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Women's Land Tenure Security and Household Human Capital: Evidence from Ethiopia's Land Certification

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Abstract

This paper examines the impact of Ethiopia's gendered land certification programs on household consumption of healthcare, food, education, and clothing. Ethiopia embarked on a land tenure reform program in 1998, after years of communism during which all land was nationalized. The reform began in Tigray region where land certificates were issued to household heads, who were primarily male. In a second phase carried out in 2003–2005, three other regions issued land certificates jointly to household heads and spouses, presenting variation in land tenure security by gender. Results using household panel data show that joint land certification to spouses was accompanied by increased household consumption of healthcare and homegrown food and decreased education expenditure, compared to household-head land certification. Joint land certification was also accompanied by increased consumption of women's and girls' clothing, and decreased men's clothing expenditures indicating results may be explained by a shift in the gender balance of power within households. Analysis on the incidence and duration of illness indicates that increased healthcare expenditures after joint land certification may be due to joint certification households seeking more effective treatment than head-only certification households for household members who fell ill or suffered injuries.

Keywords

land reform; gender; bargaining power; intrahousehold resource allocation; Africa; Ethiopia

1. INTRODUCTION

Land is an important asset in agrarian societies where landholdings determine productivity, economic welfare, social status, and political power (Agarwal, 1994a). The right to land may therefore be an important tool for promoting the health and the welfare of the poor (Acemoglu, Johnson, & Robinson, 2001; Binswanger, Deininger, & Feder, 1995; Sen, 2001). The case for improving land rights is particularly strong for women in developing

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Conflict of Interest

The author declares that he has no conflict of interest.

societies since women are less likely to own land and have smaller plots than men (World Bank, 2011).¹ Previous research finds that women's land ownership or land tenure security is positively associated with household consumption of health and nutrition inputs (Allendorf, 2007; Doss, 2006; Menon, van der Meulen Rodgers, & Nguyen, 2014; Quisumbing & Maluccio, 2003), which suggests that the health and wellbeing of a woman and her family members might depend on her individual land tenure security, and not just on the land tenure security of her husband or other male family members (Agarwal, 1994b). These studies seemingly suggest that interventions to strengthen women's land tenure security may lift the well-being of families in developing societies.

However, a shortcoming of previous studies is that the association between women's land tenure security and household consumption patterns may be confounded by other factors such that prescribing land tenure security interventions may be premature. For instance, land tenure security is often contested along class, gender, and other social differentiators such that differences in women's land tenure security may originate from differences in upbringing, level of wealth, or their agency over their rights (Kabeer, 1999; Peters, 2004). This makes it methodologically challenging to determine how much of the observed differences in consumption patterns between women with strong land tenure security and those without are due to land tenure security itself rather than social differentiators correlated with land tenure security.

I address this shortcoming by examining Ethiopia's land certification programs, which provided households with the right to use, lease, and bequeath land to family members. Land certification was conducted in four regions in the country at different times between 1998 and 2005. In one of the regions, land certificates were issued only to the household head (typically a man)² whereas certificates were issued jointly to household heads and spouses in the remaining regions. The variation over time and space of land certification programs thus provides a quasi-experiment to study the impact of increasing land tenure security either to a household head only or to both the household head and his wife. This paper examines how Ethiopia's gendered land certification programs affected household investment in human capital by studying the consumption of healthcare, food, education, and clothing. The paper therefore contributes to the literature on outcomes of land tenure security and specifically, whether it matters that women's land tenure security is enhanced in addition to enhancements to a households' land tenure security.

Ethiopia serves as an interesting case study for research on the gendered effects of land tenure reforms because it is one of the most gender unequal countries and has some of the world's poorest health outcomes: it was ranked 127 out of 142 countries in the gender equality rankings compiled by the World Economic Forum (2014); in 2004, 47% of children under five were stunted (low height-for-age) and 37% were underweight (low weight-for-age) (Rajkumar, Gaukler, & Tilahun, 2011) and 73.6 per 1000 live births did not survive to

¹There are exceptions. For instance, in parts of Malawi it is women rather than men who customarily have ownership rights to land (Kishindo, 2010).

²Using data from 2,300 households, Deininger et al. (2008) estimate that 71% of certificates are issued in a man's name alone and 14% in a woman's name alone.

age five years (United Nations, Department of Economic and Social Affairs, Population Division, 2013).

2. LITERATURE REVIEW

2.1 Land tenure security

There is no consensus on the definition and meaning of the concept of land tenure security and the definition of land tenure security that I use in this paper—the certainty that a person’s rights to land will be recognized by others and protected when challenged—incorporates MacPherson’s (1978) and Ribot and Peluso’s (2003) notion of enforceability of a person’s claims.³ This recognition and protection of rights to land could be obtained through law, custom, or convention (Ribot & Peluso, 2003). Van Gelder (2010) argues that there are three dimensions of land tenure security: (1) legal tenure security, which is backed by state authority, (2) *de facto* tenure security, and (3) perceived tenure security, which is a person’s (subjective) evaluation of her tenure situation. In the ‘ideal’ scenario, there is convergence of the three dimensions of land tenure security; the reality is that these dimensions may influence each other but they do not always correspond. However, human behavior, e.g., investment in land, hinges upon perceived land tenure security and both legal and *de facto* tenure security influence behavior by influencing perceptions (Van Gelder, 2010). Land tenure security as conceptualized cannot be measured directly and research relies on proxies of the three dimensions, such as information on challenges to land rights and their resolutions or lack thereof (Steudler, Rajabifard, & Williamson, 2004). Further, land rights could be held by different persons and the concept of land tenure security allows for collective, and not just individual, claims to land. In this paper, however, I am concerned with land tenure security of *individual* women even when their rights to land are obtained through membership in social groups, e.g., marriage-based land rights. Additionally, while there is a wide gamut of rights to land and, therefore, improvements in land tenure security could be realized through improvements in certainty of enforceability of any one or more land rights, the land tenure reform I study is focused on the right to use the land, the right to control income derived from the land, the right to protection from illegal expropriation of the land, and the right to transfer rights to the land to other persons.

What policies could be enacted to support or improve women’s land tenure security in sub-Saharan Africa is debated. Formal land titling may fail to increase land tenure security for a variety of reasons. Notably, formalization of land rights may have little impact where informal and customary tenure systems already provide tenure security (Atwood, 1990; Pickney and Kimuyu, 1994). Further, when formal land titling converts communal land into private land, segments of the community, including women, could be excluded or marginalized (Meinzen-Dick and Mwangi, 2005). Whitehead and Tsikata (2003) show that there is an emerging consensus among researchers, intergovernmental organizations, and policy makers that is coalescing around customary land tenure systems as the way forward. Whitehead and Tsikata argue that the “re-turn” to customary land tenure stems from a dissatisfaction of formal land titling interventions conducted Africa. African feminist

³For a review of the conceptualization of land tenure security, see Simbizi, Bennett, and Zevenbergen (2014) and Van Gelder (2010).

lawyers, however, question the reliability of customary tenure to protect women's land tenure security and remain drawn to a rights-based framework, while simultaneously critiquing and looking up to statutory law to provide land tenure security for women.

Theoretically, improvements in land tenure security of households are claimed to make households wealthier through four mechanisms.⁴ First, greater land tenure security can increase incentives for investing in agricultural and land-related inputs, which improve the profitability of landholdings, for example, as in Besley (1995). Second, greater land tenure security is posited to reduce the time and resources spent by households to defend their claims to land, which frees up resources that can be invested in human capital of households or in income-generating activities, as in Field (2007), for example. Third, improved formal land tenure security is postulated to enhance access to credit since the landholdings can serve as collateral (de Soto, 2000; Feder & Feeny, 1991). Fourth, the registration system that accompanies formal land tenure programs provides a publicly available registry of land information, which can reduce the costs of trading land rights to renters or buyers and, in turn, raise property values (Deininger, Ali, & Alemu, 2011). When households get wealthier they are better able to meet their needs, including investing in their human capital, i.e., the set of skills and traits that enable household members to provide labor (Schultz, 1961).

Empirical studies examining the impact of formal land tenure interventions, which have been reviewed by Lawry et al. (2017), present mixed evidence: land titling programs are associated with significant increases in investment in Latin America and Asia, which is in contrast to sub-Saharan Africa where land titling is generally associated with small or no increase in investment and farm income. Lawry et al. (2017) propose that the regional differences could be because the customary tenure systems unique to parts of sub-Saharan Africa already provide tenure security such that formalization of tenure adds little. Furthermore, Lawry et al. (2017) do not find evidence to support that land titling interventions enhance credit access. This literature along with other studies, for instance work by Fogelman and Bassett (in press) who document a case where a land titling program in Lesotho contributed to the dispossession of the title holders, suggest the view that enhancing formal land tenure security is always wealth-enhancing is too simplistic. The impact of a formal land tenure security intervention may depend on, among other factors, the nature and context of the intervention. Whether a particular improvement in legal, *de facto*, or perceived land tenure security will improve household outcomes is ultimately an empirical question.

