The Gender Dynamics in Intrahousehold Allocation of Resources

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ABSTRACT

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I examine whether policies that specifically target gender inequality are necessary in order to improve the well-being of women and girls. In the first paper I study the impact of Ethiopia's gendered land certification programs on household consumption patterns and infant and under-five mortality. After years of communism during which all land was nationalized, in 1998, Ethiopia embarked on a land tenure reform program. The reform began in Tigray region where land certificates were issued to household heads, who were largely male. In a second phase carried out during 2003-2005, three other regions, Amhara, Oromia, and SNNP, issued land certificates jointly to household heads and spouses, presenting variation in land tenure security by gender. I leverage this variation in land certification across regions and over time, to study whether inclusion of women yielded different effects. Using data from the Ethiopia Demographic and Household Surveys and longitudinal data from the Ethiopia Rural Household Survey I construct a treatment group of male-headed households in joint land certification regions and a comparison group of male-headed households in Tigray and study changes between the two groups after implementation of their respective land certification programs. I find that, compared to household-head land certification, joint certification was accompanied by increased household consumption of food, health care, women's clothing, and girls' clothing, and a decrease in girls' infant and under-five mortality. These effects are largely restricted to households with illiterate mothers indicating that

inclusion of women in land tenure reform empowered previously disempowered women who then used their improved position to allocate more household resources to their daughters.

In the second paper, I examine the relationship between women's land ownership and participation in transactional sex, multiple sexual partnerships and unprotected sex, and HIV infection status. Using a sample of 5511 women working in the agricultural sector from the 1998, 2003 and 2008–09 Kenya Demographic and Health Surveys, I find that women's land ownership is associated with fewer sexual partners in the past year and lower likelihood of engaging in transactional sex, indicators of reduced survival sex, but is not associated with unprotected sex with casual partners, indicating no difference in safer sex negotiation. Land ownership is also associated with reduced HIV infection among women most likely to engage in survival sex, i.e., women not under the household headship of a husband, but not among women living in husband-headed households, for whom increased negotiation for safer sex would be more relevant.

The third paper examines the prevalence of son preference in families of East and South Asian origin living in the United States by investigating parental time investments in children using American Time Use Surveys. The results show that East and South Asian mothers spend more total time and more quality time with their young (aged 0-5 years) sons than with young daughters while fathers' time with young children is gender neutral. I find gender specialization in time with children aged 6-17 with fathers spending more time with sons and mothers spending more time with daughters.

These findings document health and social consequences of gender inequities within households. The findings also highlight that gender-sensitive policies have the potential to transform intrahousehold dynamics and help realize gender equality policy objectives.

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Chapter 1 Research Questions

Around the world, girls and women face discrimination throughout their lives, beginning at conception. They receive a smaller share of household resources than males and as a result are less likely to be born and, if born, less likely to be adequately fed, sent to school, and live past childhood (Chen, Huq, & D'Souza, 1981; Chung & Gupta, 2007; Coale & Banister, 1994; Das Gupta, Chung, & Shuzhuo, 2009; Guilmoto, 2009; Jayachandran & Kuziemko, 2011; Marcoux, 2002; Nishikiori et al., 2006; Pande, 2003; Sen, 1990; UNESCO Institute for Statistics, 2005; World Bank, 2011). It remains unclear whether policies that specifically target gender inequality are necessary in order to rapidly improve the wellbeing of women and girls (Duflo, 2012). This three-paper dissertation addresses this research gap by answering the following three questions.

Question 1. What is the effect of land reforms that increase women's ownership of land in rural Ethiopia on household consumption patterns and child mortality?

Women's control over household land assets is associated with higher expenditures on food and an improvement in child health and nutrition (Allendorf, 2007; Doss, 2006). However, the results from existing studies are likely to be biased because women who have secure land tenure may have greater agency over their rights or come from wealthier households compared to women without secure land tenure, which would confound the associations under study. The first paper in the dissertation addresses this shortcoming by studying the impact of Ethiopia's land certification programs on the allocation of household resources towards human capital inputs, on birth spacing, and on child mortality. In 1998-99, Ethiopia's Tigray region issued land certificates to rural household heads (typically male) which converted their unstable land rights into perpetual land rights. In 2003, Amhara and Oromia regions issued

land certificates jointly to household heads and spouses, and in 2005 the Southern Nations, Nationalities, and Peoples' region also issued land certificates to household heads and spouses. The study examines the impacts of land certification on household expenditure patterns, child birth spacing and mortality, and compares the effects of household head-only land certification to joint (household head and spouse) certification. The study also examines whether joint land certification had different effects for empowered and disempowered women by comparing effects on literate and illiterate women.

Question 2. What is the association between land ownership and risk for HIV among Kenyan women who rely on land for a livelihood?

Theory predicts that land ownership empowers women to avoid HIV acquisition by reducing their reliance on risky survival sex and enhancing their ability to negotiate safer sex with their partners (Conrad & Doss, 2008). However, this prediction has not been tested empirically. The second paper uses cross-sectional data on women working in the agricultural sector in Kenya and compares the HIV infection status of women who work on their own land and those who work on family land or other types of land. The study examines whether women's land ownership is associated with number of sexual partners, with likelihood of engaging in transactional sex (e.g., sex work), or with likelihood of engaging in unprotected sex. The objective of this analysis to provide insight into the whether lower levels of survival sex or greater ability to negotiate safer sex explains the link with HIV risk.

Question 3. What is the nature and extent of discrimination against daughters in the allocation of parental time among families of East and South Asian origin that have migrated to the U.S.?

The third paper examines whether parents of East and South Asian origin in the U.S.

discriminate against daughters in their allocation of parental time. Previous research suggests that East and South Asian immigrants in the U.S. and Canada excise sex selection and that bias against daughters continues to prevail even among East and South Asian families living in rich countries. However, there is no research on whether parents of East and South Asian origin in the U.S. or in other non-Asian countries discriminate against daughters in their allocation of family resources including parental time.

The dissertation builds upon the literature on gender inequalities by documenting connections between extra-household factors and within-household gender dynamics, underscoring the potential of policies to affect gender inequalities.

Social work has traditionally concerned itself with improving the welfare of the disadvantaged. This dissertation is therefore relevant to social work since it focuses on women and girls, who continue to be marginalized in most societies. The findings from the dissertation on the impact of land tenure on the health of women and girls and on the persistence of gender discrimination will shed insight on the consequences of gender inequalities and the importance of addressing gender inequalities.

Chapter 2 Impact of women's land tenure rights on intrahousehold resource allocation and child health: A study of Ethiopia's land certification

Introduction

Land is the most important asset in agrarian societies where landholdings determine productivity, economic welfare, social status, and political power (Agarwal, 1994a). The right to land tenure is therefore an important tool for promoting economic security and the welfare of the poor (Acemoglu, Johnson, & Robinson, 2001; Binswanger, Deininger, & Feder, 1995; Sen, 2001). The case for improving land tenure security is particularly strong for women since women are less likely to own land, and those that do, have smaller plots (World Bank, 2011). Additionally, the well-being of a woman and her children 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). Previous research shows that women are more involved in family decision-making and have more influence over family decisions when they own land (Allendorf, 2007; Garikipati, 2009). Women's ownership or co-ownership of land therefore also has implications for child health since women are more likely to be concerned about child health and nutrition than men. Research shows that when women's influence over family decisions increases, families allocate more of their resources to child health and nutrition (Duflo, 2012). Women are thus likely to use their increased family influence, resulting from land ownership, to improve the nutrition and health of their children (Agarwal, 1994b).

Previous research in Sub-Saharan Africa and South Asia has examined the impact of women's land ownership on the allocation of family resources towards health and nutrition. In Ethiopia, a greater value of land and livestock assets owned by women is accompanied by a

larger share of household expenditure on food and health (Quisumbing and Maluccio, 2003). 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 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). A shortcoming of studies on the impact of women's land ownership on allocation of family resources towards children is that the association between women's land ownership and allocation of family resources is likely confounded by the women's agency over their rights, the households' wealth, and other factors that are difficult to measure and control for.

