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Joint Land Certification and Intra-household Decision-making:Towards Empowerment of Wives?

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Joint Land Certification and Intra-household Decision-making: Towards Empowerment of Wives?[1]

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Abstract

We have used gender-disaggregated household panel data from 2007 and 2012 in combination with dictator games and hawk-dove games to assess the effects of joint land certification of husbands and wives on wives' involvement in land-related decisions within households. We find that joint land certification has enhanced wives' knowledge of their rights and their influence in land-related decisions, while about a third of husbands attempt to retain their dominant positions, preferring that women retain only their traditional weak rights. Better market integration is associated with stronger influence by women in land-related decisions.

More generous husbands, as revealed by dictator game experiments between husbands and wives, had wives who were more aware of their land rights. The hawk-dove games reveal that wives play tougher and are more hawkish than their husbands when they play against each other. This may indicate that wives dare to stand up and claim their rights within households. Husbands and wives in households that had received joint land certificates were less hawkish towards one another.

JEL codes: Q15, J16, D03.

Key words: Joint land certification, gender, empowerment of wives, experiments, Ethiopia.

1. Introduction

Gender discrimination in land distribution is widespread in many parts of the world, including Africa (Deere and Doss, 2006). Female land rights have been found to enhance food consumption and children's education and affect other types of household expenditures (e.g., Allendorf, 2007; Doss, 2006). Income received by women is more likely to be used for investment in education, children's nutrition, and housing than income received by men (e.g., Hoddinott and Haddad, 1995; Duflo, 2003).

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These research findings related to women's empowerment and the role of household assets in within-household empowerment of wives have attracted increasing international interest and policy attention, as evidenced by policy reforms in many countries intended to strengthen women's rights, including their property rights to land (Agarwal 1997; 2003; Holden and Tefera 2008a). Reforms that emphasize joint ownership of land for husbands and wives have been implemented in various developing countries in recent years, including Peru and Ethiopia (Wiig 2013; Holden et al. 2011).

There is a vast theoretical literature on intra-household decision-making, from the unitary household model, which was expanded in various ways by Gary Becker (1964; 1981), to the cooperative and non-cooperative bargaining models (Manser and Brown 1980; McElroy and Horney 1981; Lundberg and Pollak 1993). The latter models show that extra-household factors, such as legal reforms, can affect within-household bargaining outcomes and welfare distribution. Important contributions that focus more explicitly on land include Agarwal (1997; 2003), who addresses many complex issues that are not adequately captured in earlier bargaining models, such as gender asymmetries, the roles of social norms, subjective perceptions and opinions, and voice. Despite legal reforms, women's property rights, in practice, often depend on how laws are interpreted and implemented at the local level. The relative influence of laws versus local norms varies with women's social position/class, education, and degree of urbanization. When there is a wide gap between a new law and traditional norms, there may be a gradual transition before the law is implemented (if it materializes at all), a transition that may take considerable time. Alesina et al. (2013) have shown that traditional gender roles are particularly strong in societies with traditional plough agriculture and that such traditional gender roles can be very persistent, undermining the effect of legal reforms that aim to change these norms and the position of women in society.

Positive effects of low-cost land registration and certification in Ethiopia are now well documented (Deininger et al. 2008; 2011; Holden et al. 2009; 2011a; 2011b), including effects on female-headed households (Holden et al. 2011a; Holden and Ghebru 2013; Ghebru and Holden 2013; Bezabih et al. 2012). However, intra-household effects have not yet been well researched in regions in which empowerment of women through joint certification of husbands and wives has been emphasized. At the same time, there is strong interest among donors in further strengthening and supporting land administration reforms in Ethiopia, as evidenced by the support of several donors, such as USAID, DFID and The World Bank, for scaling up and strengthening a reform that is perceived as successful. The objective of this paper is to provide valuable additional insights into the effects of joint land certification on women's position and empowerment within households and communities. Such insights may provide inputs that can be used to identify ways to further refine the reforms. Impact studies such as the present study are likely to substantially affect donors' willingness to fund or support such policy interventions, owing to increased emphasis on evidence-based allocation of development assistance to maintain

popular support for aid in donor countries. Policy interventions that strengthen women's position, rights and welfare are very popular among many donors and have a central position in international organizations.

This paper builds on research in two regions in Southern Ethiopia in which joint land certificates for husbands and wives have been issued since 2005, based on new land laws that were enacted starting in 2004. Women have traditionally had a weak position in the patriarchal societies of Southern Ethiopia and have generally been considered the property of men, as evidenced by the payment of bride prizes, arranged marriages where girls typically had very little influence on whom they would marry, requirements of widows to remarry the brothers of their late husbands to remain on household land, and the kidnapping of young girls as a common traditional method of obtaining a wife in some communities. The step from being mere property to becoming an equal owner can therefore be long and difficult, even with legal reforms that support women's equal land rights (Holden and Tefera 2008a).

We benefit from a detailed baseline survey, conducted in 2007 when the reform was underway, that focuses particularly on the intra-household and gender effects of the reform. The survey covered more than 600 households, of which 15% were polygamous. The sample is also diverse in terms of the ethnic and religious backgrounds of households, with three ethnic groups (Oromo, Sidama, and Wollaita[2]) and three religions (Moslem, Protestant, and Orthodox) represented. The sample also contains substantial variation in the degree of market integration and population densities, with some of the most densely populated rural areas in Ethiopia included. This also allows us to assess the effects of extreme land scarcity on within-household competition for land. The sample's farming system diversity includes annual and perennial crop zones, subsistence-oriented rain-fed production and cash crop-oriented production with irrigation.

The baseline survey included separate interviews of husbands and wives, interviews that were repeated in 2012. The individual data include information on the participation and decision-making power of men and women in land-related issues, knowledge of the law, and perceptions, opinions and experience of land-related disputes. Social experiments were used to reveal the "intra-household climate" with respect to the extent of reciprocal generosity and the extent to which women themselves are willing and able to assert themselves and enhance their bargaining power. We have used two types of experiments in an attempt to obtain information about these characteristics. First, to reveal information about the extent of generosity, we used dictator games played by both husbands and wives independently. Second, to reveal the extent of bargaining toughness ("hawkish" behavior), we used hawk-dove games in which husbands and wives played against each other.

[2] A small share of the sample also belongs to the Amhara ethnic group.

We aim to test a number of hypotheses regarding the effects of joint land certification on women's empowerment in relation to land by combining an analysis of household panel data with the social experiments noted above. These hypotheses include: that land tenure reform, including joint land certification of husbands and wives, has strengthened women's position and involvement in land-related decisions; that wives' attitudes towards women's land rights and husbands' preferences for the traditional position of women affect wives' involvement in land-related decisions in opposing directions; that the positive impact of the reform on empowerment is larger, the more generous men are (as measured in dictator game experiments) towards their wives, as generosity of men is expected to entail less resistance to women's land rights; that husbands behave more like hawks and women more like doves in Hawk-Dove games, assuming hawkishness in these games is an indicator of relative bargaining power in households; and that access to joint land certificates is associated with less hawkishness on the part of husbands and greater hawkishness on the part of wives (assuming the relative bargaining power of the latter has been strengthened by the receipt of joint land certificates).

By 2007, the 2005 reform had had some, albeit small, impact on women's ability to influence farm management (Holden and Tefera 2008a; 2008b). The relatively small effect may be due to the strong tradition of male dominance in household-farm decision-making. By 2012, it appears that women had become more involved in farm management decisions, in particular, in crop choice decisions. Additionally, they have become more involved in land rental decisions. To measure women's empowerment in relation to land management, we have used the extent of participation and influence in a set of land management decisions, including crop choice and land-rental decisions. We found that joint land certification has enhanced women's awareness of their rights and their influence in land-related decisions, while about a third of husbands have attempted to retain their dominant positions, preferring that women maintain their traditional weak rights. Better market integration was associated with stronger influence by women in land-related decisions.

The dictator games revealed that men were at least as generous towards their wives as their wives were towards their husbands, but there was substantial variation across households. Generosity appeared to be reciprocal. The Hawk-Dove games revealed that wives played tougher and were more hawkish than their husbands when spouses played against each other. While husbands gradually became less hawkish towards their wives over a sequence of games, wives continued to play very hawkish throughout the series of games. Both husbands and wives were significantly less hawkish in households that have received joint land certificates. The direction of causality may run in both directions: more hawkish husbands may prevent receipt of joint land certificates, and/or receipt of joint land certificates may foster an improved "intra-household climate," encouraging less hawkish behavior by both spouses.

The paper is structured as follows. We review relevant empirical literature in part two and provide a theoretical framework with our hypotheses in part three. The data and methods used,

including our estimation strategy, are presented in part four, where we also include descriptive statistics. The results are presented and discussed in part five. The key hypotheses are assessed in part six, and we conclude the paper in part seven.

2. Review of relevant empirical literature

Ester Boserup (1970) proposed that differences in gender roles have their origins in traditional agriculture practiced in the pre-industrial period. She found interesting differences between shifting cultivation and plough cultivation, observing that men have an advantage over women in plough agriculture, owing to superior upper body strength needed to control the plough and animals during plowing. This leads to a stronger gender division of labor in which men have a more dominant role in plough agriculture than in hoe agriculture.