In addition to the wealth effect of increased household land tenure security, changes in the land tenure security of individual household members might influence how households allocate their limited resources towards investment in human capital and other competing needs. While I focus here on the household allocation process as conceptualized in the economics literature, that conceptualization is derived from ethnographic evidence, for example, Hart (1991), who documents tensions between husbands and wives in rural Malaysia over the allocation of household resources and women's insistence on obtaining economic self-reliance. The women in Hart's study, when faced with resistance from their

⁴The link between formal tenure security and wealth has been famously advocated by de Soto (2000).

husbands, turn to community women groups for support. These within-household dynamics are formalized in the collective model of Chiappori (1992), which is outlined in the Appendix, and which postulates that factors originating from outside the household can have an impact on the household resource allocation process without necessarily changing the household members' preferences or the size of the household's budget. This effect could be realized if an extrahousehold factor alters the bargaining power balance in the household. An example is membership in women's groups emboldening women's agency back in their households as in Hart's (1991) study. Changes in bargaining power in turn influence which household member's preferences weigh more in household decisions, which is reflected in how a household allocates its resources between various commodities. Extrahousehold factors that shift the gender balance of power in the household will determine whether it is men or women who will have more say concerning household resource allocation decisions (for a conceptual review see Kabeer (1999), and for a review of the empirical economic literature see Duflo (2012)).

The extrahousehold factor that is of interest in this study is a policy that increases women's land tenure security. A growing literature has examined the relationship between women's land tenure security and allocation of family resources and finds that in families where women own land, compared to families where women do not own land, women are more likely to be involved in family decisions in India (Garikipati, 2009) and Peru (Wiig, 2013), and more likely to have final say over family decisions in Nepal (Allendorf, 2007; Mishra & Sam, 2016; Pandey, 2010). Also in Nepal, children of mothers who own land are less likely to be underweight compared to children of mothers who do not own land (Allendorf, 2007). In Ghana, the share of family farmland that is owned by women is associated with the proportion of the family budget that is spent on food (Doss, 2006). In Vietnam, children in households with land-use certificates, compared to those in households without land-use certificates, are less likely to have been sick, more likely to be covered by health insurance, and more likely to be enrolled in school, according to a study that used household fixed effects to control for time-invariant household-level differences (Menon, van der Meulen Rodgers, & Nguyen, 2014). These differences in outcomes are most pronounced in Vietnamese households where the land-use certificate is held solely by a woman. Further, households with land-use certificates that are solely held by a woman, compared to those without land-use certificates, allocate more of their family budget to food whereas households with land-use certificates solely held by a man or jointly by a husband and wife allocate the same proportion of family budget to food as households without land-use certificates (Menon, van der Meulen Rodgers, & Nguyen, 2014). It is not clear from the study whether this reflects a greater absolute increase in food expenditures in households with land-use certificates held by women or higher poverty among female-headed households that have to spend a larger proportion of household income on food. Research based on cross-sectional data also finds that women who own land are less likely to experience marital violence, for example in India (Panda & Agarwal, 2005) and Nicaragua (Grabe, 2010). This evidence, drawn from correlational studies in a variety of countries, supports the argument that increasing women's land tenure security increases their say in family decisions and leads to changes in how their families spend their resources. In

particular, the evidence suggests that improvements in women's land tenure security may increase the family resources that are spent on health and nutrition.

Results from Quisumbing and Maluccio (2003) who used panel data to examine the association between the value of land and livestock that Ethiopian newlyweds brought into their marriages and household allocations showed that greater value of women's assets was associated with a larger share of household expenditure on food but a smaller share of household expenditure on education later in marriage. The researchers also found some suggestive evidence that greater value of women's assets brought into the marriage was associated with a greater share of household expenditures spent on health. These results suggest that Ethiopian women would allocate household resources towards health and nutrition if they had more bargaining power as a result of improvements in their land tenure security.

A shortcoming of studies that have examined the impact of women's land tenure security on household expenditure patterns is that women who have high land tenure security may be different from those with low tenure security on characteristics that may bias the effect estimates. For example, if women's land tenure security is correlated with household wealth or with women's agency over their rights, studies may overestimate the effect of women's land tenure security on household expenditure patterns. In Quisumbing and Maluccio (2003), the value of landholdings that a bride brought into a marriage could be associated with factors that influence her bargaining power, which would yield biased effect estimates. This would be the case, for instance, if families that were more likely to give their daughters more valuable land also created a family environment that was more nurturing of their daughters' agency. A second shortcoming is that the observed effects in these studies are an aggregate of both the wealth effect of women's land tenure security as well as its effect on intrahousehold bargaining. It is therefore not clear from these studies whether land tenure security programs that are inclusive of women yield larger improvements in household consumption of health and nutrition than programs that are not. An exception is the Vietnam study (Menon, van der Meulen Rodgers, & Nguyen, 2014). However, in that study whether a land-use certificate is held by a man or woman could be determined by households, which would bias the results since whether a woman has a land-use certificate could be confounded by her agency over her land rights, her social supports, and/or other factors. To address these limitations, I leverage the variation in land tenure programs resulting from Ethiopia's land certification that is arguably driven by factors outside the control of households and potentially more likely to yield unbiased estimates.

2.2 Institutional context

2.2.1 Land tenure before Ethiopia's land certification—A review of Ethiopia's diverse land tenure systems and their history is beyond the scope of this paper. I however highlight some facets of the land tenure in order to situate the country's land certification program. During Ethiopia's imperial period (pre-1974) one tenure system found in northern Ethiopia was *chiguraf-sehabo* (see Lavers (2017) for a review of this system). Under *chiguraf-sehabo*, each household head was allocated a landholding by the community (acting through a committee of elders). While women could be allocated land, most

household heads were male and sons rather than daughters inherited their father's land. Consequently, women obtained their user rights to land through their relations with men, i.e., their fathers or husbands. Under a different more prevalent tenure system known as *risti* (see Lavers (2017) for a review), women (and men) had individual rights to land. Here too however, men and women did not enjoy equal land rights since sons were often given preference over daughters in bequests and women faced difficulties reclaiming their land after divorce. Additionally, women-headed households received smaller land holdings since a criteria used to allocate land was the household's ability to utilize the land, which disadvantaged women who were barred from ploughing by gender norms and resource (i.e., oxen) constraints. Elements of both systems have carried over to present day Ethiopia.

In 1975, following the establishment of a military communist regime, all land in Ethiopia was nationalized. The regime also set up "peasant associations" at the community level to implement agricultural and development policies, including allocation of land to rural households. Under this regime, households could not sell, mortgage, or rent out the land allocated to them. Hiring of labor was also illegal. While the law allowed for children to inherit their parents' land, households' held insecure land tenure: the government engaged in periodic land appropriation (without compensation) and distribution to accommodate young families and newly arrived households. Periodic redistribution meant smaller land holdings while the government's attempts to ensure equality in the quality (e.g., in fertility and grade) of land across households increased fragmentation of holdings.

The military regime was ousted in 1991 and the new government introduced changes in land policy. Land renting and hiring of labor were allowed but selling was still not permitted. The new regime, in 1995, also divided the country into nine ethnically based and politically autonomous regions and two cities. Figure 1 shows the regional boundaries. Different land certification programs conducted in the regions thereafter provide variation that I leverage to study the gendered effects of land tenure security.

2.2.2 Land certification—In 1998–99, the Tigray region implemented a low-cost land registration and certification exercise that covered 80% of the rural households. The process involved identifying owners of plots (i.e., households that had been allocated plots during the communist military regime and individuals who had inherited land), inspection and demarcation of plot boundaries with consensus elicited from plot owners and owners of neighboring plots, and entry of plot information in a land registry. Households were issued certificates in the household head's name and were given the right to use, lease, and bequeath the land to family members. Land certification marked the end of land appropriation and redistribution by the Tigray region government. In an example certification exercise documented by Rahmato (2010) the process begun with *kebele* (ward) officials issuing an announcement asking all landholders to attend a meeting to discuss land issues on a specified date. At the meeting, landholders were asked to elect four individuals from each *gott* (precinct) of the *kebele* to a Land Administration Committee. The committee was trained by *kebele* and *woreda* (district) officials, and four committee members and a few *kebele* and *woreda* officials were then deployed to each *gott* where they identified landholdings, demarcated boundaries, measured plot sizes, and recorded the name of the landholder. Landholders were present during the plot demarcation and measurement, and

disputes that arose were resolved at the plot or referred to the *kebele*. This public registration of plots with landholders from adjacent plots present is thought to have increased transparency (Deininger, Ali, Holden, & Zevenbergen, 2008). After the registration process was completed and results discussed in public, all information was entered into the *kebele* registry book and a certificate issued to landholders.

While the land certification was legislated as a gender neutral program, the reality is that there are still differences between women's and men's *de facto* tenure security. Four practices converge to place divorced and widowed women in Tigray at a disadvantage: landholdings are more likely to be passed on to sons than daughters upon death and thus unmarried women are less likely to hold inherited land than unmarried men; in cases where an unmarried woman does receive land, either through inheritance or allocation by the community, the custom of patrilocal residence often involves the woman leaving behind her land upon marriage as well as her natal family who might have championed her land rights; men waiting until they are allocated land by the community before entering into marriage such that men have a higher likelihood of bringing landholdings into a marriage than women; and the custom that land brought into a marriage reverts to its original owner (more likely the husband) upon divorce (Fafchamps & Quisumbing, 2002; Lavers, 2017). Without her name on the land certificate, a divorced or widowed woman may have low standing in the courts, which have been accused of being partial to men (Rahmato, 2010).