I address this shortcoming by examining the effect of Ethiopia's land certification program, which provided households with perpetual user rights to land. 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) 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 "natural experiment" to study the effects of increasing land tenure security either to a household head only or to both the household head and spouse. I focus on households headed by married or cohabiting men since only a minority of households is headed by women or unmarried men and the intrahousehold gender dynamics of such households are different. The study examines how Ethiopia's gendered land certification program affected household expenditures on human capital inputs, birth spacing, child (under-five) mortality, and infant (under-one) mortality. The study also examines whether joint land certification had different effects for empowered and disempowered women by comparing effects on literate and

illiterate women.

Ethiopia serves as an important 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 highest rates of child malnutrition and child mortality: it is 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 do not survive to age five years (United Nations, Department of Economic and Social Affairs, Population Division, 2013).

Literature Review

Household land tenure as a determinant of household resource allocation towards children

Improvements in land tenure security make households wealthier through four mechanisms. First, secure land tenure increases incentives for investing in agricultural and land-related inputs, which improve the profitability of landholdings (Besley, 1995). Second, it reduces the time and resources spent by households to defend their claims to land, which frees up resources that can be invested in children or in income-generating activities (Field, 2007). Third, legal land tenure enhances access to credit since the landholdings can serve as collateral (Feder & Feeny, 1991) and fourth, the registration system that accompanies land tenure programs provides a publicly available registry of land information, which reduces the costs of trading land rights to renters or buyers and, in turn, raises property values (Deininger, Ali, & Alemu, 2011). When households get wealthier they are better able to meet the needs of children.

Past research that has examined the impact of land tenure programs on allocation of

resources towards children has focused on South America. Galiani and Schargrodsky (2004) studied the effect of an urban land tenure program in an area of Buenos Aires that provided land titles to some squatters but not others because of delays in the judicial system and found that the program was accompanied by improvements in the weight-for-height Z-scores of children. Galiani and Schargrodsky (2004) also found that the households that received land titles, compared to households that did not receive titles, constructed larger and higher-quality houses, had lower fertility, and their children had higher rates of secondary school completion. Vogl (2007) examined the impact of an urban land-titling program in Peru and found that the program was accompanied by increased weight-for-height children's Z-scores. Related research has examined the impact of urban land titling in Uruguay and finds that titled families had lower rates of developing hypertension and diabetes than families that did not obtain titles (because of administrative mistakes) (Gandelman, 2010).

There are two important gaps in this research. First, existing studies have not examined the role of gender. Land tenure programs may have different effects on boys and girls and, as will be discussed later, the gender of the recipient of the land tenure may influence outcomes. Second, existing studies are focused on urban land tenure programs in South America. Effects of land tenure programs in other settings have not been examined. Consequently it is not clear what the impact of land tenure programs on children's health would be in rural Eastern Africa, a region with poorer child health and higher gender inequality.

Women's land tenure as a determinant of household resource allocation towards children

Changes in the land rights of individual household members might influence the intrahousehold distribution of resources. According to the collective model of Chiappori

(1992), which is outlined in Appendix A, factors originating from outside the household can have an impact on the household decision making process without 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. 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. Example extrahousehold factors that Chiappori mentions include divorce laws and societal norms regarding men's and women's say in the household. Such factors play a role in women's empowerment, which can be defined as improving the ability of women to make strategic life choices, if they shift the gender balance of power in the household (Duflo, 2012; Kabeer, 1999).

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 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 more likely to have final say over family decisions in Nepal (Allendorf, 2007). Also in Nepal, children of mothers who own land are less likely 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 (Menon, van der Meulen Rodgers,

& Nguyen, 2014). These differences 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. This evidence, drawn from correlational studies in a variety of countries, supports the argument that increasing women's land tenure 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 may increase the family resources that are spent on the health and nutrition of children.

Results from Quisumbing and Maluccio (2003) who used panel data to examine how the value of land and livestock that Ethiopian newlyweds brought into their marriages influenced 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 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 indicate 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.

Changes in the land tenure security may also influence the allocation of resources to children indirectly through changes in fertility behavior. In a number of developing countries, women prefer to have fewer children than their husbands (Becker, 1999) and women who report having more bargaining power have longer birth intervals (Larsen & Hollos, 2003;

Upadhyay & Hindin, 2005). Field (2005) examines the impact of Peru's urban land titling programs on the probability that a family had a new birth and finds that the program led to declines in fertility only in families where the wife's name was included in the land title. Declines in fertility that result from improvements in women's bargaining position translate into more household resources per child and longer birth intervals between children, which are likely to improve child health (Rutstein, 2008; Short, 2006).

While the land reforms will increase women's de jure rights, the reforms can fail to improve their de facto rights if cultural attitudes and practices impede women's ability to exercise their land tenure rights (Bhaumik, Dimova, & Gang, 2014; Joireman, 2008). Further, since land tenure rights are typically formalized in a written document, illiterate or uneducated women might not comprehend their rights. The prevailing status or empowerment of women could therefore influence the impact of land policy reforms aimed at addressing women's land tenure insecurity. Whether improvements in women's formal land tenure will benefit women who are already empowered more than disempowered women is an empirical question that I examine in this study.

Institutional context

Land tenure before Ethiopia's land certification

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 households. Under this regime, land was allocated to households primarily based on household size. Households could not sell, mortgage, or rent out the land allocated to them. Hiring of labor was also illegal. The law, however, allowed for children to inherit parents'

land. During the period 1975-1991, households' security of land tenure was temporary: as the amount of land available for allocation became inadequate, land was appropriated from richer households and redistributed to new households.

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 of land was still not permitted. The new regime, in 1995, also divided the country into nine ethnically based and politically autonomous regions and two cities (shown in Figure 2.1). Different land certification programs conducted in the regions thereafter provide variation that I leverage to study the gendered effects of land tenure.

Figure 2.1. Ethiopia's politically autonomous regions

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 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 provided perpetual user rights to the land. Land certification marked the end of land appropriation and redistribution by the Tigray region government.

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 land tenure security by gender that could be utilized for research.

Two factors appear to have contributed to the enactment of joint rather than head-only land certification in Amhara, Oromia, and SNNP. First, funders of the land certification program, e.g. the Swedish International Development Cooperation Agency, required attention to gender equality (Byron & Örnemark, 2010). Second, the post-communist Ethiopian government was already enacting reforms to address gender inequality, starting with the adoption of a constitution in 1995 that guaranteed gender equality. The subsequent process to amend discriminatory laws and institutions was gradual. For instance, it was not until 2000

that clauses supporting the subjugation of women in marriage were removed from the federal family policy (UN Women, 2002).

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 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).

Table 2.1. Land certification programs in Ethiopia's four main regions

Region:	**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

In Table 2.1, 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 households in SNNP 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. Holden, Deininger, and Ghebru (2011) find that land certification 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) find that land certification had positive effects on land productivity, investment in trees, maintenance of soil conservation structures, land rental market participation, land-related investment, and perceived land tenure security.

Studies have also examined households' perceptions after the Ethiopian land certification. Deininger, Ali, and Alemu (2011) find that land certification increased households' perceived land tenure security. Bezabih, Kohlin, and Mannberg (2011) find that land certification increased farmers' 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 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 and children's health. Second, the paper examines whether there were differential impacts of the certification based on whether certificates were issued jointly or to the household head alone.

An ideal study

A shortcoming of studies that have examined the impact of women's land tenure on household expenditure patterns and children's health is that these studies do not address the unobserved heterogeneity between women who have land tenure and those without tenure. A second shortcoming is that the observed effects in these studies are an aggregate of both the wealth effect of women's land tenure as well as its effect on intrahousehold bargaining. It is therefore not clear from these studies whether land tenure programs that are inclusive of women yield larger improvements in child health than land tenure programs that are not.

An ideal study to examine the intrahousehold bargaining effect of women's land tenure rights on household expenditures and child health would randomly assign male-headed households that live on land they do not own to one of three conditions: (1) receive land title that is in the household head's name; (2) receive land title that is in both the household head and his spouse's name; or (3) receive no land title. The study would not include households

headed by women or by unmarried men. Female-headed households are typically single-parent households, which, like households headed by unmarried men, will have intrahousehold gender dynamics that are different from two-parent households. The following effects would then be observed:

[1] $E[\boldsymbol{Y} \mid \text{Head-only title}] - E[\boldsymbol{Y} \mid \text{No title}]$

[2] $E[\boldsymbol{Y} \mid \text{Joint title}] - E[\boldsymbol{Y} \mid \text{No title}]$

where $\boldsymbol{Y}$ is the outcome of interest. Equation [1] is the causal effect of receiving land title that is in the household head's name. Equation [2] is the causal effect of receiving land title that is in both the household head and his spouse's name. The causal effect of interest is the effect of improving women's land tenure that is in addition to the effect that would be observed if the land tenure was given to their husbands only. This effect is given by the difference between [1] and [2]:

[3] $E[\boldsymbol{Y} \mid \text{Joint title}] - E[\boldsymbol{Y} \mid \text{Head-only title}]$.