Alesina et al. (2013) assess the historical origin of the existing cross-cultural differences in beliefs and attitudes regarding the appropriate role of women in society. They test the hypothesis that traditional agricultural practices such as plough agriculture resulted in less equal gender norms by assessing attitudes and female participation in the workplace, politics and entrepreneurial activities. They found that the hypothesis holds across countries, within countries, and across ethnicities within districts. They also tested cultural persistence by studying the children of immigrants living in Europe and the United States. They found that immigrants from societies with traditional plough agriculture exhibit less egalitarian beliefs regarding gender.

Udry (1996) assessed the efficiency of farming in Burkina Faso in areas where husbands and wives operate separate plots within households, finding substantial inefficiencies in the use of household resources in farming.

Fafchamps and Quisumbing (2005) studied marriage, bequest and assortative matching in rural Ethiopia, using household data from 1997 from the four main regions of the country. They found that most land is passed on to sons at the time of marriage, while daughters receive very little or no land, and that the distribution of wealth at the time of marriage is highly inequitable for both grooms and brides. They also found assortative matching, with wealthier grooms tending to marry wealthier brides, strengthening the tendency toward inequitable distribution of resources across generations. Inequitable distribution also continued at the time of inheritance, as most women inherit nothing at all.

Iversen et al. (2011) conducted experiments to investigate intra-household cooperation in Uganda, finding that limited cooperation and opportunistic behavior within households are common. They suggested that more work should be done to develop non-cooperative models of intra-household decision-making.

Kebede et al. (2013) employed a variety of experimental games played by married couples in one urban and two rural settings in Ethiopia, finding significant deviations from Pareto-optimal behavior by the majority of couples. Such findings provide reason to question the Pareto-optimality assumptions that follow from the unitary and collective household models.

Using dictator games in combination with survey data on a diverse rural sample of households in Southern Ethiopia, Bezu and Holden (2013) found that spouses operate separate cash budgets and, to a very limited extent, share cash or help each other with cash if one partner faces an urgent need. Husbands are found to be more likely to share cash with their wives than the other way around.

Holden and Bezu (2014) used Hawk-Dove game experiments to assess within-household cooperation, coordination and efficiency by including a range of treatments in the form of benefits from cooperation and varying both the information available and whether the games were simultaneous or sequential. They found substantial variation in the "balance of power" and the extent of cooperation between the spouses, resulting in efficiency losses due to excessive selfishness among wives and husbands, with wives found to be more hawkish than their husbands. In the present paper, we draw on data from these experiments to explore how behavior in dictator and Hawk-Dove games is related to other socio-economic variables and the joint land certification reform.

Based on this review, we believe it is safe to assume that resource allocation within households is not necessarily Pareto-optimal and preferable to rely on the separate spheres model of Lundberg and Pollak (1993), which allows for both Pareto-efficient and Pareto-inefficient outcomes.

3. Theoretical framework

3.1. Household bargaining models

Household bargaining models and game theory can serve as a useful starting point for understanding complex land rights and intra-household decision-making issues. In addition, they provide a basis for formulating testable hypotheses. One may examine joint certification as a natural experiment involving households that have received such certification.

In the Nash-bargained household model (McElroy, 1990; McElroy and Horney, 1990), divorce is labeled as a threat point, and the introduction of joint land certificates may alter both the bargaining power and the threat points, so that the balance of power changes, and the probability of divorce may also change as the threat points change. However, this will also depend on the extent to which rights based on land law and land certification are enforced or involve high enforcement costs. The model may serve as a basis for assessing whether joint certification has affected within-household outcomes (our focus) as well as the probability of divorce and

outcomes regarding how land is shared in cases of divorce (a topic left for future research). Several studies have shown that better outside family opportunities for household members affect their intra-household access to resources (McElroy, 1990). Assets brought into a marriage and the timing of marriage versus the timing of receipt of joint certificates can be used to test whether these factors influence intra-household resource allocation and land distribution in cases of divorce or the death of the husband.

However, intra-household decisions may result from cooperative bargaining. The separable spheres model (Lundberg and Pollak, 1993) presents a picture in which conflicts within households do not necessarily lead to divorce but rather to non-cooperative outcomes within households, where the fallback position may be based on a traditional division of labor and other resources. This model will be used as a basis for analyzing intra-household conditions following land certification. To what extent is there a cooperative or non-cooperative solution within households with respect to control over land resources and household decisions over land? And to what extent does this solution change after the introduction of joint land certification?

On the one hand, the initial weak household tenure rights due to earlier tenure reforms and policies in Ethiopia may cause men and their families to perceive their land rights as weak and insecure before receipt of land certificates. Men may also, therefore, perceive benefits in receiving joint land certificates, although the certificates imply a re-allocation of power over land within households. On the other hand, if men and their kin family perceive enhanced land rights of women through joint certification as a threat to their land rights, they may react opportunistically and be willing to fight for their traditional decentralized property rights, leading to increased within-household tensions. Certification may thus lead to a new Nash bargaining equilibrium or a new non-cooperative solution within households (Lundberg and Pollak 1993). Such tensions could also lead to increased intra-household tension, violence, divorce, and disputes in the court system.

We start from a very general standard household bargaining model:

$$(1)\quad N = \left(U^m - U^{*m}\left(A^m\right)\right)\left(U^f - U^{*f}\left(A^f\right)\right)$$

where N is the bargained product, U is utility, U^* is the threat point, which also coincides with reservation utility, the superscripts m and f represent husband and wife, respectively, and A is a vector of assets, rights and other factors that may affect individual bargaining power within households. In the models of Manser and Brown (1980) and McElroy and Horney (1981), the threat points represent divorce, but in the Lundberg and Pollak (1993) model, the threat points represent other non-cooperative situations within marriage. Non-cooperative bargaining models, unlike cooperative bargaining models, do not assume efficient outcomes in decision-making and are therefore subject to inspection with respect to efficiency issues. The disadvantage of non-

cooperative bargaining models is that they do not offer any strong predictions or clear guidelines on which variables are relevant to include (Pollak 2005). Various non-cooperative games, both one-shot and repeated games, can be played by two players with efficient or inefficient outcomes and possibly multiple equilibria. We postulate, however, that spouses who play more cooperatively in a sequence of sub-games are likely to be more generous towards each other and that wives in such households are likely to be more involved in land-related decisions and have husbands who are less likely to emphasize the traditional weak position of women.

Variables that have commonly been seen as affecting the bargaining power of spouses include assets brought into marriage, laws and regulations that affect how resources are distributed among parties in case of divorce, the opportunities (reservation utility) each party has outside or within marriage, the cultural norms for behavior within marriage, legal and informal protection in cases of abuse, cognitive and other human capital abilities of spouses, and social networks of spouses (Fafchamps et al. 2009; Pollak 2005).

In the present study, we are particularly interested in the effect of the legal reform that provides equal land rights to wives and husbands, equal sharing of land in cases of divorce and provision of joint land certificates as written documentation of shared land rights. Wives' empowerment or participation in decisions in the household could be seen as itself a welfare effect or as a means of achieving higher welfare outcomes for family members that more closely correspond to the preferences of wives, at least when cooperative solutions are found within the household and bargaining costs are less than bargaining gains. However, such bargaining may not always yield cooperative solutions, and there could be a net loss to the household. For individual household members, the net outcomes of such bargaining can be positive or negative.

In our study, we have chosen to examine the decision-power of women or the degree of change in their involvement and influence over land-related decisions. This outcome is represented by N (N is increasing in decision-power) in equation (1) and depends, in reduced form, on a set of factors indicated in equation (2):

(2) $$N = N\left(A^m, A^f\right) = N\left(Assets^j, Attitude^j, Culture\right); \quad \text{where } j = m, f, h$$

where h is jointly owned, the vector of assets can be brought to marriage by each spouse or jointly obtained during marriage, attitude represents both preferences and awareness of rights by the husband and wife, and culture captures ethnic differences and religion. Women's empowerment may increase with the amount of assets they bring into marriage; $\frac{\partial N}{\partial Assets^f} > 0$, while the opposite may be true for assets brought into marriage by the husband, $\frac{\partial N}{\partial Assets^m} < 0$, if these assets influence "the balance of power" within the household. It is possible that different types of assets influence N in differing degrees. We therefore split assets into land, livestock, and other non-land assets.

Opposing attitudes about women's rights and position in the household between the husband and wife can pull in opposite directions. In particular, $\frac{\partial N}{\partial AttitudeWLR^f} > 0$ and $\frac{\partial N}{\partial AttitudeWTradP^m} < 0$, where $AttitudeWLR^f$ represents women's preferences for women's strengthened land rights, and $AttitudeWTradP^m$ represents husbands' preferences for the traditional (weak) position of women. Joint land certificates may strengthen women's land rights and decision-power over land:

$$\frac{\partial AttitudeWLR^f}{\partial Landreformmeet} > 0; \frac{\partial AttitudeWLR^f}{\partial Certificate} > 0; \frac{\partial AttitudeWTradP^m}{\partial Landreformmeet} < 0; \frac{\partial AttitudeWTradP^m}{\partial Certificate} < 0.$$

Greater exposure to markets, education and the external world may enhance women's position, while traditional culture may push women toward their traditional weak position. The general resource situation of the household may also affect bargaining within households. If resources are relatively limited, bargaining may be tougher, as the husband may be more reluctant to give up control over scarcer resources. We provide more detailed specifications of the variables in the following section on data and methods.