Three other regions learned from the Tigray experience and embarked on similar land certification exercises. Amhara region began the certification of land in 2003 followed by Oromia and Southern Nations, Nationalities, and Peoples' Region (SNNP) later in 2003 and in 2005, respectively. As with Tigray, land certification in these three regions did not result in reallocation of land. However, in Amhara, Oromia and SNNP regions, certificates were issued jointly to the household head and spouse, presenting variation in formal land tenure security by gender that could be utilized for research. While inclusion of the wife's name on the certificate creates a document backed by the state, which she can use to defend her claims, seeing her name on the document may directly increase her perceived land tenure security. Data from 2,300 households collected by the Ethiopian Economic Association suggest involvement of women in land administration committees was low and comparable across regions (Deininger, Ali, Holden, & Zevenbergen, 2008).⁵ The data also suggest that female household members in Tigray were more likely (51%) to attend informational meetings about land certification than in Amhara (38%), Oromia (32%), and SNNP (44%) and slightly more likely to participate in the committee election (23% vs 21%, 13%, and 20%, respectively) (Deininger, Ali, Holden, & Zevenbergen, 2008). Overall, these data suggest that regional differences arising from the land certification are not due to higher participation of women in the certification process in the joint-certification regions.

Ethiopia's land certification has been lauded for its speed and cost-efficiency (Deininger, Ali, Holden, & Zevenbergen, 2008). The program was decentralized and operated at the village level, which allowed rapid progress with majority of rural households covered within

⁵25% of committees in Tigray, 33% in Amhara, 8% in Oromia, and 30% in SNNP had a female member (Deininger, Ali, Holden, & Zevenbergen, 2008).

2–3 years of the start of the implementation. The use of unpaid elected committee members, local tools for demarcation and measurement of plots, such as ropes and handwritten land registry books, kept the cost of the program low (Holden, Deininger, & Ghebru, 2011). Deininger et al. (2008) estimate that the program cost 1 USD per plot which was much lower than the land tenure programs adopted in other countries, e.g. in Madagascar where it cost 150–350 USD per plot to complete official land titling procedures (Jacoby & Minten, 2007).

In Table 1 we see that the program was rapidly implemented with over five million land certificates granted to rural households by 2005. Surveys conducted in 2006–2007 estimate that up to 93% of rural Tigray households, 87% of rural Amhara households, 85% of rural Oromia households, and 65% of rural SNNP households held land certificates (Deininger et al., 2008; Deininger et al., 2011; Holden & Tefera, 2008). Majority of SNNP households that did not have certificates by 2007 had been registered and were only waiting to receive a certificate (Holden & Tefera, 2008).

Several studies have examined the impacts of Ethiopia's land certification. Using panel data from northern Ethiopia, Holden, Deininger, and Ghebru (2011) find that land certification was accompanied by increased participation of households in the land rental markets, either as tenants or landlords. Holden and Ghebru (2011) compare female-headed households to male-headed households in Tigray (the region where land certificates were issued to household heads only) and find that consumption expenditures and land productivity increased more in female-headed households. The authors argue that female landlords had lower land productivity than male landlords before the land certification and, therefore, had larger gains in productivity and income with land certification because certification helped less productive landlords increase their land productivity and incomes by renting out to more productive tenants. Holden, Deininger, and Ghebru (2009) and Deininger, Ali, and Alemu (2011) drawing on panel data find that land certification is associated with increased land productivity, investment in trees, maintenance of soil conservation structures, land rental market participation, and land-related investment.

Studies have also examined households' perceptions after the Ethiopian land certification. Deininger, Ali, and Alemu (2011) find that land certification is associated with increased perceived land tenure security of households. Bezabih, Kohlin, and Mannberg (2011) use a difference-in-difference approach and find that farmers in villages that received land certificates improved in their level of trust towards formal institutions. Holden and Tefera (2008) surveyed households in two regions where land certificates were issued jointly to heads and spouses and found that 60% of households believed having a land certificate would reduce conflicts regarding transferring land to children, 75% believed that the program increased the *de facto* tenure security of women, with 50% of men as well as women responding that land would be shared equally in case of divorce.

The current study makes two contributions to the literature on Ethiopia's land certification. First, the study examines how the certification affected allocation of household resources. Second, the study examines whether there were differential impacts of the certification based on whether certificates were issued jointly or to the household head alone.

3. METHODS

3.1 Data

The study uses data from the Ethiopian Rural Household Survey (ERHS), a longitudinal survey of 1477 households from the four major regions in Ethiopia.⁶ The households were randomly sampled from 15 villages that had been selected so that all major agroclimatic zones of the country were covered. Figure 1 shows the location of the villages. The surveys were conducted twice in 1994 and once in 1995, 1997, 1999, 2004, and 2009. When the first four waves were fielded (1994–1997), none of the regions had issued any land certificates. By the fifth wave (1999) one region had issued certificates to household heads. By 2004, two other regions had issued certificates jointly to household heads and spouses. By the last wave (2009), the fourth (and last) major region had issued certificates jointly to head and spouse. ERHS data are therefore suitable since they sufficiently cover the period before, during, and after the land certification. An additional advantage of ERHS data is the low attrition rate. Between 1994 and 2004 13.2% or 1.3% of households per year were lost to follow-up.

ERHS obtained demographic information for all household members at every wave. For my main analyses, I restrict the study sample to households that had a married⁷, male household head in the pre-reform period, i.e. before 1998. I exclude households headed by unmarried people because the name on their land certificates do not depend on whether the certificates were issued in the name of the household only or in the name of both the head and the spouse. I focus on households headed by men since the gender dynamics of women-headed households are likely different from men-headed households. Additionally, only a minority of households is headed by women. This restriction yields a sample of 1061 households. I also use the households' demographic information to determine the number of adults and children (aged 0–17 years) at every wave. In supplementary analysis I use the entire Tigray sample to compare impacts of land certification on female-headed and male-headed households in Tigray.

ERHS collected data on household expenditures in the previous week on food as well as the value of food consumption from the household's own farming output, gifts, in kind wages, and loans. While food purchases directly involve an outlay of household resources, consumption of non-purchased food also involves an opportunity cost. I therefore examine both non-purchased food, which is primarily homegrown food, and purchased food. ERHS also collected data on expenditures in the prior four months on: clothes, shoes and fabrics for men, women, boys, and girls; modern medical treatment, modern medicines, and traditional medicine and healers; and school fees and other educational expenses. I sum up these separate expenditure items to determine total household expenditure on clothing, healthcare,

⁶Ethiopia Rural Household Survey data have been made available by the Economics Department, Addis Ababa University (AAU); the Centre for the Study of African Economies (CSAE), University of Oxford; and the International Food Policy Research Institute (IFPRI). Funding for data collection was provided by the Economic and Social Research Council (ESRC), the Swedish International Development Agency (SIDA) and the United States Agency for International Development (USAID). The preparation of the public release version of these data was supported, in part, by the World Bank. AAU, CSAE, IFPRI, ESRC, SIDA, USAID and the World Bank are not responsible for any errors in these data or for their use or interpretation.

⁷In the data, married and partnered (i.e., cohabiting) statuses are combined. According to data from the 2000 Ethiopia Demographic and Health Survey, the prevalence of cohabitation was low—0.5% of men with married or partnered marital status were not married.

and education. ERHS also has information on expenditures on fuel, taxes, ceremonies, voluntary contributions, furniture, and other durable and consumable goods. Total household consumption is then determined as the sum of all expenditures, including the market value of homegrown food. I convert expenditures to 2009 constant prices using the Consumer Price Index for Ethiopia and express consumption in per month terms. I obtain the proportion of a household's consumption allocated to food, clothing, healthcare, or education by dividing consumption in each of these categories by total household consumption.

Every wave of ERHS also obtained a list of all household members who suffered from an illness or injury in the four-week period preceding the survey along with the duration of the illness/injury in days. I use the information on illness and injury to understand whether any changes in healthcare expenditures could be explained by changes in the incidence or severity of illness or injury.

Agricultural characteristics allow me to include a measure of agroclimatic shocks in the analysis. ERHS has data on the barley, wheat, maize, white teff, black teff, and sorghum output of each household, which I sum to obtain total output of the major cereals. ERHS also obtained the number and type of each household's livestock which I use to determine the number of livestock units, a value that succinctly represents the total amount of livestock.

In the last (2009) wave of ERHS, one woman (typically the wife of the household head) in each household responded to a women's questionnaire that included a hypothetical scenario to evaluate her knowledge of land rights resulting from land registration.⁸ Respondents were asked, "A man who had one spouse and 3 dependent children dies. How much of his share of the household land does the spouse receive?" I consider a woman to have high perceived land tenure security if she responded "All" rather than "Half", "One-Quarter", "Nothing", or "Don't Know". Previous research finds that the majority (53%) of rural household *heads* in the four study regions expect that, upon death, their spouses will receive all the household holdings (Fafchamps & Quisumbing, 2002). Previous research also finds that in some communities where it is customary for a widow to be inherited by her deceased husband's relative, customary law provides the right for her to withdraw her consent (Lavers, 2017). However, this consent is sometimes contested by the husband's family and Lavers (2017) documents a case where a widow's withdraw of consent was only accepted after she won her case at a *woreda* court.