The intuition is that households that received land tenure, either for the household head only or for both the head and his spouse, experience the wealth effect of increased land tenure. The observed differences between these two groups of households can then be attributed to the differential bargaining power effects of head-only versus joint land tenure. As an alternative to conducting this ideal study, I leverage the exogenous variation in land tenure programs resulting from Ethiopia's land certification.

Methods

Data

The study uses two datasets: the Ethiopian Rural Household Survey and the Ethiopia Demographic and Health Surveys. These datasets are described in more detail below.

Ethiopian Rural Household Survey

The Ethiopian Rural Household Survey (ERHS) is a longitudinal survey of 1477 households from the four major regions in Ethiopia. The households were randomly sampled from 15 villages that had been selected so that all major agroclimatic zones of the country were covered. 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. As shown in Table 2.2, ERHS data are therefore suitable since they sufficiently cover the period before, during, and after the land certification.

Table 2.2. Ethiopian Rural Household Survey data structure in relation to land certification

Region	Year of data observation					
	1994	1995	1997	1999	2004	2009
Tigray				⚷	⚷	⚷
Amhara					⚷⚷	⚷⚷
Oromia					⚷⚷	⚷⚷
SNNP						⚷⚷

Notes: ⚷ refers to households observed after exposure to head-only land certification. ⚷⚷ refers to households observed after exposure to joint land certification.

ERHS obtained demographic information for all household members at every wave. I restrict the data to households that had a married, male household head in the pre-reform period, i.e. before 1998, because the wealth effects of land certification rather than intrahousehold bargaining effects are likely to dominate in households with unmarried household heads. 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.

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. I examine consumption of both purchased food and non-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 individual expenditure items to determine total expenditure on clothing, healthcare, 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 non-purchased 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.

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.

Women's empowerment is a multidimensional concept that has been measured in a number of ways in the literature. Literacy is one facet of women's empowerment that can be reliably measured and that is associated with child mortality in and outside Ethiopia (Asefa et

al., 1998; Kabeer, 1999). At baseline (in 1994) ERHS asked about every household member's ability to read and write a letter. I define a wife's literacy status as a binary variable that is equal to one if the spouse (or any spouse, in case of polyandrous households) of the household head can read a letter.

Ethiopia Demographic and Health Surveys

The Ethiopia Demographic and Health Surveys (EDHS) are nationally representative cross-sectional surveys that were conducted in 2000, 2005 and 2011. The surveys interviewed all women of reproductive age (ages 15-49 years) in the sampled households. EDHS provide data on all live births to the women, which can be used to study birth spacing, infant (under-one) and child (under-five) mortality. Each woman was asked about her fertility history and details regarding each of her live births including year of the birth, gender of the child, whether the child was still alive and, if not, the year in which the child died. EDHS interviewed 45,952 women across the three years who gave birth to 129,595 live children. I pool the three years of data and restrict the sample of children to those born to mothers who are married to the household heads i.e., those children whose parents would have been recipients of land certificates. I further restrict the sample to 79,419 children born after the end of communism (1991). Therefore, the oldest children in the study sample are children born in 1992 and the youngest born in 2011. EDHS data are ideal to study the impact of land certification since they have information on children born before, during and after land certification (see Table 2.3). The data also includes regions not affected by land certification as well as urban areas, which were also not affected by land certification.

A concern with studying mortality is censoring: the researcher does not know if a living child under the age of one (five) will survive to age one (five). To work around this

censoring issue, I restrict the sample to 73,198 children born one or more years prior to the survey date to study infant mortality and to 48,775 children born five or more years prior to the survey date to study under-five mortality. I also exclude children born in the year prior to land certification in my analysis on infant mortality and children born 1-4 years prior to land certification in my analysis on under-five mortality because these children receive some exposure to land certification. For the same reason, in my analysis of succeeding birth intervals, I exclude children born prior to land certification whose succeeding sibling was born after land reform.

Table 2.3. Ethiopia Demographic and Health Surveys data structure in relation to land reform

Region	Rural	Year of birth							
		'92 – '98	'99	'00	'01	'02	'03	'04	'05 – '11
Tigray	Rural		⚷	⚷	⚷	⚷	⚷	⚷	⚷
Tigray	Urban								
Amhara	Rural						⚷⚷	⚷⚷	⚷⚷
Amhara	Urban								
Oromia	Rural						⚷⚷	⚷⚷	⚷⚷
Oromia	Urban								
SNNP	Rural								⚷⚷
SNNP	Urban								
Others	Rural								
Others	Urban								

Notes: ⚷ refers to children exposed to head-only land certification from birth. ⚷⚷ refers to children exposed to joint land certification from birth.

EDHS also collected data on literacy by asking respondents to read aloud a standard sentence that had been translated into the respondent's language. I classify respondents who were able to read either the entire sentence or parts of it as literate.

Analytical strategy

Consumption

My objective is to study the effect of women's land rights on intrahousehold resource allocation and children's health by studying the impact of Ethiopia's gendered land

certification programs on consumption patterns, birth spacing, and children's mortality. 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, I would have data on the amount of household resources consumed by 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 can 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 changes in the gendered allocation of resources resulting from land certification. My analytical strategy examines changes in clothing expenditures, as regions conduct land certification programs over time. The main comparisons in this analysis are: (1) the difference in expenditures in Amhara, Oromia, and SNNP between the pre-certification period and after implementation of joint land certification; (2) the difference in expenditures in Tigray between the pre-certification period and after the implementation head-only land certification; and (3) the difference in the differences in expenditures between the head-only certification region and the joint certification regions. I implement this analysis using panel fixed effects. I estimate the model

[4] $$C_{hrt} = \beta_0 + \beta_1 Post_{rt} + \delta\, Post_{rt} * JointCert_r + \zeta_t + \eta_h + \varepsilon_{hrt}$$

with C being the proportion of total clothing expenditure of household h in region r at time t that is spent on a particular group, i.e., men, women, boys, or girls; $Post_{rt}$ 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 are year fixed effects and η_h are household fixed effects. ε_{hrt} is an error term. The coefficient β_1 is the estimated effect of the head-only certificate program on clothing expenditure. The coefficient of interest is δ, which is an estimate of the effect of joint land certification that is in addition to the effect of head-only land certification. The panel data is sufficient to identify both β_1 and δ since every household has at least one observation before and after the implementation of land certification in any of the regions.

The validity of the empirical strategy relies on several features. The household fixed effects control for both observed and unobserved time-invariant household characteristics. Therefore, differences between households that are constant over time are accounted for. As shown in Table 2.4, 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. Household fixed effects control for such heterogeneity to the extent that it is time-invariant.

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 during the study period, 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 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.

Table 2.4. Characteristics of rural households before land certification (1994-1997)

	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 non-purchased	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

Notes: 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.

Since the land tenure reforms were triggered by changes at the federal and region level, they can be considered exogenous to the households. Consequently, the concern with

the strategy 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 women's empowerment programs accompanied the rollout of land certification. I cannot rule out this concern using the described analytical strategy. However, in my analysis of birth spacing and mortality I have data from urban households which allow me to account for region-level time-varying confounders.

Standard errors obtained from an OLS regression of equation [4] will be prone to over-rejection of the null hypothesis because repeated observations within households are correlated and so too are observations within regions (Bertrand, Duflo, & Mullainathan, 2004). In addition, common solutions to this problem (such as computing cluster-robust standard errors) require a large number of clusters. I use instead a cluster bootstrap procedure, which has been shown by Cameron, Gelbach, and Miller (2008) to yield correct inference with a small number of clusters. I make inference on the coefficients of interest using a bootstrap clustered on region and performed over 1000 repetitions.