Research in behavioral economics has shown that many individuals in diverse societies demonstrate other-regarding preferences (Henrich et al. 2001), and various theories have been proposed to explain this finding. The dictator game has become a preferred tool for investigating individual generosity towards other persons (see Engel (2011) for a meta-study). Usually, such experiments have been applied to assessments of sharing behavior among anonymous individuals. We have expanded the format to sharing behavior within households, in particular, using it as a device to tease out mutual generosity between husbands and wives. We believe that mutual generosity influences the attitudes in equation (2) and propose that mutual generosity facilitates greater involvement by wives in land-related decisions, particularly through changes in husbands' attitudes towards women's land rights. This hypothesis builds on psychological game theory, where generosity observed in dictator games among spouses may be seen as a reciprocal sub-game outcome in repeated games between spouses (Geanakoplos et al. 1989; Rabin 1993; Dufwenberg and Kirchsteiger 2004). On the other hand, spouses who are tougher in bargaining with their spouses may also be better able to achieve their goals. Such bargaining power may also be revealed by having spouses play bargaining games against one another. We used a sequence of six Hawk-Dove games played by spouses against each other to generate a measure of each individual's "hawkishness".

Based on our theoretical framework and the empirical literature, we set out to test the following hypotheses about joint land certification and the empowerment of women in Ethiopia:

H1. Women's land rights and decision-making power over land has been significantly strengthened by the new land laws and issuance of joint land certificates;

H2. Wives' preferences for strengthened land rights of women positively influence, and husbands' preferences for the traditional position of women negatively influence, the degree of involvement of women in land-related decisions;

H3. Wives' awareness and preferences for strengthened land rights of women are positively related to assets that they bring into marriage and negatively related to assets that their husbands bring into marriage;

H4. Wives' awareness and preferences for strengthened land rights of women are positively related to the degree of market integration and education of family members (Henrich et al. 2001; 2010);

H5. Women's empowerment and position is weaker in plough-based farming systems than in the perennial zone (Boserup 1970; Alesina et al. 2013);

H6. The positive impact of the reform on empowerment is greater, the more generous men are towards their wives, as generosity of men implies less resistance to women's land rights;

H7. Husbands behave more like hawks, and women behave more like doves, in Hawk-Dove games, assuming that hawkishness in these games is an indicator of relative bargaining power in households;

H8. Access to joint land certificates is associated with diminished hawkishness among husbands and greater hawkishness among wives (assuming women's relative bargaining power has been strengthened by the receipt of joint land certificates).

4. Survey locations, data and methods

4.1. Survey locations and sampling

Most of Ethiopia is dominated by plough agriculture, under which pairs of oxen are used to pull ploughs. Exceptions are the perennial zone, where plows are less used, and the pastoral areas. Our sample includes districts dominated by traditional plough agriculture (Sashemene and Arsi Negelle districts) and two areas in the perennial zone, one dominated by rain-fed subsistence-oriented production (Wollaita) and one dominated by perennial cash crop production with supplementary irrigation (Wondo Genet). The Oromo ethnic group dominates in the Sashemene and Arsi Negelle districts, the Sidama ethnic group dominates in Wondo Genet, and the Wollaita ethnic group dominates in Wollaita. A substantial number of Oromos have, however, also settled in Wondo Genet, and a separate district, Wondo Genet Oromo, has been established recently, with the new district included in Oromia Region rather than in SNNP Region, which contains both the Wondo Genet district and the Sidama zone together with the sample from Wollaita.

The degree of market integration varies across locations, with Sashemene as a market center. Sashemene and Wondo Genet are located very close to Awassa, the largest town in this part of Ethiopia and the administrative centre of SNNP Region. Arsi Negelle and Sashemene are located along the main road between Awassa and Addis Ababa and therefore have very good market access. The cash crop producing area, Wondo Genet, is also located near Sashemene and has good roads facilitating market-oriented cash crop production. Wollaita, which is located in a more remote rural setting and has poorer market access, is characterized by more traditional

subsistence-oriented production, with enset (false banana) as the main staple crop, and extremely high population densities, implying very small farm sizes and high levels of poverty.
Communities (*kebelles* or "Peasant Associations") were strategically sampled within each district to obtain additional within-district variation in distance to market. Within each community, households were sampled randomly from lists of households obtained from the community administration.

4.2. **Household-individual panel survey**

The first author carried out a baseline survey in 2007, covering 613 households (15% polygamous with up to four wives), in four districts in Oromia and the SNNP Regions (Holden and Tefera, 2008a, b). This survey focused explicitly on the initial effects of joint certification on husbands and wives in the two regions and included detailed data collection for all land parcels of households and separate interviews with husbands and wives on their knowledge of the land laws, perceptions of their land rights, the division of labor within households and their opinions and expectations regarding the effects of joint land certification. In polygamous households, separate interviews were conducted for each of the wives. These interviews included specific questions about who was responsible for a range of land-related decisions, whether the spouse was consulted and whether decisions were joint decisions. Other questions were related to how land had been divided upon divorce or the death of the husband in the past.

Separate village level survey instruments were also used to collect information from each village regarding how land registration and certification were implemented (Holden and Tefera, 2008a). Separate survey instruments were also used to interview local conflict mediators to identify how women were treated in land-related disputes. At the time of the 2007 survey, the land of 80% of households had been registered, and 60% of households had received their land certificates. These detailed baseline data provide a unique opportunity to identify effects, using a new survey of the same households and individuals in 2012. Empowerment and attitude variables were constructed (see details below) based on stated responses.

Parametric econometric methods were used in the analyses of the survey data to test our hypotheses. These include ordered probit models, probit models, censored tobit models and fractional response models. To assess the robustness of the results, alternative specifications with district and village fixed effects were used with robust or cluster-corrected standard errors. More specific details regarding each model are presented below.

4.3. **Social experiments**

The survey in 2012 was combined with social experiments to elicit intra-household generosity among spouses and the relative bargaining power of household members and relate these results to actual decision-making. Dictator games were run separately for husbands and wives, and thereafter, Hawk-dove games were run in which husbands and wives played a sequence of six

games against each other to elicit their hawkishness towards one another as an indicator of their bargaining power (Bezu and Holden 2013; Holden and Bezu 2014; Ashraf, 2009).

4.4. Construction of variables

The following approaches were used to construct variables to measure empowerment and attitudes towards the new land rights that aim to strengthen women's position within households:

Measurements of empowerment:

We assessed the extent of participation in a set of land management decisions, including crop choice and land renting decisions, and whether participation has led to changes in such decisions. Our measurements are constructed from the responses to the following questions:

i) Are you involved in land investment and production decisions with respect to any of the plots? 1=Yes, 0=No

ii) Have any of these discussions resulted in changes in how the household makes decisions or manages its land resources? 1=Yes, 0=No

iii) The wife's name on the land certificate affects her power over the land = 1 if any of codes 2, 3, 4, 5, and 6 below apply; = 0 otherwise.

1=Has no effect; 2=She would have a stronger position in case of divorce or husband's death; 3=She would be more involved in land-related decisions within marriage (e.g., crop choice and input use); 4=She would control more of the income from production on the land; 5=She would be more involved in land-renting decisions; 6=She would perform more work on the land; 7=It depends on the family,

An indicator variable for degree of empowerment with values from 0 to 3 was constructed based on responses to these three questions. A value of 1 was given to wives who responded positively to each question. The number of positive responses (out of 3) then determines the degree of perceived empowerment.

Husbands' preference for the traditional position of women:

An index was generated from responses to three questions:

i) A widow should not be allowed to marry outside the family of the late husband = 1, = 0 otherwise;

ii) A widow should marry the brother of the late husband = 1; = 0 otherwise

iii) The husband decides when there is disagreement between husband and wife = 1, = 0 otherwise.

The index was generated by summing the responses to these three questions.

Wives' stated preferences for strengthened women's land rights

An index was generated by summing the responses to three questions:

i) The wife can deny a husband the right to rent out land = 1, = 0 otherwise;

ii) A wife expects a joint land certificate = 1, = 0 otherwise;

iii) A wife expects equal land sharing upon divorce = 1, = 0 otherwise.

4.5. Descriptive statistics

We provide a brief review of some descriptive statistics in this section to clarify important contextual conditions. The share of households in our survey sample that had received a land certificate increased from 61.7% in 2007 to 82.4% in 2012 out of a total sample of 615 households. Only 5.8% of households perceived that tenure security had decreased during this period, while 57% perceived that tenure security had increased.

Perceptions of the effects of land certification on within-household discussions of land-related decisions were elicited. Crop choice and land renting emerged as the two most commonly discussed types of decisions following the reform and were mentioned by more than 60% of households. Other issues identified as more subject to discussion between spouses after land certification included division of labor, investment decisions regarding land, house construction and allocation of land to children.