3.2 Analytical strategy

My objective is to study the effect of women's formal land tenure security on how households allocate their resources towards investment in human capital by studying the association between the rollout of Ethiopia's gendered land certification programs and household consumption patterns. The analytical strategy examines changes in consumption patterns, as regions conduct land certification programs over time. The main comparisons in

⁸It is not clear to what extent male family members influenced the respondents' responses. However, ERHS had engaged in over two decades of developing rapport with the interview communities, which likely reduced the need for men to control interviewers' access to household women.

this analysis are: (1) the difference in consumption between the precertification period and after implementation of joint land certification in Amhara, Oromia, and SNNP regions; (2) the difference in consumption between the precertification period and after the implementation head-only land certification in Tigray region; and (3) the difference in the differences in consumption between the head-only certification region and the joint certification regions. I implement this analysis using household panel fixed effects. I fit the model

$$C_{hrt} = \beta_0 + \beta_1 \text{Post}_{rt} + \delta \text{Post}_{rt} * \text{JointCert}_r + \zeta_t + \eta_h + \varepsilon_{hrt} \quad [1]$$

with C being the proportion of total consumption of household h in region r at time t that is spent on healthcare; Post_{rt} is an indicator that varies across regions and time and is equal to 1 if the household is observed after its region's land certification program; and JointCert_r is an indicator equal to 1 if the household is in one of the joint certificate-issuing regions (Amhara, Oromia and SNNP). ζ_t and η_h are year and household fixed effects respectively. ε_{hrt} is an error term. Standard errors clustered on region to account for correlated observations within regions. The coefficient β_1 estimates the association between exposure to the head-only certificate program and the proportion of household consumption spent on healthcare. The coefficient of interest is δ , which estimates the association between exposure to joint land certification and proportion of household consumption spent on healthcare that is in addition to the effect of head-only land certification.⁹ The intuition is that households that were exposed to land certification, either head-only or joint certification, experienced the wealth effect of increased formal land tenure security. The observed differences between head-only and jointly certified households, δ , can then be attributed to the differences in the bargaining power effects of head-only versus joint land tenure under circumstances described below.

The validity of the analytical strategy relies on several features. The household fixed effects controls for both observed and unobserved time-invariant household characteristics. Therefore, differences between households in variables related to both household allocation and the timing and nature of the land certification that are constant over time are accounted for. As shown in Table 2, households in Tigray had older heads, fewer spouses per head, were poorer, and spent a smaller proportion of their budgets on clothing and healthcare than the joint-certificate regions prior to the land reforms. Additionally, there are ethnic and cultural differences across regions (not shown). Household fixed effects control for such heterogeneity to the extent that it is time-invariant. Household fixed effects also control for region-level differences such as ethnicity and religion that are constant over the study period. Since households exposed to the joint certificate programs had younger household heads, a concern is that these households may have different demographic trajectories, e.g., by bearing more children, which could be correlated with the introduction of the certification programs. In subsequent models I examine if results are robust to controlling for the age of

⁹The panel data are sufficient to identify both β_1 and δ since the rollout of land certification differed from region to region and because every household has at least one observation before and after the implementation of land certification in its own region as well as other regions.

the household head and number of adults and children in the household. Agroclimatic shocks including pests, disease, and extreme weather events may also influence the results if they are correlated with the rollout of land certification. I therefore include controls for number of livestock units and the previous year's household output of major cereals in kilograms. A shortcoming of including time-varying controls is that they may attenuate the estimates of interest if the controls mediate the effects of the land certification on consumption. In this case, these models serve as lower bound of effect estimates. Household fixed effects also remove the effect of non-random attrition that is correlated with time invariant region, village, or household characteristics.

I also fit models using log-transformed healthcare consumption to understand how the observed effects on proportion of total consumption spent on healthcare were realized. These models also serve as a specification sensitivity check since the conceptual framework does not explicitly prescribe the functional form that should be used.

I use models similar to [1] to study the association between the rollout of land certification and the share of total household consumption that is spent on purchased food, homegrown food, clothing, and education as well as log monthly consumption in these categories. Results using log per capita consumption are similar and for the sake of brevity I present only results for log consumption.

My second objective is to examine if there were changes in women's bargaining power as a result of land certification, which would shed insight on the mechanisms underlying the observed effects. If inclusion of women in land certification shifted bargaining power away from men towards women, I expect that household consumption changed towards goods that women prefer more strongly than men. Ideally, there would be data on the amount of household resources consumed by the men, women, boys, and girls in each household. However, the majority of household resources are spent on food and other shared goods, which cannot be accurately assigned to specific individuals in a household. Since cultural norms and fit considerations limit sharing of clothing across gender or age groups, I assume that expenditure on men's, women's, boys', or girls' clothing represents consumption that is utilized exclusively by men, women, boys and girls, respectively. I therefore use clothing expenditures to study the association between land certification and changes in the gendered allocation of resources.

After examining the link between land certification and household consumption of healthcare, food, education and clothing my next objective is to study whether changes in household consumption were accompanied by changes in health outcomes. I examine the association between land certification and illness and injury episodes in the prior four weeks. I use individual-level data and utilize models similar to [1] study three outcomes: whether individual household members were ill or injured, duration of the illness/injury episodes, and duration of the illness/injury episodes conditional on being ill or injured.

The land tenure reforms were triggered by changes at the federal and region levels and are plausibly exogenous to the households. Consequently, the concern with the reduced form approach used is with region-level time-varying confounders. These would be region-level

factors that influence household allocation and that systematically varied with the timing of the land certification programs. For example, we would be concerned if other health programs accompanied the rollout of land certification. To address this concern and obtain an estimate of the impact of perceived land tenure security on household resource allocation I use an instrumental variables model to examine the association between women's perceived land tenure security and share of household consumption spent on purchased food, homegrown food, clothing, education, and proportion of clothing expenditures spent on men's, women's, boys', and girls' clothing. Equation [2] shows the statistical model:

$$C_{hr} = \gamma_0 + \gamma_1 \text{HighTenureSecurity}_{hr} + X_{hr}B + u_{hrt} \quad [2]$$

where C is the proportion of total consumption of household h in region r in 2009 that is spent on a particular category e.g. healthcare; $\text{HighTenureSecurity}_{hr}$ is an indicator that varies across households is equal to 1 if the female respondent in the household believes that a wife would receive all of her husband's land if he dies; and X_{hr} is a vector of household-level controls, namely age of the household head, number of household adults, number of household children, number of livestock units, and the previous year's household output of major cereals. u_{hrt} is an error term. Standard errors clustered on region to account for correlated observations within regions. To address the endogeneity of perceived land tenure security, I instrument $\text{HighTenureSecurity}_{hr}$ with a dummy variable equal to one if the household is in a region that implemented joint land certification. The two-stage least squares estimate of γ_1 will exploit the variation in perceived land tenure security that is due to households being in different regions. This analysis requires that the women (i.e., spouses of the household heads) do not migrate based on land tenure reforms, which is plausible given the low rates of migration in the sample. The analysis also requires that a region's decision to implement joint rather than head-only certification be exogenously determined and that this region-level decision influence the household resource allocation entirely through its effect on women's perceived land tenure security. This is a constraining requirement that is not verifiable. Therefore, the results from this exercise serve as effect estimates. The instrumental variable analysis also requires a strong correlation between the instrument (head-only versus joint certification) and perceived tenure security. Our data satisfy this requirement: only four percent of female respondents in Tigray report high perceived land tenure security, which is lower than in the three joint certification regions (i.e., 22% in Amhara, 30% in Oromia, and 29% in SNNP).

4. RESULTS

4.1. Healthcare, food, clothing, and education expenditures

Table 3 presents results for the association between land certification and household consumption. The top panel examines the proportion of total household consumption spent on healthcare, homegrown food, purchased food, clothing, and education. Model 1, which controls for household fixed effects and year of observation, shows that exposure to the head-only land certification was not accompanied by a change in the proportion of total household consumption spent on healthcare. On the other hand, joint land certification,

compared to head-only land certification, was accompanied by an increase in the share of consumption spent on healthcare by 0.8 percentage points, though statistically insignificant. Model 2 adds controls for time varying household characteristics (age of the household head, number of adults, number of children, number of livestock units, and cereal output) and leaves the results largely unchanged except that the effect of joint land certification turns statistically significant.

Models 3 and 4 show that including women in land certification increased the proportion of total household consumption allocated to homegrown food by a modest and statistically insignificant 7 percentage points. On the other hand, including spouses in the land certification reduced proportion of household consumption on purchased food by a statistically insignificant 6 percentage points. Models 7–10 show that inclusion of women in land certification programs, was accompanied by a 2–3 percentage point decline in the share of consumption allocated to clothing and no change in education consumption share.