I examine whether joint land certification had different effects for literate and illiterate women by adding the interaction term $Post_{rt}*JointCert_r*WifeLiterate_h$ to model [4]:

[5] $C_{hrt}=\tilde{\beta}_0 + \tilde{\beta}_1 Post_{rt} + \tilde{\delta}_0 Post_{rt}*JointCert_r + \tilde{\delta}_1 Post_{rt}*JointCert_r*WifeLiterate_h + \tilde{\zeta}_t + \tilde{\eta}_h + \tilde{\varepsilon}_{ht}$

where $WifeLiterate_h$ is an indicator equal to 1 if a wife of the household head in household h was literate at baseline (1994). In addition to the household and agroclimatic time-varying controls mention previously, this model includes an interaction between $WifeLiterate_h$ and year of observation dummies to control for changes over time common to households with

literate or illiterate wives. Coefficient $\tilde{\delta}_0$ is the estimated difference between the effect on consumption of joint certification programs in households with an illiterate wife and head-only certification. Coefficient $\tilde{\delta}_1$ compares the difference in the effect of joint certification programs on consumption in households with illiterate wives and those with literate wives. $\tilde{\delta}_1$ will be different from zero if women's literacy modified the impact of joint land certification on intrahousehold dynamics.

I also fit models using logged clothing expenditures to understand how observed changes in the proportions were realized. These models also serve as a model specification sensitivity check since the conceptual framework does not explicitly prescribe the functional form that should be used.

A second objective is to study how the land certification programs influenced resource allocation towards human capital investments at the household-level. For this I fit model [5] to study the effect of land certification on the share of total household consumption that is spent on purchased food, non-purchased food, clothing, healthcare and education as well as log monthly consumption in these categories.

Birth spacing and mortality

To study how inclusion of women in land certification influenced birth spacing and mortality I first compute the difference in these outcomes between the pre- and post-certification periods on a sample of children born in rural areas of Amhara, Oromia, and SNNP (i.e., regions that issued joint land certificates). There are two important shortcomings with this simple approach. First, the approach will yield unbiased estimates of the impact of joint certification only if the rollout of land certification was not correlated with other factors that influenced the outcomes of interest. As shown in Figure 2.2, this is an untenable

requirement as there was a decline in infant mortality in all regions during the study period. This decline could be due to that some other factor, e.g. better health care. Second, the approach cannot isolate how much of the observed changes were due an increase in wealth as a result of land certification or how much of the effect was due to the inclusion of women in the land certification.

To address these shortcomings, I next use a difference-in-differences quasi-experimental approach. This approach compares changes in the outcomes (i.e. birth spacing or mortality) between rural children exposed to land certification and outcomes in regions that did not conduct land certification. Because I have data on children born every year between 1992 and 2011, I make these comparisons as the land certification programs are rolled out in different regions, i.e. this approach extends the basic difference-in-differences design that has observations at only two time points. The difference-in-differences strategy relies on the assumption that birth spacing and mortality in the head-only certification region, joint certification regions, and no certificate regions would have followed parallel trends had land certification not been implemented. In Figure 2.2 we see that the three types of regions had similar declines in infant mortality before the start of certification. Tigray region's mortality falls more rapidly that the rest of the country after its head-only certification. Additionally, it is only after joint certification that mortality in Tigray, Amhara, and SNNP starts to fall more rapidly than in regions not exposed to certification.

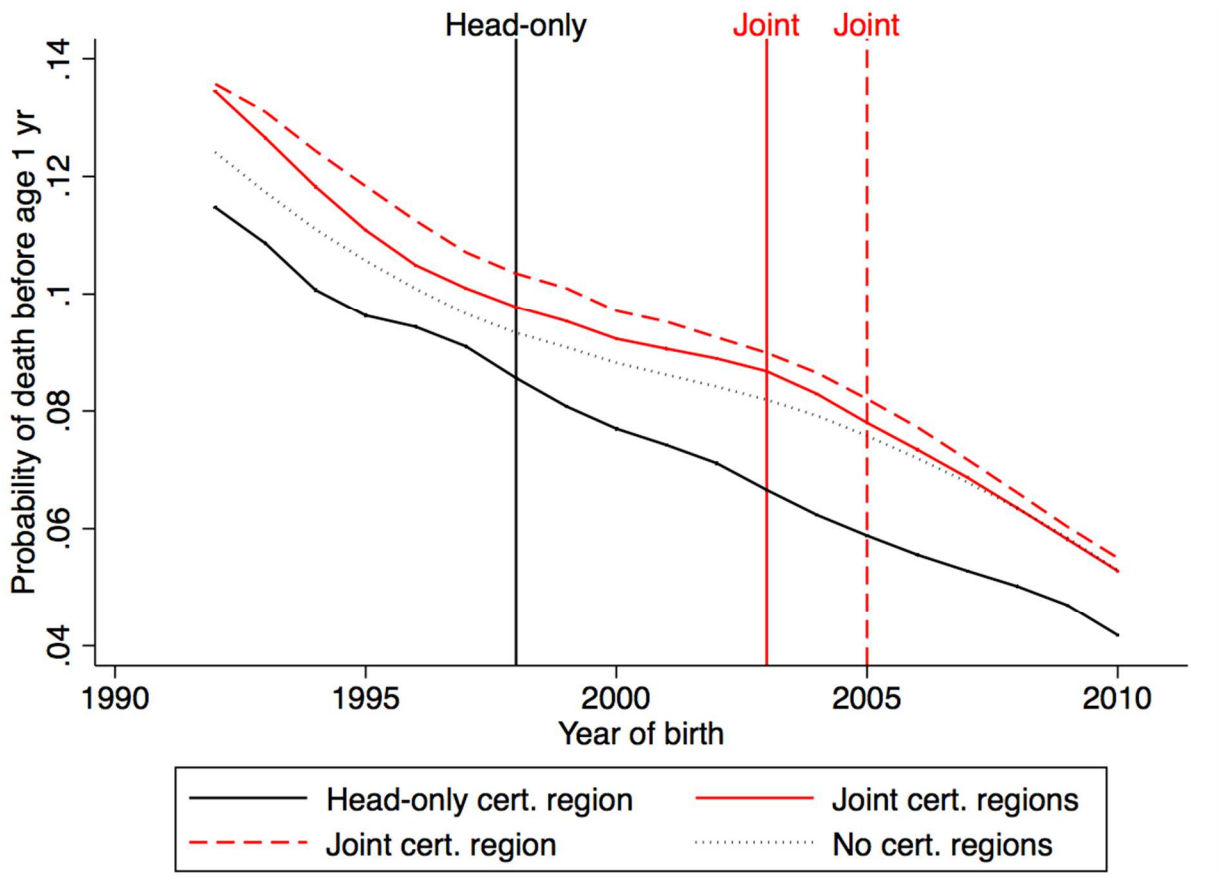

Figure 2.2. Infant mortality of rural children in Ethiopia
Notes: Head-only cert. region = Tigray. Joint cert. regions = Amhara and Oromia. Joint cert. region = SNNP.
Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys

I fit the difference-in-differences model:

[8] $$S_{irt} = \gamma_0 + \gamma_1 Head\text{-}onlyCert_r + \gamma_2 JointCert_r + \gamma_3 Post_{rt} + \gamma_4 Post_{rt} * JointCert_r + BirthYear_t + \varepsilon_{irt}$$

where S_{irt} is the succeeding birth interval in months of child i in region r born in year t; $Head\text{-}onlyCert_r$ is an indicator equal to 1 if the child is in Tigray region; $JointCert_r$ is an indicator equal to 1 if the child is in Amhara, Oromia or SNNP regions; $Post_{rt}$ is an indicator equal to 1 if the child is in a land certification region (Tigray, Amhara, Oromia or SNNP) and was born after the region's land certification program; and $BirthYear_t$ is a full set of year of birth

dummies. γ_3 estimates the effect on birth spacing of being exposed to head-only certification from birth. The coefficient of interest is γ_4. γ_4 estimates the effect on birth spacing of being exposed to joint certification from birth that is in addition to exposure to head-only certification.

One concern with the above approach is that the estimated effect will be biased if there are region-level factors that affect the outcomes of interest and that are correlated with the roll out of land certification. I address this concern by including data on children from urban areas and conducting a difference-in-differences-in-differences analysis. This approach compares changes in the outcomes (i.e. birth spacing or mortality) between rural children exposed to land certification while controlling for: (1) changes in outcomes in regions that did not conduct land certification; and (2) changes in outcomes among urban children who should not have been affected by land certification.