Of those that indicated that there had been more discussion, 53.7% stated that there had been changes in decision-making. The most important types of issues regarding which changes in decisions had occurred, as perceived by spouses, were crop choice, improved land management, productivity and income generation.

Approximately 6.5% of the sample of married couples stated that they have faced land management issues that they have failed to agree upon. Again, crop choice, land management and income management emerged as common issues upon which spouses had difficulty obtaining agreement, as did the issue of land renting. We asked who decides when spouses cannot agree, and it appears that in most cases, the husband decides or that the decision is postponed. This may be the kind of non-cooperative outcome within families that the Lundberg and Pollak (1993) model allows for.

The distribution of wives' land-related empowerment index variable is presented in Table 1. Female-headed and polygamous households are dropped from the sample, as we are primarily interested in the responses of male-headed monogamous households with land certificates. The index shows that a large percentage (55%) of the respondents are at index levels 2 and 3, indicating substantial levels of empowerment.

The distribution of wives' land rights attitude index is presented in Table 2. For this index, we also have responses from 2007 and can determine whether there is a change in attitudes from 2007 to 2012. A chi-square test demonstrates that there has been a highly significant change in the attitude index from 2007 to 2012, with wives becoming more conscious of their land rights over time.

Table 1. Distribution of wives' land-related empowerment indicator

Indicator level	Freq.	Percent	Cum.
0	20	6.2	6.2
1	126	39.3	45.5
2	93	29.0	74.5
3	82	25.6	100.0
Total	321	100.0	

Source: Own survey data.

Table 2. "Wives' land rights attitudes"- index distribution by year for wives in monogamous households with land certificates

Index score	Stats	2007	2012	Total
0	Freq.	38	24	62
	Percent	11.3	7.5	9.4
1	Freq.	43	7	50
	Percent	12.8	2.2	7.6
2	Freq.	117	58	175
	Percent	34.7	18.1	26.6
3	Freq.	139	232	371
	Percent	41.3	72.3	56.4
Total	Freq.	337	321	658

Note: Pearson chi2(3) = 71.9 Pr = 0.000 for difference in distribution from 2007 to 2012. Source: Own survey data.

The distribution of husbands' preferences regarding the traditional position of women index is presented in Table 3 for husbands in monogamous households with land certificates. We find that approximately 64% of husbands favored at least one of the traditional positions regarding women.

Table 3. "Husbands' preference for traditional position of women"- index in 2012

Index score	Freq.	Percent	Cum.
0	115	35.8	35.8
1	122	38.0	73.8
2	70	21.8	95.6
3	14	4.4	100
Total	321	100	

Source: Own survey data

Table 4 provides overview statistics for additional variables used in the econometric analysis.

Table 4. Descriptive statistics for household and individual data

	Mean	Median	St. Err.	N
Wives' empowerment index	1.68	2	0.041	494
Age of household head	45.50	43	0.650	494
Household size	7.39	7	0.140	494
Average education level in household	2.92	2.8	0.085	485
Male work force	1.98	2	0.062	494
Female work force	1.90	2	0.055	494
Polygamous household, dummy	0.19	0	0.018	493
Tropical livestock units	3.73	2.8	0.179	494
Age difference husband-wife, years	6.34	6	0.565	454
Land certificate dummy	0.82	1	0.017	494
Farm size, ha	0.85	0.625	0.032	491
Land individually owned by husband (UNIT???)	1.79	1	0.104	453
Land individually owned by wife	0.19	0	0.044	480
Husband's assets brought to marriage, 1000EB	2.14	0.6	0.222	453
Wife's assets brought to marriage, 1000EB	0.18	0	0.031	482
Wife's share of livestock	0.03	0	0.007	443
Husband's allocation to wife in dictator game, EB	16.73	20	0.453	387
Wife's allocation to husband in dictator game, EB	14.29	20	0.461	388
Husbands' probability of playing Hawk in HD game	0.25	0.17	0.014	417
Wives' probability of playing Hawk in HD game	0.43	0.33	0.016	417
Wives' land rights attitude index	2.59	3	0.036	494
Husbands' preference for traditional position of women index	0.98	1	0.039	494

Source: Own survey and experimental data

4.6. Estimation strategy

We estimate the following parsimonious models:

a) Ordered probit model for women's land rights attitude index, with data from 2007 and 2012:

$$AttitudeWLR_{ht}^{f} = \alpha_1 Landreformmeet_h + \alpha_2 Landcertificate_h + \alpha_3 Year_t + c_i + e_{ht}$$

$$\Pr\left[AttitudeWLR_{ht}^{f} = j \right] = \Pr\left[\varepsilon_{j-1} < AttitudeWLR_{ht}^{f} < \varepsilon_j \right]$$

3) $$= \Pr\begin{bmatrix} \varepsilon_{j-1} - \alpha_1 Landreformmeet_h + \alpha_2 Landcertificate + \alpha_3 Year_t + c_i < e_t < \\ \varepsilon_j - \alpha_1 Landreformmeet_h + \alpha_2 Landcertificate_h + \alpha_3 Year_t + c_i \end{bmatrix} =$$

$$F\left(\varepsilon_j - \alpha_1 Landreformmeet_h + \alpha_2 Landcertificate_h + \alpha_3 Year_t + c_i\right) -$$

$$F\left(\varepsilon_{j-1} - \alpha_1 Landreformmeet_h + \alpha_2 Landcertificate_h + \alpha_3 Year_t + c_i\right)$$

where $AttitudeWLR_{ht}^{f}$ is the latent index variable for the wife's attitude towards strengthened land rights for women in household *h*, $Year_t$ is a dummy for year=2012, c_i represents community fixed effects, e_{ht} is the normally distributed error term, ε_j represent the threshold (cut) parameters, and *F*(.) is the standard normal cumulative density function. The index variable takes values from 0 to 3 (see Table 2).

b) Ordered probit model for men's preferences regarding women's traditional weak position:

4) $$AttitudeWTradP_h^m = \beta_0 + \beta_1 Landreformmeet_h + \beta_2 Landcertificate_h + c_i + u_h$$

with a full specification similar to equation 3) above. Additionally, here the index variable ranges from 0 to 3 (see Table 3).

c) Ordered probit model for women's participation in land-related decisions (empowerment):

5) $$N_h = \gamma_1 AttitudeWLR_h^f + \gamma_2 AttitudeWTradP_h^m + c_i + \nu_h$$

where N_h is the latent index for the wife's participation in land-related decisions in household *h* as a function of the attitude index variables (represented in linear form in the parsimonious model) and the community dummy variables. The more complete specification, as in equation 3), is dropped to keep the notation simple. The model was run only for households that had received land certificates.

The women's land-related empowerment model, which is applied only to monogamous male-headed households that have received land certificates alternatively includes district fixed effects and community fixed effects, a range of household characteristics such as religion, ethnic group, age of household head, household size, average educational level of household members, the male and female work force in adult equivalents, whether the wife's name is on the land certificate, farm size and livestock endowment (Table 6). We assume that assets brought to marriage only have effects through the preference/attitude index variables and therefore did not include these variables.

Expanded models for wives' preferences for strengthened land rights of women and men's preferences for women's traditional position are presented in Table 7. There, we include land and non-land assets brought to marriage, in addition to the variables included in the empowerment models in Table 6.

d) Models used to analyze the dictator game experiments

These models were used to assess the extent of generosity between husbands and wives and how generosity relates to the preference variables, assets brought to marriage and other household characteristics:

$$
\begin{aligned}
& G_h^f = g_1^f \, AttitudeWLR_h^f + g_2^f \, AttitudeWTradP_h^m + g_3^f \, Assets_h^j + g_4^f G_h^m + c_h + c_i + \nu_h \\
& G_h^m = g_1^m \, AttitudeWLR_h^f + g_2^m \, AttitudeWTradP_h^m + g_3^m \, Assets_h^j + g_4^m G_h^f + c_h + c_i + \nu_h, \\
& \text{where } j = m,\ f
\end{aligned} \tag{6}
$$

where generosity (G^j) is measured by the amounts that spouses gave to each other (without the other one knowing) in the dictator games. We assess how generosity is related to wives' preferences for strengthened land rights of women, men's preferences for the traditional position of women, land and non-land assets brought to marriage, generosity of the other spouse, hawkishness of spouses in Hawk-Dove game experiments, a set of household characteristics and district versus community controls. The results are presented in Table 8.

e) Models of hawkishness of husbands and wives in Hawk-Dove game experiments

These models were used to assess the bargaining power of spouses, the "intra-household climate" and the association of receipt of joint land certificates with the bargaining power and hawkishness of spouses. Separate models for husbands and wives were run, using the general specification:

$$
\begin{aligned}
& H_h^f = \eta_1^f \, Certificate_h + \eta_2^f \, Assets_h^j + \eta_3^f H^m + c_h + c_i + \upsilon_h \\
& H_h^m = \eta_1^m Certificate_h + \eta_2^m \, Assets_h^j + \eta_3^m H^f + c_h + c_i + \upsilon_h, \\
& \text{where } j = m,\ f
\end{aligned} \tag{7}
$$

where H_h^f and H_h^m represent the hawkishness (bargaining power) of wives and husbands, respectively, as measured in the Hawk-Dove game experiments as functions of households having a joint land certificate, land and non-land assets brought into marriage, hawkishness of the other spouse, other household characteristics and community dummies. The dependent variables are count variables for the number of times a wife and husband played hawk out of six games played. Negative binomial regressions were used in the analysis. The results, in the form of average marginal effects with cluster robust standard errors and clustering at the community level, are presented in Table 9.