The second panel of Table 3 presents results for log monthly expenditures. The results are robust to controlling for time-varying household and agricultural characteristics suggesting that agroclimatic shocks and underlying demographic trends are not driving the results. Models with time-varying controls show that, compared to head-only land certification, joint land certification was associated with increased consumption of healthcare and homegrown food of 33% and 60% respectively, 28% lower education expenditures, and no impact on food and clothing expenditures.

I perform a sensitivity analysis to examine whether the Ethiopia-Eritrea War (May 1998 to June 2000) might be driving the results. The concern here is that Tigray (the head-only region) lies on border with Eritrea and might therefore have been more affected by the war than other regions. I conduct the analysis after excluding Tigray households in the village closest to the Eritrean border (i.e., Geblen village). If the results were driven by the war, I expect that excluding Geblen would weaken the estimated effects of joint land certification. As we see in Appendix Table B.1, the war is unlikely to be driving the results since I obtain similar results after excluding Geblen.

4.2 Men's, women's, boys' and girls' clothing expenditures

Table 4 presents results for analysis examining the association between land certification programs and household clothing expenditures. Models 1 and 2 in the top panel show that exposure to the head-only land certification was not accompanied by a change in the proportion of clothing expenditures spent on men. On the other hand, joint land certification, compared to head-only land certification, is associated with a three percentage point decrease in the share of clothing expenditures spent on men. Models 3 and 4 suggest that both head-only land certification and joint land certification had no impact on the proportion of total clothing expenditures that was spent on women. Head-only and joint certification were accompanied by modest and statistically insignificant increases on the proportion of clothing expenditures spent on boys. In Model 5 we see that head-only certification was accompanied by a one percentage point drop in clothing expenditure share spent on girls. Joint certification, compared to head-only certification, was accompanied by a three percentage point increase in girls' share. Overall, the results in the first panel suggest that

head-only land certification shifted resources towards boys and away from girls and women. On the other hand, including women in the land certification shifted resources away from adults (particularly men) to children (particularly girls).

The bottom panel of Table 4 examines how the changes in clothing expenditure proportions were realized. The results show that head-only certification was accompanied by increased expenditure on men and boys and declines on women's and girl's clothing expenditures (not statistically significant). Joint land certification, relative to head-only certification, is associated with a 57% increase in expenditures on women and a 37% increase on girls, without negatively influencing expenditures on men or boys.

4.3 Illness and injury

To obtain insight into whether the increase in healthcare expenditures after joint land certification (reported in Table 3) was a response to higher rates of illness/injury or more severe illness/injury among household members, I examine the relationship between land certification and the probability of individuals being ill or injured in the prior four weeks and the duration of illness/injury in days. This analysis is based on individual-level data collected at each wave. Table 5 presents the results, which show that head-only land certification was accompanied by a five percentage point reduction in the likelihood of being ill or injured (columns 1–2) or a one-day reduction in the duration of illness (columns 3–4). The estimates for joint land certification do not differ from those of head-only certification. These results suggest that the increased healthcare spending was not due to poorer health among household members. Columns (5) and (6) examine the duration of injury or illness episodes among those who suffered from an illness or injury, and the results show that the duration of illness/injury was 4–5 days shorter among ill/injured individuals exposed to joint land certification compared to those exposed to head-only certification. This finding suggests that the difference between head-only and joint certification in healthcare expenditures may be due to joint certification households seeking more effective treatment for those who fell ill or suffered injuries than head-only certification households.

4.4 Women's perceived land tenure security

Table 6 examines the association between women's perceived land tenure security and proportion of their households' consumption that is healthcare, homegrown food, purchased food, clothing, and education. This analysis is based on data collected in the 2009 wave from a woman in each surveyed household. The first row presents OLS estimates, which will be biased if women with high perceived tenure security are different from those with low perceived tenure security on characteristics that influence household resource allocation. Estimates from the instrumental variable models, which are the preferred models, are in the second row. The results are mostly consistent with those obtained from the reduced form panel data models, i.e., households where the female respondent had high perceived tenure security spent more household resources on healthcare, less on purchased food and clothing, and about the same on homegrown food and education compared to households where the female respondent had low to moderate perceived tenure security.

Table 7 presents the results of analysis examining the association between women's perceived land tenure security and proportion of their households' clothing budget spent on men, women, boys, and girls. The instrumental variable estimates indicate that women's perceived land tenure security is associated with greater spending on women's and girls' clothing and lower spending on men's and boy's clothing, which is consistent with women's land tenure security shifting bargaining power and household resources away from men and towards women.

4.5 Female-headed households

All analyses so far have been based on a sample of male-headed households. In supplementary analysis, I use the entire sample of Tigray households in the ERHS data to examine whether the association between head-only land certification and clothing expenditure patterns differs between male-headed and female-headed households. The objective of this analysis is to obtain insight on whether females in female-headed households benefited more than females in male-headed households after head-only land certification. I use statistical analysis similar to that presented in equation [1] but where $JointCert_i$ is replaced with a dummy variable indicating whether the household is headed by a man or a woman. Appendix Table B.2 presents the results. The coefficients are mostly statistically insignificant, which is expected given the small sample size. However, the direction of the coefficients supports that land certification to female household heads is associated with lower expenditure on men's and boys' clothing and higher expenditure on women's and girls' clothing than land certification to male household heads.

5. CONCLUSION

I study how improvements in women's formal land tenure security is associated with investment of household resources in human capital by leveraging the variation in timing and gendered nature of Ethiopia's land certification programs. The legislation that provided for land certification endowed households with the legal right to use for an unlimited period, lease, and bequeath land to family members. Land certification thereby increased legal land tenure security of households by design and, as suggested by extant literature reviewed in the paper, land certification was accompanied by increased *de facto* and perceived land tenure security. I use the program that provided land certificates to household heads, typically male, as a reference for the wealth effect of improved land tenure security, and the difference in outcomes between male-headed households exposed to head-only certification and those exposed to joint certification as a measure of the effect of improving women's land tenure security. I find that male-headed households exposed to joint land certificate programs increased the share of household resources spent on healthcare, decreased the share spent on clothing and there is evidence that they increased the share of consumption allocated to homegrown food. I also find that male-headed households in joint land certification regions, compared to those under head-only land certification, increased healthcare expenditures, consumption of homegrown food, and decreased education expenditures. The increase in consumption of homegrown food after joint land certification suggests that increased women's bargaining power extends to decisions concerning household production. The study findings corroborate the growing literature that suggests

that improvements in women's bargaining power increase the amount of household resources that are spent on health and nutrition (see Duflo (2012) for a review) and decrease the amount of household resources spent on education (for example, see Edmonds (2006) and Quisumbing & Maluccio, (2003). An exception to this pattern is Benhassine et al. (2011)). The reason for the decrease in education expenditures resulting from increased women's bargaining power has been not adequately explored in the literature. A potential explanation is that Ethiopian women experience more acutely the effects of low investment in health and nutrition than education, for instance because gender norms assign the task of safeguarding the health of family members to women.

I then examine whether shifts in the gender balance of power could explain these results by studying clothing expenditures. I find that inclusion of women in land certification is associated with a shift in expenditures away from men and towards girls. Additionally, analysis on the incidence and duration of illness indicates that the increase in healthcare expenditures after joint land certification was not due to poorer health among household members but may be due to joint certification households seeking more effective treatment for those who fell ill or suffered injuries than head-only certification households.

There are several limitations to this study. First, the results from this study will be biased if there were other events that were correlated with the roll out of land certification. Second, the study does not examine which aspects of the land certification matter for women's bargaining power. For instance, the land certification involved changes in legal land tenure, education regarding land tenure rights, and inclusion of women in village-level land committees that were originally comprised of men, any of which might have shifted women's bargaining power. I attempt to address these limitations in instrumental variable models, which yield results of perceived land tenure security that are consistent with the fixed effects estimates. Third, the extent to which the findings will be generalizable to different settings or contexts is not clear because of Ethiopia's unique history. However, Ethiopia is a useful case study for other developing countries that are contemplating land tenure reforms because it is an example of a rapid, low-cost land certification exercise implemented across communities that have divergent customs and land tenure systems that could be implemented in other low-resource settings. Ethiopia's case study is also instructive because by the accident of not including women's names in the first phase of land certificates, it provides valuable data on the consequences of statutory-derived women's land tenure security.

The study results suggest that extending land tenure security to women improved women's bargaining power within households and consumption of healthcare and food. Improving women's land tenure security has the potential to transform intrahousehold dynamics and may influence the realization of health and development policy objectives. This study also adds to the growing list of studies that have evaluated Ethiopia's land certification program. In particular, the results support efforts to issue joint land certificates in Tigray and potentially other parts of the country that are not covered.

Research on the effects of land tenure security and household outcomes is important for shaping development policy. So far, studies examining the link between formal land tenure

security and household economic outcomes have yielded mixed findings. This study adds to this body of work and suggests that the nature of land tenure security interventions, in particular how supportive of women they are, may account for the mixed evidence.