The difference-in-differences-in-differences model is:

[9] $$S_{irt} = \gamma_0 + \gamma_1 Head\text{-}only Cert_r + \gamma_2 JointCert_r + \gamma_3 Post_{rt} + \gamma_4 Post_{rt} * JointCert_r + \gamma_5 Rural_{ir} + \delta_1 Post_{rt} * Rural_{ir} + \delta_2 Post_{rt} * Rural_{ir} * JointCert_r + BirthYear_t + \boldsymbol{X}_{irt}\boldsymbol{\tau} + \varepsilon_{irt}$$

which extends model [8] and adds: *Rural*, an indicator equal to 1 if the child is in a rural area; an interaction between *Post* and *Rural*; an interaction between *Post*, *Rural* and *JointCert*; and other controls, $\boldsymbol{X}_{irt}$, which are the child's birth order, type of certification (head-only, joint, or none)-specific year of birth linear trends, and year of EDHS survey (i.e., dummy variables representing whether the child's mother was interviewed in 2000, 2005 or 2011). δ_1 estimates the effect on birth spacing of being exposed to head-only certification from birth. The coefficient of interest is δ_2. δ_2 estimates the effect on birth spacing of being exposed to joint certification from birth that is in addition to exposure to head-only certification. I fit models

similar to [8] and [9] separately for male and female children to examine infant and child mortality.

The implementation of head-only land certification began five years before the start of joint land certification programs. As result, my strategy using birth year fixed effects largely compares long-term effects of head-only land certification with short-term effects of joint land certification, which would yield biased estimates if there were differences between the short-term and long-term effects of land certification. I address this concern by controlling for time since land certification, which is a set of dummy variables for each year between 0 and 13 after land certification and a dummy for observations made before certification. I stratify the analysis by whether the mother of the child is literate to study how effects of joint land certification differed based on the empowerment level of mothers.

Results

Consumption

Table 2.5 presents results for the effect of land certification programs on clothing expenditures. The top panel examines effect on the proportion of clothing expenditures spent on men, women, boys, and girls. Model (1) controls for household fixed effects and year of observation. The results 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, decreased the share of clothing expenditures spent on men by three percentage points. 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. Results in columns (3) and (4) show that head-only land certification did

not influence the proportion of total clothing expenditures that was spent on women. Additionally, the impact of joint land certification on the proportion of clothing expenditure on women was not statistically different from the impact of head-only land certification. Columns (5) and (6) show that there were no statistically significant effects of land certification on the proportion of clothing expenditures spent on boys but the point estimates suggest that head-only certification was accompanied by a two percentage point increase in the proportion of clothing expenditures spent on boys. Models (7) and (8) show that head-only certification was accompanied by a one percentage point drop in clothing expenditure share spent on girls (not statistically significant). Joint certification, however, increased girls' share by three percentage points. Overall, the results in the first panel indicate that including women in the land certification shifted resources away from men to girls. There is some weak evidence that head-only certification increased resources allocated to boys. A caveat regarding the generalization of these results is that clothing expenditures represent a small fraction of consumption.

The bottom panel of Table 2.5 examines log clothing expenditures. Although most of the estimates in the bottom panel are not precisely estimated, the point estimates suggest that 1) head-only certification was accompanied by an increase in men's and boys' clothing expenditures and a decrease in women's and girls' clothing expenditures, and 2) joint land certification was associated with a statistically significant increase in women's and girls' clothing expenditures without a corresponding drop in men's and boys' expenditures.

Previous research argues that improvements in women's property rights may fail to enhance the position of women if institutions and norms continue to constrain their ability to exercise those rights (Bhaumik, Dimova, & Gang, 2014; Joireman, 2008). In Table 2.6 I test

whether land certification had differential effects for women with low empowerment and those with higher empowerment by examining if the literacy of the household heads' wives moderated the impact of joint land certification. Model (2) in Table 2.6 shows that joint land certification, compared to head-only land certification, decreased the share of clothing expenditures spent on men by two percentage points in households where the wife was illiterate and an additional three percentage points in households where the wife was literate. Results in models (3) and (5) show the wife's literacy status did not modify the impact of joint land certification on women's or boys' clothing expenditure share. However, model (8) shows joint certification increased girls' clothing expenditure share with a larger increase observed in households where the wife was literate. The results in the first panel indicate that joint certification decreased expenditure on men and increased expenditures on girls for both households with a literate wife and those with an illiterate wife-only. However, these effects are larger in households where the spouse of the head is literate.

Results from the bottom panel mirror those from the top panel, with one exception: joint land certification was accompanied by an increase in boy's clothing expenditures in households with a literate wife but not in a household with an illiterate wife.

Table 2.5. Effect of land certification programs on clothing expenditures spent on men, women, boys, and girls

	(1) Men's	(2) Men's	(3) Women's	(4) Women's	(5) Boys'	(6) Boys'	(7) Girls'	(8) Girls'
Proportion of total clothing expenditure								
Post	-0.004	-0.000	-0.007	-0.010	0.021	0.021	-0.010	-0.011
	(0.015)	(0.013)	(0.013)	(0.017)	(0.013)	(0.016)	(0.024)	(0.025)
Post*JointCertificate	-0.026***	-0.031***	-0.010	-0.007	0.005	0.008	0.031***	0.029***
	(0.007)	(0.010)	(0.008)	(0.015)	(0.015)	(0.017)	(0.008)	(0.010)
R^2	0.191	0.198	0.191	0.200	0.228	0.234	0.238	0.245
Log monthly expenditure								
Post	0.187	0.196	-0.172	-0.229	0.251	0.238	-0.099	-0.115
	(0.206)	(0.198)	(0.213)	(0.230)	(0.239)	(0.238)	(0.224)	(0.211)
Post*JointCertificate	0.136	0.079	0.557**	0.571**	0.109	0.060	0.418***	0.373**
	(0.182)	(0.197)	(0.234)	(0.247)	(0.115)	(0.100)	(0.151)	(0.149)
R^2	0.526	0.535	0.493	0.504	0.572	0.587	0.541	0.558
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
Observations	7,097	7,004	7,097	7,004	7,097	7,004	7,097	7,004

Notes: 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. Monthly expenditure in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Bootstrapped standard errors clustered on region in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2.6. Moderating effect of literacy on impact of land certification programs on clothing expenditures spent on men, women, boys, and girls

	(1) Men's	(2) Men's	(3) Women's	(4) Women's	(5) Boys'	(6) Boys'	(7) Girls'	(8) Girls'
Proportion of total clothing expenditure								
Post	0.001	0.002	0.000	-0.003	0.010	0.012	-0.011	-0.011
	(0.017)	(0.014)	(0.013)	(0.018)	(0.013)	(0.016)	(0.026)	(0.026)
Post*JointCertificate	-0.020***	-0.023***	-0.016*	-0.013	0.016	0.019	0.020**	0.017**
	(0.004)	(0.009)	(0.009)	(0.017)	(0.016)	(0.018)	(0.008)	(0.009)
Post*JointCertificate*WifeLiterate	-0.033***	-0.032***	-0.017	-0.005	0.000	-0.008	0.050***	0.046***
	(0.005)	(0.008)	(0.013)	(0.018)	(0.016)	(0.013)	(0.014)	(0.015)
R^2	0.187	0.192	0.192	0.201	0.227	0.232	0.240	0.245
Log monthly expenditure								
Post	0.146	0.177	-0.156	-0.206	0.274	0.275	-0.081	-0.089
	(0.202)	(0.192)	(0.212)	(0.225)	(0.218)	(0.213)	(0.262)	(0.250)
Post*JointCertificate	0.197	0.143	0.533**	0.569**	-0.001	-0.041	0.281*	0.265*
	(0.195)	(0.207)	(0.267)	(0.272)	(0.112)	(0.102)	(0.166)	(0.153)
Post*JointCertificate*WifeLiterate	-0.015	-0.037	0.072	0.026	0.245***	0.123***	0.362***	0.244***
	(0.164)	(0.145)	(0.083)	(0.084)	(0.027)	(0.032)	(0.058)	(0.087)
R^2	0.523	0.531	0.492	0.501	0.571	0.585	0.544	0.560
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
Observations	6,697	6,618	6,697	6,618	6,697	6,618	6,697	6,618

Notes: 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. Monthly expenditure in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Bootstrapped standard errors clustered on region in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

As shown in Table A.2, including an interaction between year of observation and whether the wife of the household head was literate at baseline yields similar results to those in Table 2.6. A caveat regarding the generalization of these results is that clothing expenditures represent a small fraction of consumption.