5. Results and Discussion

5.1. Wives' empowerment in land-related decisions

We first present a set of parsimonious models to assess the relationship between the land certification reform, women's land rights attitudes, men's attitudes regarding the traditional position of women, and women's empowerment in land-related decisions, see Table 5. We use attendance in land registration and certification meetings to capture exposure to the reform (dummy variable) together with a dummy for having received a land certificate. We use the constructed index variables to capture women's land rights attitudes, men's attitudes regarding women's traditional position, and women's empowerment in land-related decisions. In the first model, the dependent variable is the women's land rights attitude index. We collected the data for this variable both in 2007 and 2012 and have therefore also included a year dummy (=1 for 2012) in this model. In the second model, the dependent variable is men's attitudes regarding women's traditional position (index), with attendance at meetings and receipt of land certificates as explanatory variables. In the third model, the dependent variable is the empowerment in land-related decisions index variable, and again, attendance at meetings and the attitude variables are used as explanatory variables. This model applies only to households that have received land certificates, due to the way the dependent variable is constructed. It is possible that the empowerment effect exerts its influence primarily through the attitude variables, but we do not rule out that attendance in meetings may directly affect involvement in land-related decisions. All models have limited dependent (ordered) variables, and we have therefore used ordered probit models. We use village fixed effects to control for local time-invariant unobservables.

Table 5. The relation between land certification reform, wives' land rights attitude index, husbands' attitude towards women's tradition position, and women's involvement in land-related decisions.

	Wives' land rights attitude index	Husbands' preference for traditional position of women index	Wives' land-related empowerment index
Attended land reform meeting	0.206***	-0.178*	0.135
Land certificate, dummy	-0.088	0.051	
Year dummy, =1 for 2012	0.723****		
Wives' land rights attitude index			0.284****
Husbands' land rights attitude index			-0.108*
Community FE	Yes	Yes	Yes
cut1	-1.037****	-0.081	-0.838***
cut2	-0.606***	0.934****	0.522**
cut3	0.337*	2.043****	1.444****
Prob > chi2	0.000	0.000	0.000
Number of observations	1166	617	501

Note: The models include all households. Ordered probit models with robust standard errors. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.1%.

We observe that the women's attitudes index has increased significantly (at the 0.1% level) from 2007 to 2012 and that attendance at land reform meetings is strongly positively related to women's attitude index, while having received a joint land certificate has no direct significant effect on the index level. This indicates that the reform has raised awareness among women regarding their land rights.

Husbands' preferences for the traditional position of women were negatively associated with their participation in land reform meetings (significant at the 10% level). This may imply that the informational meetings have encouraged positive attitudes among men regarding stronger land rights for women.

Women's land-related empowerment index was strongly positively associated with women's land rights attitude index (significant at the 0.1% level) and negatively related with men's preferences for the traditional position of women index (significant at the 10% level). The relatively stronger effect of the women's land rights index implies that increased awareness among women may have contributed most to increased involvement of women in land-related decisions.

We implemented a sensitivity analysis of the land-related empowerment models by including a range of additional control variables in several of the ordered probit models that relate the wives' empowerment index to various possible explanatory variables in Table 6, narrowing the sample to monogamous male-headed households. The first model (OP1) uses district fixed effects, while the other models use community (*kebelle*) fixed effects.

Wives' empowerment (involvement in land-related decisions) is strongly positively correlated with the wives' land rights attitude index, a correlation that is significant at the 0.1% level in all models. This constitutes strong evidence that women who are aware of and emphasize their rights are also able to become more involved in household decision-making regarding land. However, the husbands' preferences for the traditional position of women index was also highly significant and negative (significant at the 1% level in all models), indicating that women become less involved in land-related decisions in households where husbands resist acceptance of women's land rights, favoring women's traditional position.

In addition, we included a dummy variable for inclusion of the wife's name on the land certificate, a variable that was not significant in any of the models but had a positive sign. This variable is likely to be endogenous, and we do not have any good instruments to predict it. We assessed factors that are correlated with inclusion of the wife's name on the land certificate in monogamous households. The results are included in Appendix Table A1. Household size was positively associated, and male work force was negatively associated, with inclusion of wives' names on certificates. Both variables are significant at the 5% level in all model specifications.

Table 6. Factors associated with wives' participation in land-related decisions (empowerment indicator) in monogamous male-headed households

	OP1	OP2	OP3	OP4
Wives' land rights attitude index	0.292****	0.333****	0.332****	0.358****
Husbands' land rights attitude index	-0.231***	-0.235***	-0.234***	-0.228***
Age of household head	-0.001	-0.001	-0.001	0.000
Household size	0.015	0.031	0.028	0.038
Average education level in hh.	0.006	0.024	0.034	0.044
Male work force	0.054	0.039	0.034	0.033
Female work force	-0.082	-0.090	-0.085	-0.104
Farm size, ha	-0.203	-0.243**	-0.261**	-0.236*
Tropical livestock units	0.054*	0.049*	0.052*	0.038
Wife's name on certificate, dummy	0.205	0.282	0.253	0.326
Religion dummies, baseline= Muslim				
Protestant			-0.673**	-0.487
Orthodox			-0.695**	-0.455
Other			-0.512	-0.211
Ethnic group dummies, baseline= Oromo				
Sidama				-0.025
Wollaita				-0.759
Amhara				-0.234
Other				0.680
District dummies, baseline= Sashemene				
Arsi Negelle	0.125			
Wondo Genet	-0.478**			
Wollaita	-0.720****			
Wondo Oromia	0.110			
Village fixed effects	No	Yes	Yes	Yes
Cut1 constant	-1.297***	-1.190**	-1.308***	-1.316**
Cut2 constant	0.302	0.457	0.345	0.335
Cut3 constant	1.185***	1.368***	1.263**	1.258**
Prob > chi2	0.000	0.000	0.000	0.000
Number of observations	315	315	315	307

Note: Results from ordered probit models. Standard errors corrected for clustering at community level in models with district fixed effects. Robust standard errors in models with community fixed effects. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.1%.

The OP1 model shows that wives' empowerment is weakest in Wollaita, the most remote and least market-integrated district with the highest level of poverty. It is not surprising that this more subsistence-oriented community lags others with respect to the empowerment of women in relation to land, as this is also an area where land is very scarce and farm sizes are extremely small.

The empowerment effect appears to have been stronger among Muslim than among Protestant and Orthodox households and among Oromo than among Sidama and Wollaita ethnic groups. This is contrary to the finding of Alesina et al. (2013) that traditional gender roles are more persistent in plough-based agricultural areas. Our findings indicate that the empowerment of women has been strongest in locations where plough agriculture dominates and where the majority of the population is Muslim. We found no significant effect of household education, age of household head, female work force and male work force, while livestock endowment was positively related with wives' empowerment (significant at the 10% level in three of the models).

In models that include polygamous households, the polygamous dummy variable was significant at the 10% level and negative, suggesting that wives' empowerment in land-related decisions is significantly weaker in such households. (The results are available from the authors upon request.)

In Table 7, we have investigated factors that may explain or be correlated with the attitudes towards women's land rights variables. In particular, we have included additional disaggregated asset variables and models with district and community fixed effects as robustness checks of our results. We emphasize only variables that are significant and that have consistent signs in both types of model. Inclusion of experimental variables occasioned a notable loss in the number of observations. We have included models with these variables in the Appendix Table A2.

The wives' land rights attitude index is significantly higher for wives in marriages in which the husband brought more non-land assets into marriage (significant at the 5 and 1% levels) and negatively related to the livestock endowment of the household (significant at the 5% level in both models). It is possible that livestock are associated with a more traditional orientation and plough agriculture, while non-land assets are related to a more "modern" lifestyle. The women's attitudes index is significantly stronger in Muslim households than in Protestant and Orthodox households. In addition, many of the community dummy variables (not included in the Table) are significant, implying large local variation between communities, while few of the individual variables are significant. This shows that social processes are important for women's attitudes and vary substantially locally. The policy implication of this finding may be that awareness campaigns have a substantial impact on the effectiveness of joint certification with respect to the empowerment of women. The change in awareness is likely to be a combined effect of joint certification, legal changes that favor women, and social influences through education, media, market integration and women's associations. Inclusion of the wife's name on the certificate can be important but is not sufficient to ensure greater involvement of women in land-related decisions.

Table 7. Factors correlated with wives' and husbands' land rights attitudes indices.