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References

- Acemoglu D, Johnson S, Robinson JA. The colonial origins of comparative development: An empirical investigation. *The American Economic Review*. 2001; 91(5):1369–1401.
- Agarwal, B. *A field of one's own: Gender and land rights in South Asia*. Cambridge, UK: Cambridge University Press; 1994a.
- Agarwal B. Gender and command over property: A critical gap in economic analysis and policy in South Asia. *World Development*. 1994b; 22(10):1455–1478.
- Allendorf K. Do women's land rights promote empowerment and child health in Nepal? *World Development*. 2007; 35(11):1975–1988. [PubMed: 23700354]
- Atwood DA. Land registration in Africa: The impact on agricultural production. *World Development*. 1990; 18(5):659–671.
- Benhassine N, Devoto F, Duflo E, Dupas P, Pouliquen V. Turning a shove into a nudge? A “labeled cash transfer” for education. *American Economic Journal: Economic Policy*. 2015; 7(3):86–125.
- Besley T. Property rights and investment incentives: Theory and evidence from Ghana. *Journal of Political Economy*. 1995; 103(5):903–937.
- Bezabih M, Kohlin G, Mannberg A. Trust, tenure insecurity, and land certification in rural Ethiopia. *Journal of Socio-Economics*. 2011; 40(6):833–843.
- Binswanger, HP., Deininger, K., Feder, G. Power, distortions, revolt and reform in agricultural land relations. In: Behrman, J., Srinivasan, TN., editors. *Handbook of development economics*. Amsterdam, The Netherlands: Elsevier; 1995. p. 2659–2772.
- Browning, M., Chiappori, P., Weiss, Y. *Economics of the Family*. New York, NY: Cambridge University Press; 2014.
- Chiappori P. Collective labor supply and welfare. *Journal of Political Economy*. 1992; 100(3):437–467.
- Deininger K, Ali DA, Alemu T. Impacts of land certification on tenure security, investment, and land market participation: Evidence from Ethiopia. *Land Economics*. 2011; 87(2):312–334.
- Deininger K, Ali DA, Holden ST, Zevenbergen J. Rural land certification in Ethiopia: Process, initial impact, and implications for other african countries. *World Development*. 2008; 36(10):1786–1812.
- De Soto, H. *The mystery of capital: Why capitalism triumphs in the West and fails everywhere else*. New York: Basic Books; 2000.
- Doss C. The effects of intrahousehold property ownership on expenditure patterns in Ghana. *Journal of African Economies*. 2006; 15(1):149–180.
- Duflo E. Women empowerment and economic development. *The Journal of Economic Literature*. 2012; 50(4):1051–1079.
- Edmonds EV. Child labor and schooling responses to anticipated income in South Africa. *Journal of Development Economics*. 2006; 81(2):386–414.
- Fafchamps M, Quisumbing AR. Control and ownership of assets within rural Ethiopian households. *Journal of Development Studies*. 2002; 38(6):47–82.
- Feder G, Feeny D. Land tenure and property rights: Theory and implications for development policy. *The World Bank Economic Review*. 1991; 5(1):135–153.

- Field E. Entitled to work: Urban property rights and labor supply in Peru. *The Quarterly Journal of Economics*. 2007; 122(4):1561–1602.
- Fogelman C, Bassett TJ. Mapping for investability: Remaking land and maps in Lesotho. *Geoforum*. (in press).
- Garikipati S. Landless but not assetless: Female agricultural labour on the road to better status, evidence from India. *The Journal of Peasant Studies*. 2009; 36(3):517–545.
- Grabe S. Promoting gender equality: The role of ideology, power, and control in the link between land ownership and violence in Nicaragua. *Analyses of Social Issues and Public Policy*. 2010; 10(1): 146–170.
- Hart G. Engendering everyday resistance: Gender, patronage and production politics in rural Malaysia. *Journal of Peasant Studies*. 1991; 19(1):93–121.
- Holden ST, Deininger K, Ghebru H. Impacts of low-cost land certification on investment and productivity. *American Journal of Agricultural Economics*. 2009; 91(2):359–373.
- Holden ST, Deininger K, Ghebru H. Tenure insecurity, gender, low-cost land certification and land rental market participation in Ethiopia. *The Journal of Development Studies*. 2011; 47(1):31–47.
- Holden ST, Ghebru H. Household welfare effects of low-cost land certification in Ethiopia. Center for Land Tenure Studies Working Paper 03/11. 2011
- Holden ST, Tefera T. From being property of men to becoming equal owners? Early impacts of land registration and certification on women in southern Ethiopia. 2008 Unpublished Report for UNHABITAT.
- Jacoby HG, Minten B. Is land titling in sub-saharan africa cost-effective? evidence from Madagascar. *The World Bank Economic Review*. 2007; 21(3):461–485.
- Kabeer N. Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change*. 1999; 30(3):435–464.
- Kishindo P. The Marital Immigrant. Land, and Agriculture: A Malawian Case Study. *African Sociological Review*. 2010; 14(2):89–97.
- Lavers T. Land Registration and Gender Equality in Ethiopia: How State–Society Relations Influence the Enforcement of Institutional Change. *Journal of Agrarian Change*. 2017; 17(1):188–207.
- Lawry S, Samii C, Hall R, Leopold A, Hornby D, Mtero F. The impact of land property rights interventions on investment and agricultural productivity in developing countries: A systematic review. *Journal of Development Effectiveness*. 2017; 9(1):61–81.
- Macpherson, CB. Property, mainstream and critical positions. Toronto, ON: University of Toronto Press; 1978.
- Meinzen-Dick R, Mwangi E. Cutting the web of interests: Pitfalls of formalizing property rights. *Land Use Policy*. 2009; 26(1):36–43.
- Menon N, van der Meulen Rodgers Y, Nguyen H. Women's land rights and children's human capital in Vietnam. *World Development*. 2014; 54:18–31.
- Mishra K, Sam AG. Does women's land ownership promote their empowerment? Empirical evidence from Nepal. *World Development*. 2016; 78:360–371.
- Panda P, Agarwal B. Marital violence, human development and women's property status in India. *World Development*. 2005; 33(5):823–850.
- Pandey S. Rising property ownership among women in Kathmandu, Nepal: An exploration of causes and consequences. *International Journal of Social Welfare*. 2010; 19(3):281–292.
- Peters PE. Inequality and social conflict over land in Africa. *Journal of Agrarian Change*. 2004; 4(3): 269–314.
- Pinckney TC, Kimuyu PK. Land tenure reform in East Africa: Good, bad or unimportant? *Journal of African Economies*. 1994; 3(1):1–28.
- Quisumbing AR, Maluccio JA. Resources at marriage and intrahousehold allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. *Oxford Bulletin of Economics and Statistics*. 2003; 65(3):283–327.
- Rahmato, D. Land rights and tenure security: Rural land registration in Ethiopia. In: Ubink, JM.Hoekema, AJ., Assies, W., editors. *Legalising land rights: Local practices, state responses and*

tenure security in Africa, Asia and Latin America. Leiden, Netherlands: Leiden University Press; 2009. p. 59-96.

Rajkumar, AS., Gaukler, C., Tilahun, J. Combating malnutrition in Ethiopia: An evidence-based approach for sustained results. Washington, DC: World Bank; 2011.

Ribot JC, Peluso NL. A theory of access. Rural sociology. 2003; 68(2):153–181.

Sen, A. Development as freedom. Oxford, UK: Oxford University Press; 2001.

Schultz T. Investment in Human Capital. The American Economic Review. 1961; 51(1):1–17.

Simbizi MCD, Bennett RM, Zevenbergen J. Land tenure security: Revisiting and refining the concept for Sub-Saharan Africa's rural poor. Land Use Policy. 2014; 36:231–238.

Steudler D, Rajabifard A, Williamson IP. Evaluation of land administration systems. Land Use Policy. 2004; 21(4):371–380.

United Nations, Department of Economic and Social Affairs, Population Division. World mortality report 2013. New York, NY: United Nations; 2013.

Van Gelder JL. What tenure security? The case for a tripartite view. Land Use Policy. 2010; 27(2):449–456.

Wiig H. Joint titling in rural Peru: Impact on women's participation in household decision-making. World Development. 2013; 52:104–119.

Whitehead A, Tsikata D. Policy discourses on women's land rights in Sub-Saharan Africa: The implications of the re-turn to the Customary. Journal of Agrarian Change. 2003; 3(1–2):67–112.

World Bank. World development report 2012: Gender equality and development. World Bank Publications; 2011.

World Economic Forum. The global gender gap report 2014. Geneva, Switzerland: World Economic Forum; 2014.

APPENDIX

A. Outline of the collective model

To briefly outline the collective household model, I consider a household that is comprised of a woman a , a man b , and children c . Each individual has his or her own preferences, which are described over the individual's consumption as well as the consumption of other household members. For example, the children's consumption of nutritious food may generate a positive externality for their mother whereas a father's consumption of alcohol may generate negative externalities for the mother. Households consume K types of public goods and k types of private goods. A good is considered private if it cannot be consumed by more than one person. Let $\mathbf{P} = (P_1, \dots, P_K)$ and $\mathbf{p} = (p_1, \dots, p_k)$ be the K - and k -vectors of prices for the public and private goods respectively. A household will purchase $\mathbf{Q} = (Q_1, \dots, Q_K)$ and $\mathbf{q} = (q_1, \dots, q_k)$ quantities of public and private goods respectively such that a receives $\mathbf{q}^a = (q_1^a, \dots, q_k^a)$, b receives $\mathbf{q}^b = (q_1^b, \dots, q_k^b)$, and c receive $\mathbf{q}^c = (q_1^c, \dots, q_k^c)$ private goods. The utility function of a is denoted $U^a(\mathbf{Q}, \mathbf{q}^a, \mathbf{q}^b, \mathbf{q}^c)$ and of b by $U^b(\mathbf{Q}, \mathbf{q}^a, \mathbf{q}^b, \mathbf{q}^c)$. For the sake of brevity, I assume that children do not have their own utility functions although nothing in the collective framework precludes the existence of child utility functions. Further, the externalities that occur to parents' utilities from children's consumption may differ from child to child. For instance, parents may derive more positive externality from a son's consumption than from a daughter's consumption.