Next, I examine in Table 2.7 the effect of land certification on intrahousehold allocation of resources towards five human capital inputs: non-purchased food, purchased food, clothing, healthcare, and education. Model (1) in the first panel examines the proportion total household consumption allocated to non-purchased food (i.e. home-grown, gifts, in kind wages, and loans) controlling for household fixed effects, and year of observation. Model (2) adds controls for time-varying household and agricultural characteristics and yields similar results. Including women in land certification did not have a statistically significant impact on the proportion of total household consumption allocated to non-purchased food. However, the point estimate suggests that inclusion of wives in land certification increased the proportion of total household consumption allocated to non-purchased food by seven percentage points. Models (3) and (4) show that including spouses in the land certification had not statistically significant impact on the proportion of household consumption on purchased food although the point estimates suggest a decline. Models (5)-(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, a one percentage point increase in healthcare consumption share and no change in education consumption share.

The second panel of Table 2.7 presents results for the effect of land certification programs on 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 increased consumption of non-purchased food and healthcare by 58% and 33% respectively, and decreased education consumption by 28%. Results using log *per capita* consumption are similar to those presented in Table 2.7 and for the sake of brevity I present only results for log consumption.

In Table 2.8 I examine whether joint land certification had different effects for households with literate and illiterate wives. Model (2) shows that jointly-issued land certificate programs had different effects on households depending on whether the household head's wife was literate or illiterate. Including women in land certification increased the proportion of total household consumption allocated to non-purchased food in households with an illiterate wife by nine percentage points. Having a literate wife decreased the effect by seven percentage points. On the other hand, including spouses in the land certification reduced proportion of household consumption on purchased food by about eight percentage points in households with an illiterate wife but the decrease was more modest in households with a literate wife. Models (5)-(10) show that there were no statistically significant differences between households with an illiterate wife and those with a literate wife on the effects of joint land certification on clothing, healthcare and education, although the point estimates on the effect of joint land certification on healthcare indicate a decrease in healthcare spending in households with literate wives.

Table 2.7. Effect of land certification programs on household expenditure patterns

	(1) Food not purchased	(2) Food not purchased	(3) Food purchased	(4) Food purchased	(5) Clothing	(6) Clothing	(7) Health care	(8) Health care	(9) Education	(10) Education
Proportion of total household consumption										
Post	-0.049	-0.052	0.015	0.014	0.027	0.028	-0.001	-0.000	0.000	-0.000
	(0.031)	(0.038)	(0.062)	(0.067)	(0.021)	(0.021)	(0.002)	(0.002)	(0.003)	(0.003)
Post*JointCertificate	0.065	0.070	-0.064	-0.061	-0.023***	-0.026***	0.008***	0.008***	-0.001	-0.001
	(0.055)	(0.046)	(0.082)	(0.070)	(0.007)	(0.006)	(0.003)	(0.002)	(0.002)	(0.002)
R^2	0.340	0.349	0.283	0.297	0.237	0.246	0.194	0.196	0.227	0.232
Log monthly consumption										
Post	-0.470	-0.510*	0.225	0.179	0.369	0.345	0.023	0.028	0.599***	0.545***
	(0.296)	(0.305)	(0.246)	(0.258)	(0.230)	(0.228)	(0.149)	(0.195)	(0.155)	(0.137)
Post*JointCertificate	0.546**	0.577***	-0.147	-0.107	0.008	-0.005	0.328***	0.326**	-0.339**	-0.281**
	(0.248)	(0.203)	(0.229)	(0.213)	(0.149)	(0.122)	(0.122)	(0.132)	(0.159)	(0.133)
R^2	0.262	0.268	0.350	0.359	0.432	0.452	0.548	0.550	0.536	0.545
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
Observations	7,056	6,971	7,056	6,971	7,056	6,971	7,056	6,971	7,056	6,971

See Table 2.5 notes.

Table 2.8. Moderating effect of literacy on impact of land certification programs on household expenditure patterns

	(1) Food not purchased	(2) Food not purchased	(3) Food purchased	(4) Food purchased	(5) Clothing	(6) Clothing	(7) Health care	(8) Health care	(9) Education	(10) Education
Proportion of total household consumption										
Post	-0.054***	-0.058***	0.024*	0.027*	0.027***	0.027***	0.003	0.003	0.001	0.000
	(0.004)	(0.006)	(0.013)	(0.014)	(0.005)	(0.005)	(0.002)	(0.003)	(0.001)	(0.001)
Post*JointCertificate	0.079**	0.085***	-0.077	-0.077*	-0.021***	-0.025***	0.009	0.009*	-0.002	-0.001
	(0.039)	(0.032)	(0.054)	(0.046)	(0.002)	(0.002)	(0.006)	(0.005)	(0.001)	(0.001)
Post*JointCertificate* WifeLiterate	-0.078***	-0.068***	0.041**	0.031**	-0.017	-0.016	-0.023	-0.023	-0.002	-0.001
	(0.028)	(0.024)	(0.016)	(0.014)	(0.011)	(0.010)	(0.014)	(0.014)	(0.003)	(0.003)
R^2	0.347	0.356	0.289	0.302	0.237	0.245	0.196	0.197	0.230	0.234
Log monthly consumption										
Post	-0.386***	-0.434***	0.280**	0.233*	0.383***	0.340***	0.202***	0.206***	0.679***	0.616***
	(0.080)	(0.098)	(0.121)	(0.126)	(0.042)	(0.042)	(0.008)	(0.018)	(0.049)	(0.056)
Post*JointCertificate	0.551***	0.600***	-0.197	-0.160	-0.039	-0.040	0.225***	0.227***	-0.366***	-0.303***
	(0.123)	(0.083)	(0.129)	(0.129)	(0.051)	(0.034)	(0.028)	(0.066)	(0.043)	(0.044)
Post*JointCertificate* WifeLiterate	-0.747***	-0.715***	-0.155*	-0.144*	0.112	0.146	-0.273***	-0.275***	-0.334***	-0.307***
	(0.103)	(0.105)	(0.084)	(0.084)	(0.242)	(0.218)	(0.105)	(0.101)	(0.097)	(0.114)
R^2	0.304	0.308	0.350	0.358	0.429	0.446	0.550	0.552	0.536	0.542
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
Year dummies*WifeLiterate	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
Observations	6,661	6,589	6,661	6,589	6,661	6,589	6,661	6,589	6,661	6,589

See Table 2.5 notes.

The second panel of Table 2.8 presents results for the effect of land certification programs on log monthly expenditures. Models with time-varying controls show that, compared to head-only land certification, joint land certification increased consumption of non-purchased food and healthcare by 60% and 23% respectively, and decreased education consumption by 30% in households with illiterate wives. Having a literate wife decreased the positive effects of joint land certification on human capital inputs and increased the negative effects: the gains in non-purchased food and healthcare expenditure are eroded and the households spent statistically less on purchased food and on education.

I perform sensitivity analyses 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. First, I conduct the analyses 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 greatly change the estimated effects. As we see in Table A.3, the war is unlikely to be driving the results since effects are similar after excluding Geblen. Second, I examine data from the Annual Agricultural Sample Survey (Central Statistical Authority, 1999) which suggest that the war had no impact on the Tigray region economy: the total area of private peasant land devoted to growing crops increased by 13% from 1997/1998 to 1998/1999 and there was a 42% increase in total crop production in Tigray in the same period, reflecting a 26% increase in productivity per area of land. Over the same period Amhara region recorded a smaller increase in productivity (8%), whereas Oromia and SNNP recorded productivity declines (-4% and -17%, respectively).