	Wives' land rights attitude index	Wives' land rights attitude index	Husbands' preference for traditional position of women index	Husbands' preference for traditional position of women index
Age of household head	0.006	0.004	-0.008	-0.007
Household size	0.034	0.028	0.002	0.008
Average education level in hh.	0.098*	0.077	0.026	0.032
Male work force	-0.066	-0.074	-0.064	-0.080
Female work force	0.102	0.097	0.078	0.061
Polygamous household, dummy	0.011	0.185	-0.117	-0.141
Land brought to marriage by husband	-0.037	-0.050	0.067**	0.076**
Land brought to marriage by wife	-0.179**	-0.206	0.003	-0.011
Husband's assets brought to marriage, 1000EB	0.047**	0.080***	0.011	0.011
Wife's assets brought to marriage, 1000EB	0.012	0.043	-0.168*	-0.169
Tropical livestock units	-0.053**	-0.051**	0.044***	0.038**
Wife's share of livestock	0.095	0.007	-0.633	-0.519
Age difference husband-wife	-0.009	-0.010	0.017***	0.013**
Land certificate dummy	0.024	-0.040	-0.180	-0.089
Farm size, ha	-0.006	-0.264	-0.222**	-0.157
Ethnic group dummies, baseline= Oromo				
Sidama	0.591*	0.479	0.125	0.160
Wollaita	-0.020	-0.062	0.311	0.305
Amhara	0.010	-0.429	-1.032**	-1.056**
Other	-0.011	-0.159	0.373	0.407
Religion dummies, baseline= Muslim				
Protestant	-0.626**	-1.568****	0.164	0.195
Orthodox	-0.687*	-1.651***	0.229	0.335
Other	-0.637	-1.524**	-0.507	-0.461
District baseline= Sashemene				
Arsi Negelle	0.481*		-0.203	
Wondo Genet	-0.082		-0.167	
Wollaita	0.806		0.188	
Wondo Oromia	0.072		0.102	
Village fixed effects	No	Yes	No	Yes
Cut 1 constant	-2.510****	-2.702****	-0.628**	-0.323
Cut2 constant	-1.409****	-1.504***	0.599*	0.956**
Cut3 constant	-0.185	-0.166	1.754****	2.177****
Prob > chi2	0.009	0.000	0.000	0.000
Number of observations	382	382	382	382

Note: Results from ordered probit models. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.1%.

The husbands' land rights attitude index is significantly (at the 5% level in both models) related to the land husbands bring into marriage, indicating that men's attitudes towards women's land rights are more negative, the more land men bring into marriage. Husbands also exhibit more negative attitudes, the more livestock the household possesses (significant at the 1 and 5% levels), consistent with the finding with respect to wives' attitudes. Livestock endowment may be related to a more traditional lifestyle and traditional gender roles. A larger age gap between husband and wife is correlated with greater resistance to women's land rights (significant at the 1 and 5% levels). The religion, district and community dummy variables are insignificant, indicating smaller variation across communities and religions for husbands than for wives. A small group of Amhara in the sample appeared to be significantly less opposed to strengthened women's land rights.

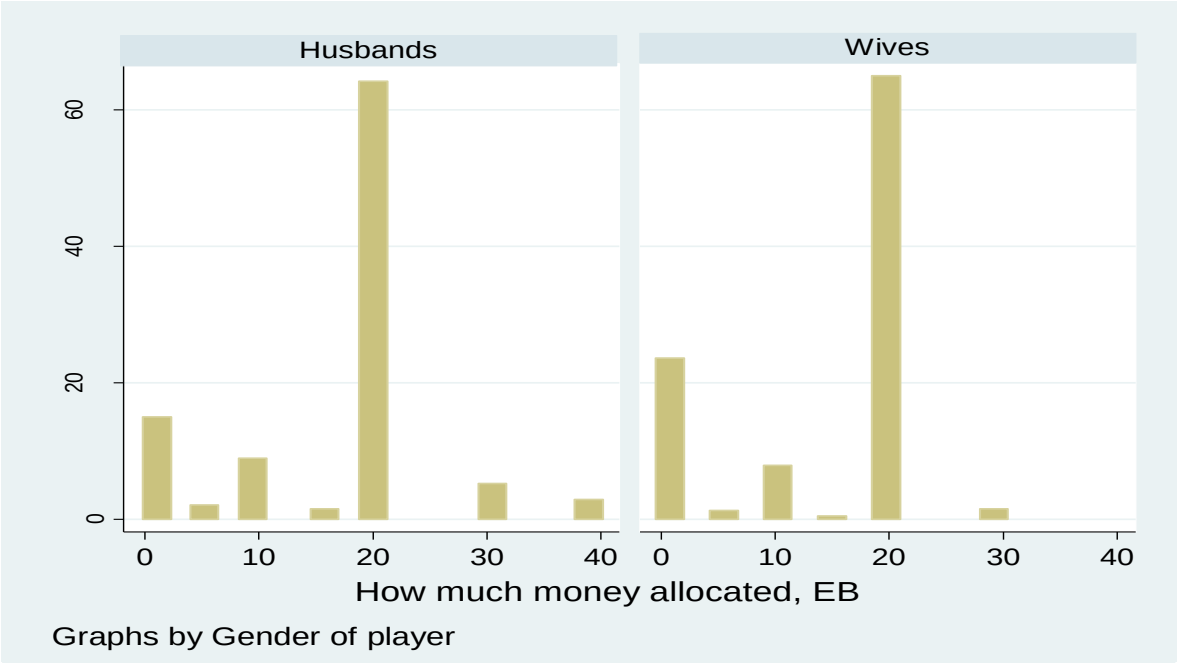
We also ran versions of the models with the dictator game and Hawk-dove game variables included. The Hawk-dove game variables were not significant in any of the models, while the dictator game variables were significant in the models that include the women's land rights attitude index (see Appendix Table A2). The wives' land rights attitude index was significantly higher in households where the husband appeared to be more generous in the dictator games (significant at the 5 and 10% levels in the two models). The generosity variables from the dictator games were insignificant in the models of husbands' attitudes. Most of the other results remained robust to smaller sample sizes, with the experimental variables included.

5.2.Summary of experimental findings

We now examine the experimental outcomes and assess factors that are correlated with husbands' and wives' decisions in the dictator and Hawk-Dove games. We were unable to include all male-headed households in the sample in these experiments, as both spouses were not available for the experiments in all cases. We assess whether and how game behavior was affected by individual and household characteristics in households in which both spouses participated in the games.

Is spouses' generosity towards one another related to the resources they bring into marriage? Is generosity related to their attitudes towards women's land rights? Is the hawkishness of spouses, when playing the Hawk-Dove games against each other, related to their generosity towards each other, to their receipt of joint land certificates and to other individual and household characteristics?

The distribution of allocations by husbands and wives to each other in the dictator games is presented in Figure 1. We observe that more than 60% of husbands and wives shared the 40EB equally with their spouses. A higher percentage of wives allocated nothing to their husbands than the other way around. Additionally, a higher percentage of husbands than wives allocated to their spouses amounts above 50%.

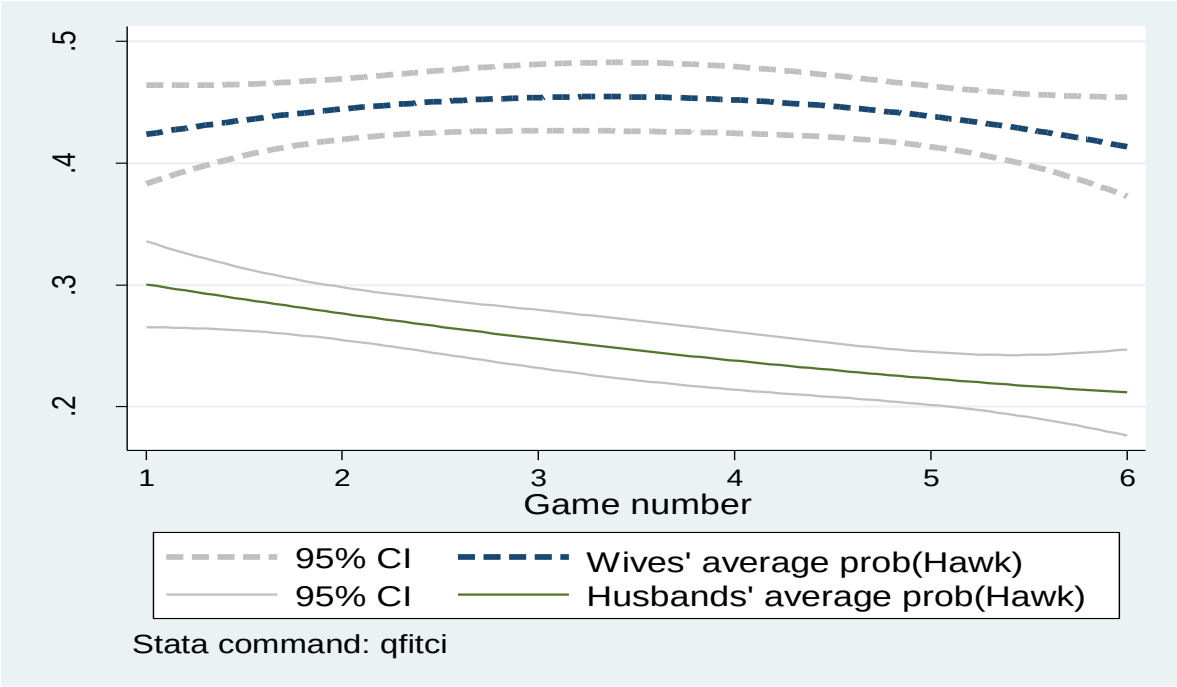


Source: Bezu and Holden 2013

Figure 1. Distribution of allocations (out of 40 Ethiopian Birr) to the spouse by husbands and wives in monogamous households.