The household then makes decisions on how to allocate its total expenditure, x . A key assumption of the collective model is that the household allocation, denoted $(\mathbf{Q}, \mathbf{q}^a, \mathbf{q}^b, \mathbf{q}^c)$, is pareto efficient. Thus, for any other allocation, denoted $(\bar{\mathbf{Q}}, \bar{\mathbf{q}}^a, \bar{\mathbf{q}}^b, \bar{\mathbf{q}}^c)$, that is feasible within

the budget constraint, if $U^a(\bar{Q}, \bar{q}^a, \bar{q}^b, \bar{q}^c) > U^a(Q, q^a, q^b, q^c)$ it must be that $U^b(\bar{Q}, \bar{q}^a, \bar{q}^b, \bar{q}^c) < U^b(Q, q^a, q^b, q^c)$ (and conversely). The household allocation problem is therefore the solution to the maximization problem:

$$\max_{Q, q^a, q^b, q^c} U^b(Q, q^a, q^b, q^c)$$

$$\text{subject to (1) } P^T Q + p^T (q^a + q^b + q^c) \leq x$$

$$(2) U^a(Q, q^a, q^b, q^c) \geq \bar{U}^a$$

where $\bar{U}^a$ is some utility for individual a that is determined by prices (P, p) , total household expenditure x , and distribution factors (defined below). Therefore, the household behaves as if it is maximizing the utility of one member holding the other member's utility at a given level. Conversely, among all household allocations that give some utility $\bar{U}^b$ to b , the pareto efficient one(s) will give a the maximum utility that is feasible. The result from the collective approach is that the household allocation problem is the solution to the maximization problem:

$$\max_{Q, q^a, q^b, q^c} \mu U^b(Q, q^a, q^b, q^c) + U^a(Q, q^a, q^b, q^c)$$

$$\text{subject to } P^T Q + p^T (q^a + q^b + q^c) \leq x$$

μ , is a function of prices (P, p) , total household expenditure x , and distribution factors. A distribution factor is defined as “any variable that has an impact on the allocation decision process but affects neither preferences nor budget constraints” (Browning, Chiappori, & Weiss, 2011). Example distribution factors include, societal norms regarding men's and women's say in the household, and divorce laws. A natural interpretation of μ is in the context of bargaining power. If μ is large then b 's preferences dominate and when μ is small, then a 's preference matter more.

Table B.1

Association between land certification and investment in human capital, excluding village close to Eritrean border

	(1) Healthcare	(2) Food homegrown	(3) Food purchased	(4) Clothing	(5) Education
Proportion of total household consumption					
Post	-0.001 (0.003)	0.039 (0.020)	-0.056 (0.030)	0.022 * (0.009)	-0.002 ** (0.000)

	(1) Healthcare	(2) Food homegrown	(3) Food purchased	(4) Clothing	(5) Education
Post*JointCertificate	0.009 ** (0.003)	0.001 (0.034)	-0.006 (0.055)	-0.025 *** (0.004)	-0.001 (0.002)
R ²	0.014	0.118	0.077	0.056	0.041
Observations	6,721	6,721	6,721	6,721	6,721
Log monthly consumption					
Post	0.084 (0.050)	-0.462 (0.200)	-0.072 (0.183)	0.260 * (0.093)	0.359 *** (0.048)
Post*JointCertificate	0.301 *** (0.051)	0.515 ** (0.151)	0.043 (0.152)	0.008 (0.063)	-0.199 ** (0.060)
R ²	0.129	0.036	0.035	0.101	0.110
Observations	3,392	6,074	6,460	5,073	2,735

Note: Figures in each column are from a unique household fixed effects regression on the dependent variables in header row. Post is dummy equal to 1 if household observed after exposure to a certification program. JointCertificate is dummy equal to 1 if in regions that issued certificates jointly to head and spouse. All models control for household fixed effects, year of observation, number of household adults, number of household children, age of household head, cereal output, and number of livestock units. Monthly consumption in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Standard errors clustered on region in parentheses.

p<0.01,

**

p<0.05,

*

p<0.1.

Table B.2

Association between land certification and clothing expenditures spent on men, women, boys, and girls in female-headed versus male-headed households in Tigray

	(1) Men's	(2) Men's	(3) Women's	(4) Women's	(5) Boys'	(6) Boys
Proportion of total clothing expenditure						
Post	1.538 (2.372)	1.105 (2.214)	-9.981 *** (3.084)	-11.915 *** (3.092)	3.862 *** (1.310)	1.646 (1.310)
Post*Female-headed	-4.656 ** (2.175)	-4.833 ** (2.203)	0.865 (3.011)	2.292 (3.074)	-1.550 (2.093)	-2.363 (2.093)
R ²	0.035	0.047	0.062	0.071	0.085	0.118
Observations	992	981	992	981	992	981
Log monthly expenditure						
Post	-0.915 *** (0.252)	-0.983 *** (0.362)	-1.986 *** (0.239)	-2.253 *** (0.276)	-0.488 ** (0.192)	-0.676 *** (0.192)
Post*Female-headed	-0.540 (0.624)	-0.554 (0.763)	0.101 (0.275)	0.077 (0.275)	0.011 (0.173)	-0.082 (0.173)
R ²	0.275	0.307	0.344	0.378	0.314	0.342
Observations	207	205	339	336	345	342
Controls:						
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
# of adults, # of children	No	Yes	No	Yes	No	Yes
Head's age	No	Yes	No	Yes	No	Yes
Cereal output	No	Yes	No	Yes	No	Yes

	(1)	(2)	(3)	(4)	(5)	(6)
	Men's	Men's	Women's	Women's	Boys'	Boys'
Livestock units	No	Yes	No	Yes	No	Yes

Note: Figures in each column are from a unique household fixed effects regression on the dependent variables in header row. Post is a dummy variable equal to 1 if household observed after exposure to Tigray's land certification program. Monthly expenditure in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Standard errors clustered on household in parentheses.

p<0.01,
**
p<0.05,
*
p<0.1.

- Joint land certification is associated with increased consumption of healthcare and food
- Joint land certification is associated with increased consumption of women's and girls' clothing
- Improving women's land tenure security may shift the gender balance of power in households and influence investment in human capital

Figure 1.

Ethiopia map showing region boundaries and study villages

Note: Land reform regions are shaded and named. SNNP = Southern Nations, Nationalities, and Peoples.

Table 1

Land certification programs in Ethiopia's four main regions

	Tigray	Amhara	Oromia	SNNP
Year program started	1998	2003	2003	2005
Certificate Type	Head only	Joint	Joint	Joint
Fee for certificate ^a	3 Birr	Free of charge	5 Birr	2 Birr
Households registered by August 2005 ^b	632,000 (88%)	2,400,000 (79%)	2,400,000	700,126 (40%)
Certificates in man's name alone	71% ^{c,e}	9% ^c	10%–15% ^d	3%–13% ^d

^a 1 USD = 8 Birr in 2000–2004^b Source: Field visits to regional Ethiopia Environmental Protection Land Administration and Use Authority offices and 24 kebeles (wards) in all four regions (Deininger et al., 2008)^c Source: Country-wide panel survey of 2,300 households (Deininger et al., 2008)^d Source: 600 households in two *woredas* (districts) in each of Oromia and SNNP (Holden & Tefera, 2008)^e 14% in woman's name alone

Table 2

Characteristics of male-headed rural households before land certification

	Head-only certificate region		Joint certificate region	
	Mean	S.D.	Mean	S.D.
Number of adults	2.89	(1.15)	3.25	(1.79)
Number of children	3.36	(2.21)	3.56	(2.27)
Head's age	52.07	(14.55)	45.46	(15.31) ***
Head's occupation				
Farmer	0.89	(0.32)	0.89	(0.31)
Not working not looking/Disabled	0.06	(0.24)	0.05	(0.22)
Other	0.05	(0.22)	0.06	(0.23)
Number of spouses	1.04	(0.19)	1.15	(0.42) ***
Livestock units	1.96	(1.49)	2.92	(3.55)
Production of major cereals (kg)	193.56	(394.85)	484.25	(818.48)
Total monthly consumption	908.09	(712.83)	1328.54	(1096.54) ***
Consumption proportion that is				
Food homegrown	0.45	(0.29)	0.42	(0.27)
Food purchased	0.43	(0.27)	0.37	(0.26)
Clothing	0.04	(0.06)	0.06	(0.08) ***
Healthcare	0.01	(0.02)	0.02	(0.06) **
Education	0.00	(0.00)	0.00	(0.01)
Monthly clothing, shoes and fabrics consumption:				
Men	6.71	(19.77)	22.82	(47.73) ***
Women	13.16	(29.28)	22.53	(45.41) *
Boys	5.91	(16.48)	15.90	(37.64) **
Girls	7.69	(22.06)	14.49	(40.09)
Number of households	80		981	

Note: Head-only certificate region = Tigray. Joint certificate regions = Amhara, Oromia and SNNP. Monthly consumption in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009.

