let me now describe some examples when the mediator is called by at least one farmer.

Let's say farmer A claims 4 tilms, and farmer B call for the mediator. This means that the mediator will come and divide the land equally [*point*]. Farmer A will gain 11 Birr and farmer B will gain 11 Birr.

Let's say farmer A calls for the mediator and farmer B call for the mediator. This means that the mediator will come and divide the land equally [*point*]. Farmer A will gain 11 Birr and farmer B will gain 11 Birr.

Let's say farmer A call for the mediator and farmer B claims 4 tilms. This means that the mediator will come and divide the land equally [*point*]. Farmer A will gain 11 Birr and farmer B will gain 11 Birr.

In order to make sure that you understood the rules of the game correctly, let me ask you a practice question.

If farmer A claims 3 tilms and farmer B call for mediator, how much money will farmer A gain? [*Repeat*]

Think over the answer and you will tell me when I come around to each of you. Then I will explain the correct answer to all of you later. [*Repeat*]

[*Farmer A=11 Birr and Farmer B=11 Birr*]

[*Check for answers privately – note who provided a correct and incorrect answer*]

[*If necessary go through the whole thing again*]

Remember that there are 4 tilms of land that currently do not have borders to be shared between you and the person with whom you are matched. Both of you have the same arguments why the land should belong to you. You can either claim whatever size of land you want or call a mediator.

Now we will distribute the decision sheet, where you will put your decision on which alternative you want each round game.

[*Distribute Decision Sheet*]

[*Show Decision Sheet*] You can either claim any amount of tilms you like or call for mediator. Those of you who prefer the option ‘mediator’, mark the box with the letter ‘M’. Those of you who do not want to ask for a mediator, please claim the amount you want by putting a mark on the box below the number of your choice. I will approach each one of you and help you put your choice.

[*Decision time: Approach everyone and record their vote. Don’t give any additional information. Repeat what is said above if required*]

[*Collect Decision Sheet*]

Now I will ask you to guess what you think your pair has decided. You will be paid 5 Birr if it happens that you have made the correct guess about your pair’s decision.

[*Distribute Decision Sheet*]

[*Decision time: Approach everyone and record their choice. Don’t give any additional information. Repeat what is said above if required*]

[*Collect Decision Sheet*]

I will now match your choice with that of the person with whom you are matched right away. Then I will calculate how much money you earned according to the rules that I stated to you earlier. Then I will call each one you into the other room and pay you the total amount of money that you earned including the 5 Birr you get for coming here, and you will go home.

Thank you all very much for participating in this game.

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