The mean probabilities of playing Hawk over six rounds of Hawk-dove games played by husbands and wives against each other are presented in Figure 2. We observe that the probability of playing Hawk was approximately 30% in the first round for husbands and declined towards 22% in the last round, while for wives, the mean probability started at approximately 42% and remained above 40% throughout the six rounds.

Table 8 presents factors associated with the level of generosity towards the spouse exhibited by husbands and wives in the dictator games, using models with district and community fixed effects for robustness assessment.



Source: Holden and Bezu (2014).

Figure 2. Probability of playing Hawk by husbands and wives by game number in H-D-games

Husbands' generosity towards wives was significantly negatively correlated with the average educational level in the household (significant at the 5 and 1% levels), while it was positively correlated with the male work force in the household (significant at the 10% level in both models). Polygamous husbands allocated significantly less to wives than monogamous husbands (significant at the 5 and 10% levels). Wives' allocations to husbands were significantly positively correlated (significant at the 0.1% level in both models) with husbands' allocations to wives, demonstrating mutual generosity among spouses (Bezu and Holden 2013). Husbands' generosity towards their wives was significantly lower in Wollaita than in the other districts (significant at the 1% level). This is the area with poorest market access and highest level of poverty.

Table 8. Factors associated with husbands' and wives' generosity towards their spouses in dictator games

	Husband's allocation to wife	Husband's allocation to wife	Wife's allocation to husband	Wife's allocation to husband
Wives' land rights attitude index	2.130*	1.077	-2.649**	-2.860**
Husbands' land rights attitude index	-0.655	-0.027	-0.661	-0.092
Age of household head	0.008	-0.009	-0.066	-0.065
Household size	-0.413	-0.341	0.075	0.169
Average education level in household	-1.031**	-1.183***	0.889*	0.682
Male work force	1.033*	1.061*	-0.678	-0.778
Female work force	0.676	0.528	-2.049**	-1.838**
Polygamous household, dummy	-3.769**	-2.816*	2.728	3.598*
Land individually owned by husband	-0.288	-0.188	0.270	-0.074
Land individually owned by wife	-1.735	-1.735	-1.063	-0.073
Husband's assets brought to marriage, 1000EB	-0.010	-0.028	0.027	-0.002
Wife's assets brought to marriage, 1000EB	0.333	0.402	-0.369	-0.357
Tropical livestock units	0.186	0.147	-0.338	-0.317
Wife's share of livestock	12.447	8.024	-5.890	-8.428
Age difference husband-wife	-0.005	0.008	0.035	0.047
Household has land certificate, dummy	2.592*	1.604	-1.278	-1.208
Farm size, ha	0.865	0.835	1.387	1.607
Wife's allocation to husband in dictator game	0.336****	0.251****		
Husband's allocation to wife in dictator game			0.391****	0.291***
Husband's hawkishness in HD-game	-0.290	-0.951	-2.977	-4.614*
Wife's hawkishness in HD-game	-1.547	-1.154	-0.030	-0.547
District baseline= Sashemene				
Arsi Negelle	-1.591		-2.099	
Wondo Genet	1.067		-0.644	
Wollaita	-6.228***		0.152	
Wondo Oromia	-2.135		-2.461	
Community fixed effects	No	Yes	No	Yes
Constant	8.961	12.011**	21.376****	22.763****
Sigma constant	8.907****	8.486****	10.262****	9.605****
Prob > chi2	0.000	0.000	0.003	0.000
Number of observations	296	296	296	296

Note: Results from censored tobit models with district fixed effects or village fixed effects. Standard errors corrected for clustering at community level in models with district fixed effects. Robust standard errors in models with community fixed effects. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.1%.

Wives' generosity was negatively related to their attitudes index score for women's land rights (significant at the 5% level in both models) and negatively related to the female work force in the household (also significant at the 5% level in both models). Again, we find a strong positive

correlation between the independent responses of husbands and wives. There was a weak indication that the hawkishness of husbands was associated with less generous behavior of wives and that polygamous wives were more generous towards their husbands than monogamous wives were, in contrast to polygamous husbands. However, these variables were only significant at the 10% level in the models with community fixed effects.

We now assess the factors associated with the hawkishness of husbands and wives when playing against each other in repeated Hawk-Dove games. The results, obtained using negative binomial models with cluster robust standard errors, are presented in Table 9. The dependent variable is the number of times out of six that an individual played hawk. We used models with community fixed effects.

We observe in Table 9 that hawkishness was significantly lower among both husbands and wives in households with joint land certificates. This result may indicate that joint land certification has positively affected the intra-household "climate," but we cannot rule out the opposite causal relationship, namely, that "conflict households" have failed to obtain land certificates. Kidnapping marriage was also associated with significantly more hawkish behavior of both husbands and wives. Wives were also significantly more hawkish in households with larger numbers of children not attending school and in households with older husbands. The average educational level of household members was negatively associated with husbands' hawkishness, while husbands' educational levels were positively associated with husbands' hawkishness.

Inclusion of additional individual asset variables caused a drop in sample size, but this did not strongly affect the variables that were included in both types of models. The models that include the additional asset variables show that husbands were more hawkish, the more non-land assets their wives brought into marriage, while they were less hawkish, the more land their wives brought into marriage. Additionally, they were less hawkish, the more assets they themselves brought into marriage. A larger age difference between husband and wife was associated with more hawkish behavior by husbands. Wives were less hawkish, the larger the share of livestock they own within the household. Both spouses responded to more hawkish behavior by their spouse with less hawkish behavior (significant at the 0.1% level).

Table 9. Factors associated with hawkishness of husbands and wives in Hawk-Dove games

	Models without separate asset variables		Models with separate asset variables	
	Husbands	Wives	Husbands	Wives
Polygamous household, dummy	0.295	0.140	0.484	-0.145
Male work force	0.227	0.016	0.254	-0.012
Female work force	-0.020	-0.034	0.016	0.103
Average education of hh members	-0.137**	0.076	-0.167**	0.055
Household size	-0.085	0.029	-0.102	0.011
Wife's education	-0.031	0.005	-0.039	0.037
Age of male head	0.002	0.024**	-0.016	0.025
Education of male head	0.071*	-0.002	0.096**	-0.007
Number of children not attending school	0.125	0.519**	0.179	0.523**
Has land certificate	-0.938**	-1.898****	-1.065*	-2.033****
Years with land certificate ownership	-0.001	-0.087	-0.055	-0.099
Land holding, temad	-0.014	-0.022	0.016	0.053
Number of Hawk by wife	-0.326****		-0.258****	
Number of Hawk by husband		-0.474****		-0.381****
Marriage type dummies: Baseline: Arranged marriage				
Arranged marriage with bride agreement	0.077	0.157	0.139	0.020
Love marriage	0.320	0.270	0.417	0.245
Exchange marriage	-0.517	0.599	-0.547	0.446
Kidnapping marriage	1.181****	1.326**	1.187***	1.589*
Land brought to marriage by husband			-0.039	0.010
Land brought to marriage by wife			-0.390**	0.133
Husband's assets brought to marriage, 1000EB			-0.039***	-0.048
Wife's assets brought to marriage, 1000EB			0.295****	-0.046
Tropical livestock units			0.082	0.094
Wife's share of livestock			-0.993	-7.092**
Age difference husband-wife			0.034***	0.000
Community dummies:	Yes	Yes	Yes	Yes
Constant	0.964***	1.454***	2.233***	1.154*
Ln alpha constant	-1.779**	-2.648**	-2.447**	-2.675***
Number of observations	270	270	237	237

Note: Dependent variable: Number of times out of six that respondent played Hawk. Negative binomial models with cluster robust standard errors, clustering on community (*kebelle*). Models show average marginal effects. .
Significance levels: *: significant at 10%, **: significant at 5%, ***: significant at 1%, ****: significant at 0.1% level

6. Discussion of hypotheses

We now discuss our results in relation to the key hypotheses that we aimed to test. The first hypothesis (H1) states that women' land rights and decision-making power over land has been significantly strengthened by the new land laws and the issuance of joint land certificates. We found strong evidence in support of this hypothesis, as women's favorable attitudes towards women's land rights were significantly strengthened between 2007 and 2012, and we found a positive correlation between women's attitudes and their involvement in land-related decisions. We also found a strong correlation between participation in meetings during the reform process and awareness among women of their land rights. We also found a weak but significant negative relationship between men's preferences for the traditional position of women and their participation in land reform meetings. Hypothesis H1, therefore, cannot be rejected.

Hypothesis H2 states that husbands' and wives' attitudes towards women's land rights and position (wives' preferences for strengthened land rights for women and husbands' preferences for the traditional position of women) affect the degree of involvement of women in land-related decisions. As already discussed, we found a significant positive correlation between women's positive attitudes towards women's land rights and their involvement in land-related decisions (Table 6). We also found a significant negative correlation between husbands' preferences for the traditional position of women and women's participation in land-related decisions. Both of these variables are highly significant. We therefore cannot reject hypothesis H2.