Difference with Head-only certification region at the 1%, 5%, and 10% levels indicated with ***, **, and * respectively.

Source: 1994, 1995, and 1997 Ethiopian Rural Household Survey.

Table 3

Association between land certification and investment in human capital in male-headed households

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Healthcare	Healthcare	Food homegrown	Food homegrown	Food purchased	Food purchased	Clothing	Clothing	Education	Education
Proportion of total household consumption										
Post	−0.001 (0.002)	−0.000 (0.002)	−0.049 *** (0.007)	−0.052 ** (0.010)	0.015 (0.025)	0.014 (0.026)	0.027 * (0.010)	0.028 * (0.011)	0.000 (0.001)	−0.000 (0.001)
Post*JointCertificate	0.008 (0.003)	0.008 * (0.003)	0.065 (0.042)	0.070 (0.033)	−0.064 (0.066)	−0.061 (0.054)	−0.023 ** (0.004)	−0.026 *** (0.004)	−0.001 (0.002)	−0.001 (0.002)
R ²	0.014	0.014	0.101	0.113	0.060	0.076	0.045	0.054	0.035	0.039
Observations	7,056	6,971	7,056	6,971	7,056	6,971	7,056	6,971	7,056	6,971
Log monthly consumption										
Post	0.023 (0.028)	0.028 (0.045)	−0.492 * (0.179)	−0.531 * (0.199)	0.225 (0.176)	0.179 (0.180)	0.369 * (0.129)	0.345 * (0.129)	0.599 *** (0.079)	0.545 *** (0.067)
Post*JointCertificate	0.328 *** (0.025)	0.326 *** (0.050)	0.574 * (0.183)	0.604 ** (0.144)	−0.147 (0.168)	−0.107 (0.161)	0.008 (0.124)	−0.005 (0.080)	−0.339 * (0.119)	−0.281 * (0.105)
R ²	0.124	0.127	0.028	0.036	0.029	0.039	0.074	0.102	0.090	0.107
Observations	3,491	3,453	6,344	6,285	6,784	6,701	5,281	5,219	2,875	2,832
Controls:										
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of adults, # of children	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Head's age	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Cereal output	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Livestock units	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Note: Figures in each column are from a unique household fixed effects regression on the dependent variables in header row. Post is a dummy variable equal to 1 if household observed after exposure to a certification program. JointCertificate is a dummy variable equal to 1 if in regions that issued certificates jointly to head and spouse. Monthly expenditure in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Standard errors clustered on region in parentheses.

*** p<0.01,
** p<0.05,
* p<0.1.

Table 4

Association between land certification and clothing expenditures spent on men, women, boys, and girls in male-headed households

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Men's	Men's	Women's	Women's	Boys'	Boys'	Girls'	Girls'
Proportion of total clothing expenditure								
Post	-0.004 (0.009)	-0.000 (0.008)	-0.007 (0.010)	-0.010 (0.014)	0.021 (0.012)	0.021 (0.014)	-0.010 (0.013)	-0.011 (0.014)
Post*JointCertificate	-0.026*** (0.003)	-0.031** (0.006)	-0.010 (0.009)	-0.007 (0.016)	0.005 (0.013)	0.008 (0.016)	0.031*** (0.005)	0.029*** (0.008)
R ²	0.002	0.007	0.006	0.010	0.005	0.010	0.003	0.006
Observations	7,097	7,004	7,097	7,004	7,097	7,004	7,097	7,004
Log monthly expenditure								
Post	0.187 (0.115)	0.196 (0.112)	-0.172 (0.142)	-0.229 (0.155)	0.251 (0.154)	0.238 (0.152)	-0.099 (0.149)	-0.115 (0.150)
Post*JointCertificate	0.136 (0.099)	0.079 (0.100)	0.557** (0.107)	0.571** (0.121)	0.109 (0.102)	0.060 (0.071)	0.418** (0.107)	0.373*** (0.077)
R ²	0.090	0.103	0.141	0.153	0.135	0.161	0.107	0.140
Observations	3,023	2,989	3,176	3,137	3,221	3,185	3,027	2,988
Controls:								
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of adults, # of children	No	Yes	No	Yes	No	Yes	No	Yes
Head's age	No	Yes	No	Yes	No	Yes	No	Yes
Cereal output	No	Yes	No	Yes	No	Yes	No	Yes
Livestock units	No	Yes	No	Yes	No	Yes	No	Yes

Note: Figures in each column are from a unique household fixed effects regression on the dependent variables in header row. Post is a dummy variable equal to 1 if household observed after exposure to a certification program. JointCertificate is a dummy variable equal to 1 if in regions that issued certificates jointly to head and spouse. Monthly expenditure in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Standard errors clustered on region in parentheses.

p<0.01,

**
p<0.05,

*
p<0.1.

Table 5

Association between land certification and duration of illness or injury in the previous four weeks among members in male-headed households

	(1)	(2)	(3)	(4)	(5)	(6)
	Ill/injured = 1	Ill/injured = 1	Days ill/injured	Days ill/injured	Days ill/injured conditional on ill/injured = 1	Days ill/injured conditional on ill/injured = 1
Post	-0.048** (0.011)	-0.046** (0.010)	-1.002* (0.343)	-0.915* (0.333)	5.698 (3.494)	6.102 (3.614)
Post*JointCertificate	0.011 (0.016)	0.012 (0.017)	0.371 (0.366)	0.338 (0.419)	-4.042* (1.494)	-4.733* (1.633)
Controls:						
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
# of adults, # of children	No	Yes	No	Yes	No	Yes
Head's age	No	Yes	No	Yes	No	Yes
Cereal output	No	Yes	No	Yes	No	Yes
Livestock units	No	Yes	No	Yes	No	Yes
R ²	0.021	0.022	0.015	0.016	0.092	0.095
Observations	40,642	40,374	40,642	40,374	3,942	3,904

Note: Figures in each column are from a unique household fixed effects regression on the dependent variables in header row. Post is a dummy variable equal to 1 if household observed after exposure to a certification program. JointCertificate is a dummy variable equal to 1 if in regions that issued certificates jointly to head and spouse. Standard errors clustered on region in parentheses.

*** p<0.01,

** p<0.05,

* p<0.1.

Table 6

Association between high women's land tenure security and household consumption shares in male-headed households

	(1)	(2)	(3)	(4)	(5)
	Healthcare share	Food homegrown share	Food purchased share	Clothing share	Education share
OLS	-0.001 (0.007)	0.027 (0.015)	-0.018 (0.018)	0.001 (0.007)	0.002 (0.002)
IV-2SLS	0.122 *** (0.006)	-0.017 (0.145)	-0.385* (0.216)	-0.045 *** (0.015)	-0.006 (0.012)
First stage F statistic	58.93	58.93	58.93	58.93	58.93
Observations	731	731	731	731	731
Controls:					
# of adults, # of children	Yes	Yes	Yes	Yes	Yes
Head's age	Yes	Yes	Yes	Yes	Yes
Cereal output	Yes	Yes	Yes	Yes	Yes
Livestock units	Yes	Yes	Yes	Yes	Yes

Note: OLS = ordinary least squares and IV-2SLS = instrumental variable two-stage least squares. Each figure in the OLS and IV-2SLS rows is the coefficient on *HighTenureSecurity* from a unique linear regression on the dependent variables in header row. *HighTenureSecurity* is a dummy equal to 1 if the female respondent of a given household reported a high land tenure security. Standard errors clustered on region in parentheses.

p<0.01,

**
p<0.05,

*
p<0.1.

Table 7

Association between high women's land tenure security and clothing expenditure shares spent on men, women, boys, and girls in male-head households

	(1)	(2)	(3)	(4)
	Men's clothing share	Women's clothing share	Boy's clothing share	Girl's clothing share
OLS	0.005 (0.016)	0.016 * (0.006)	0.019 (0.015)	-0.041 * (0.014)
IV-2SLS	-0.160 ** (0.081)	0.110 *** (0.038)	-0.133 ** (0.065)	0.182 *** (0.016)
First stage F statistic	58.93	58.93	58.93	58.93
Observations	889	890	891	892
Controls:				
# of adults, # of children	Yes	Yes	Yes	Yes
Head's age	Yes	Yes	Yes	Yes
Cereal output	Yes	Yes	Yes	Yes
Livestock units	Yes	Yes	Yes	Yes

Note: OLS = ordinary least squares and IV-2SLS = instrumental variable two-stage least squares. Each figure in the OLS and IV-2SLS rows is the coefficient on *HighTenureSecurity* from a unique linear regression on the dependent variables in header row. *HighTenureSecurity* is a dummy equal to 1 if the female respondent of a given household reported a high land tenure security. Standard errors clustered on region in parentheses.

p<0.01,

**
p<0.05,

*
p<0.1.