Hypothesis H3 states that wives' awareness and preferences for strengthened land rights of women are positively related to assets they brought into marriage and negatively related to assets their husbands brought into marriage. Table 8 shows very little evidence in favor of this hypothesis. Individual land brought into marriage by wives was significantly negatively related to the wives' land rights index in the model with district fixed effects and insignificant in the other model. Assets brought into marriage by husbands were positively related to the wives' land rights attitude index in both models. Livestock owned by the household was negatively related to the wives' land rights attitude index and positively related to wives' involvement in land-related decisions. This indicates a more complex relationship between assets at marriage and women's empowerment than our hypothesis suggests. We must therefore reject the hypothesis.

Hypothesis H4 that wives' awareness and preferences for strengthened land rights of women are positively related to the degree of market integration and education of family members finds support in our data, as the extent of change in women's empowerment is weakest in the district (Wollaita) with the lowest level of market integration. However, this result must be interpreted with some caution, due to the high collinearity between market integration, religion and ethnicity in our data.

We find little evidence in the data for hypothesis H5, which states that women's empowerment and position is weaker in the plough-based farming systems than in the perennial zone (Boserup

1970; Alesina et al. 2013). Women's empowerment in land-related decisions is significantly stronger in areas where plough agriculture dominates (Arsi Negelle and Sashemene). However, these areas are also those with the best market access, suggesting that market integration may have a stronger impact than the cultivation system.

Related to the social experiments and more specifically to the dictator games that involve sharing between spouses, hypothesis H6 proposes that the positive impact of the reform on empowerment is larger, the more generous men are towards their wives, as generosity may imply less resistance to women's land rights. We found that wives' allocations to their husbands in dictator games were significantly negatively associated with the land rights attitude index (Table 8). We also found that husbands' allocations to their wives in dictator games were positively related to wives' land rights attitude index in Table A2 (significant at the 5 and 10% levels). This evidence, therefore, appears to support hypothesis H6. Generosity among husbands appears to facilitate a more rapid strengthening of women's land rights and positions within households.

Hypothesis H7 states that husbands behave more like hawks and women more like doves in the hawk-dove games, based on traditional gender roles in the study areas. We found, contrary to the hypothesis, that wives were on average significantly more hawkish than their husbands in Hawk-dove games played against each other. This could indicate that wives have gained power within households or at least that they dare to assert themselves and compete with their husbands over resources. A large share of husbands was found to treat their wives politely and generously. We therefore reject hypothesis H7.

Hypothesis H8 states that husbands are less hawkish in households that have received land certificates, while wives are more hawkish in such households. As shown in Table 9, we found that both husbands and wives were significantly less hawkish in households with land certificates. This may imply that receipt of joint land certificates has contributed to improved collaboration within households and therefore less competition over resources. We cannot, however, rule out possible reverse causality, whereby conflicts in some households have prevented them from receiving land certificates. Hypothesis H8, therefore, can be partly rejected. Improved collaboration within households may yield win-win benefits, so that the intra-household bargaining game is not a zero-sum game. Joint land certification may have contributed positively to such an outcome. Our Hawk-Dove game experiments resulted in many non-cooperative and inefficient outcomes for the households. However, we refer to Holden and Bezu (2014) for further details.

7. Conclusions

We conclude that the joint land certification reform in Southern Ethiopia has positively affected women's favorable attitudes towards strengthened land rights of women and that this development has contributed to increased involvement of women in land-related decision-

making. Issuance of joint land certificates appears to have been a useful policy tool to promote increased involvement of women in land-related decisions within households. We found substantial variation across communities in wives' land rights attitude index, suggesting substantial local variation in the social processes that are likely to influence women's positions on such issues. This finding indicates that informational meetings and awareness-raising are critical activities that may enhance the effects of the reform. As budgets for such activities may be a critical constraint for land administrations, this is an area where donor funds can be usefully invested, with strong positive effects on women's empowerment. Our study covered very diverse farming systems and different ethnic groups in Ethiopia, indicating that our findings are applicable to diverse socio-economic conditions. The findings may therefore be generalizable to other areas in Ethiopia and perhaps other parts of Africa. The low-cost approach in Ethiopia can provide useful insights for other African countries, although it is always important to design reforms that fit local contexts, as there is no guarantee that success in one location can be replicated elsewhere. Piloting and adjusting designs of tenure reforms in a step-wise fashion is important to increasing the chances of success and preventing large-scale failures.

Husbands' preferences for the traditional position of women showed relatively little local variation and were associated with the age gap between husbands and wives, the amount of land the husband brought into marriage and household livestock ownership. More generous husbands appeared to have wives who emphasized stronger land rights for women. It appears likely that men's resistance may decline with additional campaigns that emphasize the importance of equal rights.

Future research should focus more heavily on the welfare outcomes of the reform, how the intra-household climate for collaboration affects the efficiency of household production and the distribution of welfare within households. In Ethiopia, it will be important to integrate joint land certification with second stage land certification that is currently underway. Another priority should be the relationship between the reform and the extent of increased involvement of women in decision-making and organization of activities at the community level.

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9. Appendix

Table A1. Factors associated with wife's name on the certificate in monogamous households

	WN1	WN2	WN3
Wives' land rights attitude index	0.033	-0.026	-0.016
Husbands' land rights attitude index	0.004	-0.036	-0.150
Age of household head	0.018**	0.018**	0.011
Household size	0.133**	0.132**	0.134**
Average education level in hh.	-0.063	-0.069	-0.074
Male work force	-0.218**	-0.234**	-0.231**
Female work force	0.047	0.054	0.055
Farm size, ha	0.229	0.154	0.337
Tropical livestock units	0.039	0.048	0.043
Religion dummies, baseline= Muslim			
Protestant		0.072	-0.689
Orthodox		0.209	-0.627
Ethnic group dummies, baseline= Oromo			
Sidama		-0.008	0.013
Wollaita		0.888	1.113
Amhara		-0.240	-1.012
Other		0.374	0.382
District dummies, baseline= Sashemene			
Arsi Negelle	0.154	0.214	
Wondo Genet	1.043***	0.897	
Wollaita	1.054****	0.020	
Wondo Oromia	-0.429	-0.440	
Kebelle fixed effects	No	No	Yes
Constant	-1.026	-0.736	-0.539
Prob > chi2	0.001	0.020	0.001
Number of observations	315	299	261

Note: Results from probit models. Four communities were dropped in the model with community fixed effects because they predicted certification perfectly. Standard errors corrected for clustering at community (*kebelle*) level. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.1%.

Table A2. Factors correlated with wives' and husbands' land rights attitudes indices: With dictator game variables.

	Wives' land rights attitude index	Wives' land rights attitude index	Husbands' preference for traditional position of women index	Husbands' preference for traditional position of women index
Age of household head	-0.001	-0.006	-0.007	-0.007
Household size	0.052	0.049	0.007	0.009
Average education level in hh.	0.121*	0.079	0.034	0.050
Male work force	-0.041	-0.043	-0.063	-0.079
Female work force	-0.003	-0.008	0.032	0.047
Polygamous household, dummy	0.391	0.595**	-0.164	-0.185
Land individually owned by husband	-0.039	-0.033	0.062*	0.063*
Land individually owned by wife	-0.116	-0.310	0.096	0.144
Husband's assets brought to marriage, 1000EB	0.055**	0.080**	0.014	0.013
Wife's assets brought to marriage, 1000EB	0.043	0.083	-0.231**	-0.212*
Tropical livestock units	-0.076***	-0.082***	0.031	0.030
Wife's share of livestock	-1.495	-2.068	-0.808	-0.505
Age difference husband-wife	-0.010	-0.012	0.015**	0.013*
Land certificate dummy	0.076	-0.101	-0.048	0.038
Farm size, ha	0.070	-0.072	-0.273**	-0.248*
Husband's allocation to wife in dictator game	0.023**	0.017*	-0.010	0.000
Wife's allocation to husband in dictator game	-0.015	-0.020*	-0.010	-0.003
Ethnic group dummies, baseline= Oromo				
Sidama	0.890**	0.804**	0.154	0.307
Wollaita	0.243	0.303	0.192	0.341
Amhara	0.403	0.230	-1.530***	-1.450***
Other	0.229	0.170	0.405	0.465
Religion dummies, baseline= Muslim				
Protestant	-0.727**	-1.844****	0.224	0.181
Orthodox	-0.580	-1.677***	0.443	0.446
Other	-0.862	-1.859***	-0.495	-0.517
District dummy variables, baseline= Sashemene				
Arsi Negelle	0.678**		-0.375	
Wondo Genet	0.002		-0.325	
Wollaita	0.938*		-0.064	
Wondo Oromia	0.206		-0.010	
Community fixed effects	No	Yes	No	Yes
Cut 1 constant	-1.222**	-1.478**	-1.118***	-0.546

Cut2 constant	0.013	-0.100	0.115	0.738
Cut3 constant			1.207***	1.877****
Prob > chi2	0.000	0.000	0.000	0.000
Number of observations	319	319	319	319

Note: Results from ordered probit models. Significance levels: *: 10%, **: 5%, ***: 1%, ****: 0.1%.