Birth spacing and mortality

Table 2.9. Characteristics of rural Ethiopian children born before land reform (born between 1992 and 1997)

	Head-only certificate region		Joint certificate regions		No certificate regions	
	Mean	S.E.	Mean	S.E.	Mean	S.E.
Succeeding birth interval (months)	34.823	0.348	32.168	0.183***	28.898	0.381***
Preceding birth interval (months)	34.669	0.356	32.507	0.218***	29.389	0.457***
Died before age 1 years	0.094	0.007	0.109	0.003*	0.093	0.006
Died before age 5 years	0.155	0.01	0.179	0.005**	0.159	0.009
Female	0.484	0.008	0.487	0.004	0.474	0.008
Age	9.563	0.39	9.395	0.182	9.796	0.191
Birth order	3.765	0.066	3.919	0.036**	3.635	0.053
Mother's age at birth	26.061	0.194	25.925	0.106	25.018	0.176***
Mother is literate	0.050	0.008	0.145	0.007***	0.042	0.005
Observations	3,249		14,955		11,852	

Notes: Data adjusted for survey design. Statistically significant difference from head-only certificate region indicated with *** p<0.01, ** p<0.05, * p<0.1.
Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys

Table 2.9 compares the characteristics of rural children in the EDHS sample born before the start of land certification by type of land certificates issued. Mothers in joint certificate regions had the highest literacy rates, the largest number of children, and their children had higher child and infant mortality rates than children from other regions. The average birth interval for children in Tigray (the region that issued certificates to household heads) was 35 months, which is longer than the average intervals in regions that later issued joint land certificates and regions that did not issue land certificates. There were no differences in gender and age of children between Tigray, regions that issued joint certificates, and regions that did not issue certificates. Mothers' age at birth in Tigray was statistically the same as that in regions that would later issue joint certificates. Table 2.9 indicates that children in joint certificate regions were at a disadvantage compared to children in other regions. The difference-in-differences and difference-in-differences-in-differences analyses of birth spacing and mortality account for these differences across regions to the extent that they

are time-invariant.

Table 2.10. Estimates of effect of including women in land certification on succeeding birth interval (in months)

	(1) Δ pre- to post-certification	(2) Difference-in-differences	(3)	(4) Difference-in-differences-in-differences
All children				
Post*JointCert*Rural	0.427	-4.974***	4.463**	5.573***
	(0.622)	(0.806)	(1.743)	(1.667)
Post*Rural		8.371***	-8.297***	-9.408***
		(0.927)	(2.324)	(2.197)
Observations	21,967	44,631	49,313	49,313
Children with illiterate mother				
Post*JointCert*Rural	0.290	-5.185***	7.217***	8.035***
	(0.728)	(0.888)	(1.643)	(1.758)
Post*Rural		8.234***	-15.415***	-16.339***
		(0.987)	(2.886)	(2.805)
Observations	18,685	39,473	41,814	41,814
Children with literate mother				
Post*JointCert*Rural	1.439*	-2.477**	7.990	9.371*
	(0.747)	(1.013)	(5.089)	(5.429)
Post*Rural		10.238***	-2.521	-4.513*
		(1.360)	(2.831)	(2.498)
Observations	3,121	4,460	6,713	6,713
Controls:				
Post	Yes	Yes	Yes	Yes
Type of certification (head-only/joint/none)	No	Yes	Yes	Yes
Rural	No	Yes	Yes	Yes
Birth year dummies	No	Yes	Yes	Yes
Post*JointCertificate	No	Yes	Yes	Yes
Time since land certification	No	No	Yes	Yes
Rural*Type of certification (head-only/joint/none)	No	No	Yes	Yes
Rural*Birth year dummies	No	No	Yes	Yes
Rural*Time since land certification	No	No	Yes	Yes
Gender	No	No	No	Yes
Birth order	No	No	No	Yes
Head-only, joint & no certificate birth-year trends	No	No	No	Yes
Year of survey dummies	No	No	No	Yes

Notes: Post is a dummy equal to 1 if household observed after exposure to a certification program.
JointCertificate is a dummy equal to 1 if the child is in regions that issued certificates jointly to head and spouse.
Bootstrapped standard errors clustered on region in parentheses.
Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys.

Table 2.10 presents the results for estimates of the effect of land certification on birth spacing. The top panel shows results for all children in the sample. Model (1) examines succeeding birth intervals in rural Amhara, Oromia, and SNNP and shows that there was no change in succeeding birth intervals between the pre-certification period and the post-certification period in these regions. Model (2) uses a difference-in-differences approach to get an estimate of the causal effect of land certification. The model is estimated on a sample of children from rural areas of all regions in Ethiopia and shows that head-only land certification was accompanied by an eight-month increase in birth interval while joint land certification was accompanied by a smaller increase in birth interval. This result suggests that the inclusion of women in the land certification decreased birth intervals by five months. My preferred models are (3) and (4) which estimate a difference-in-differences-in-differences model on a sample of rural and urban child to account for any region-level factors that influenced birth spacing and that were correlated with the introduction of land certification. These models show that including women in land certification increased their children's succeeding birth intervals by 4-6 months. This effect corresponds to a 13-19% increase in birth intervals.

The second panel of Table 2.10 shows results on a sample restricted to children of illiterate mothers and the third panel is restricted to children of literate mothers. Results of the effect on birth spacing of including women in land certification from the difference-in-differences-in-differences models (models (3) and (4)), are similar across the two panels and suggest that joint land certification was associated with a similar increase in birth interval. The results in Table 2.10 suggest that joint land certification improved women's ability to space out births. A caveat of these results is that they are sensitive to the analytical approach

used indicating that they are influenced by how the comparison group is defined. I examine effects on preceding birth interval in Appendix Table A.4 and the results are qualitatively similar.

My final objective is to study whether the inclusion of women in land certification programs affected mortality of their children. Table 2.11 examines the effect of land certification on infant and child mortality. The top panel is restricted to children with illiterate mothers and the bottom to children with literate mothers. The difference-in-differences-in-differences models in the top panel suggest that head-only land certification had no effect on children's infant mortality and that the inclusion of women in land certificates reduced infant mortality by six percentage points. Similarly, head-only land certification was accompanied by a four percentage point decline (not statistically significant) in child mortality and that the inclusion of women in land certificates had no additional effect. The difference-in-differences-in-differences estimates in the bottom panel suggest that the effect of joint land certification on mortality was not statistically significantly different from that of head-only land certification among children of literate mothers. The results in Table 2.11 therefore indicate that the inclusion of women in land certification decreased the infant mortality rates of children of illiterate women but not of literate women

In Table 2.12 and Table 2.13 I separately examine effects on boys and girls. The results in Table 2.12 indicate that the inclusion of women in land certification decreased the infant and child mortality rates of daughters of illiterate women but not of literate women. The results from the difference-in-differences-in-differences models in Table 2.13 show that there was no statistically significant difference between the effect of head-only certification and joint certification on the mortality of boys' of either literate or illiterate mothers.

Table 2.11. Estimates of effect of including women in land certification on children's infant mortality (death before age 1 year) and child mortality (death before age 5 years)

	Infant mortality				Child mortality			
	Δ pre post	DD	DDD	DDD	Δ pre post	DD	DDD	DDD
Children with illiterate mother								
Post*JointCert*Rural	-0.030***	-0.007	-0.063*	-0.063**	-0.060***	-0.014***	-0.008	-0.013
	(0.004)	(0.004)	(0.032)	(0.032)	(0.003)	(0.005)	(0.041)	(0.041)
Post*Rural		0.004	0.001	0.004		-0.001	-0.045	-0.042
		(0.003)	(0.029)	(0.029)		(0.010)	(0.058)	(0.056)
Observations	28,347	57,450	60,971	60,971	15,027	33,166	35,420	35,420
Children with literate mother								
Post*JointCert*Rural	-0.019***	-0.023*	-0.009	-0.014	-0.061***	-0.089***	0.035	0.006
	(0.006)	(0.012)	(0.032)	(0.033)	(0.008)	(0.015)	(0.071)	(0.070)
Post*Rural		0.026***	0.021	0.024		0.088***	-0.085**	-0.060
		(0.010)	(0.016)	(0.017)		(0.021)	(0.037)	(0.038)
Observations	4,800	6,935	11,123	11,123	2,428	3,589	6,144	6,144
Controls:								
Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type of certification (head-only/joint/none)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Rural	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post*JointCertificate	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time since land certification	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Type of certification	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Birth year dummies	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Time since land certification	No	No	Yes	Yes	No	No	Yes	Yes
Birth order	No	No	No	Yes	No	No	No	Yes
Type of certification-specific birth-year trends	No	No	No	Yes	No	No	No	Yes
Year of survey dummies	No	No	No	Yes	No	No	No	Yes

Notes: DD=difference-in-differences. DDD=difference-in-differences-in-differences. Post is a dummy equal to 1 if household observed after exposure to a certification program. JointCertificate is a dummy equal to 1 if the child is in regions that issued certificates jointly to head and spouse. Bootstrapped standard errors clustered on region in parentheses.

Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys.

Table 2.12. Estimates of effect of including women in land certification on girls' infant mortality (death before age 1 year) and child mortality (death before age 5 years)

	Infant mortality				Child mortality			
	Δ pre post	DD	DDD	DDD	Δ pre post	DD	DDD	DDD
Girls with illiterate mother								
Post*JointCert*Rural	-0.025***	0.004	-0.064***	-0.062***	-0.058***	-0.007	-0.070	-0.069*
	(0.003)	(0.007)	(0.024)	(0.023)	(0.003)	(0.010)	(0.051)	(0.041)
Post*Rural		-0.004	-0.051*	-0.051*		0.001	-0.078	-0.081
		(0.004)	(0.026)	(0.027)		(0.012)	(0.059)	(0.053)
Observations	13,779	27,891	29,567	29,567	7,350	16,050	17,128	17,128
Girls with literate mother								
Post*JointCert*Rural	-0.012	0.002	0.025	0.017	-0.066***	-0.052**	0.002	-0.037
	(0.011)	(0.017)	(0.025)	(0.026)	(0.009)	(0.021)	(0.089)	(0.082)
Post*Rural		-0.016	0.046**	0.053**		0.007	-0.014	0.022
		(0.016)	(0.021)	(0.022)		(0.035)	(0.051)	(0.051)
Observations	2,375	3,436	5,494	5,494	1,178	1,756	2,992	2,992
Controls:								
Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type of certification (head-only/joint/none)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Rural	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post*JointCertificate	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time since land certification	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Type of certification	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Birth year dummies	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Time since land certification	No	No	Yes	Yes	No	No	Yes	Yes
Birth order	No	No	No	Yes	No	No	No	Yes
Type of certification-specific birth-year trends	No	No	No	Yes	No	No	No	Yes
Year of survey dummies	No	No	No	Yes	No	No	No	Yes

Notes: DD=difference-in-differences. DDD=difference-in-differences-in-differences. Post is a dummy equal to 1 if household observed after exposure to a certification program. JointCertificate is a dummy equal to 1 if the child is in regions that issued certificates jointly to head and spouse. Bootstrapped standard errors clustered on region in parentheses.

Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys.

Table 2.13. Estimates of effect of including women in land certification on boys' infant mortality (death before age 1 year) and child mortality (death before age 5 years)

	Infant mortality				Child mortality			
	Δ pre post	DD	DDD	DDD	Δ pre post	DD	DDD	DDD
Boys with illiterate mother								
Post*JointCert*Rural	-0.034***	-0.016**	-0.058	-0.063	-0.061***	-0.018**	0.048	0.027
	(0.005)	(0.006)	(0.067)	(0.069)	(0.006)	(0.007)	(0.059)	(0.060)
Post*Rural		0.012**	0.050	0.058		-0.004	0.024	0.043
		(0.006)	(0.045)	(0.045)		(0.011)	(0.070)	(0.071)
Observations	14,568	29,559	31,404	31,404	7,677	17,116	18,292	18,292
Boys with literate mother								
Post*JointCert*Rural	-0.026***	-0.049***	-0.056	-0.058	-0.057***	-0.108***	0.051	0.030
	(0.010)	(0.014)	(0.070)	(0.073)	(0.012)	(0.019)	(0.130)	(0.138)
Post*Rural		0.066***	0.003	0.002		0.142***	-0.132**	-0.123**
		(0.009)	(0.029)	(0.029)		(0.030)	(0.056)	(0.049)
Observations	2,425	3,499	5,629	5,629	1,250	1,833	3,152	3,152
Controls:								
Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type of certification (head-only/joint/none)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Rural	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post*JointCertificate	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time since land certification	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Type of certification	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Birth year dummies	No	No	Yes	Yes	No	No	Yes	Yes
Rural*Time since land certification	No	No	Yes	Yes	No	No	Yes	Yes
Birth order	No	No	No	Yes	No	No	No	Yes
Type of certification-specific birth-year trends	No	No	No	Yes	No	No	No	Yes
Year of survey dummies	No	No	No	Yes	No	No	No	Yes

Notes: DD=difference-in-differences. DDD=difference-in-differences-in-differences. Post is a dummy equal to 1 if household observed after exposure to a certification program. JointCertificate is a dummy equal to 1 if the child is in regions that issued certificates jointly to head and spouse. Bootstrapped standard errors clustered on region in parentheses.
Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys.

Conclusion

I study how improvements in women's land tenure security affect intrahousehold allocation of resources, birth spacing and child mortality by leveraging the variation in timing and gendered nature of Ethiopia's land certification programs. I use the program that provided land certificates to household heads, typically male, as a reference for the wealth effect of improved land tenure, and the difference in outcomes between households exposed to head-only certification and those exposed to joint certification as a measure of the effect of extending land tenure to women. I also investigate whether the prevailing status or empowerment of women influences the impact of improved women's land tenure security by comparing effects of land certification between households with literate and illiterate wives. I find that inclusion of women in land certification shifted expenditures away from men's goods in both literate and illiterate women's households. I then examine how women use their increased bargaining power and find that households exposed to joint land certificate programs with illiterate wives saw increases in non-purchased food and healthcare consumption. On the other hand, joint land certification in the context of households with literate wives was accompanied by a decline in food and healthcare consumption. I also find that inclusion of women in land certification programs increased birth intervals between children of both literate and illiterate mothers by 4-6 months. In my final analysis I find that inclusion of women in land certification reduces infant and child mortality of daughters of illiterate mothers by 6-7 percentage points but not of literate mothers or of sons (of either literate or illiterate mothers).

The different effects of joint land certification for illiterate and literate women might reflect the differing priorities of the two groups, which would influence what the women do

when they obtain stronger land tenure security. For instance, the children of illiterate or uneducated Ethiopian women are more likely to be malnourished and have higher infant and child mortality rates than those of literate or educated women (Asefa, Hewison, & Drewett, 1998). Illiterate women may therefore more acutely experience the effects of low levels of household resources and choose to allocate towards food and health care while literate women feel more acutely other pressures. Under this scenario, illiterate women will use their enhanced bargaining position to address their children's health and nutrition while literate women focus on other concerns.

The study findings suggest that joint land certification improved women's ability to space out births. I cannot establish from the current study whether this behavior stems from improved access to contraceptives, improved ability to negotiate for contraceptive use, or other mechanisms. However, the findings imply that women and men in Ethiopia have different fertility or birth spacing preferences and that policy reforms that influence women's land tenure rights may in turn affect the demographics.

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. My difference-in-differences-in-differences approach attempts to address this by using urban children as an additional control group and so the concern is restricted to phenomena in rural areas that are correlated with land certification rollout. 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 land tenure rights, education of women regarding their 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.

Further study would be required. 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.

The study results indicate that extending land tenure rights to women improved women's bargaining power within households. However, how the women choose to use their improved bargaining position depends on their prevailing conditions. Illiterate women, whose children are more likely to be undernourished and have higher mortality rates, use their improved bargaining power to increase household allocation towards home-grown and other non-purchased food and health care; and the mortality rates of their daughters decline. Land certification for literate women, on the other hand, is accompanied by declines in food and health care consumption, and the mortality rates of their children do not improve. Since changes in birth spacing are common to both literate and illiterate women's households, the improvements in the mortality of illiterate mothers' daughters are likely not due to changes birth spacing but due to changes in the share of household resources allocated to various household members and across different types of goods.

Improving women's land tenure has the potential to transform intrahousehold dynamics and hasten the realization of policy objectives. Agrarian societies should therefore consider women's land tenure security to be an important tool for health and development policy. Ultimately, gender inequalities in land tenure security should be addressed because of human rights concerns even in the absence of beneficial effects on health.

Chapter 3 Women's land ownership and their risk of HIV infection in Kenya

Introduction

About 1.3 million people in Sub-Saharan Africa die annually from HIV-related causes (UNAIDS, 2010). Although this is an improvement from the 1.4 million annual deaths a decade ago, there is growing recognition that rapid gains in controlling the epidemic will require efforts that incorporate structural approaches (Auerbach, Parkhurst, & Cáceres, 2011; Gupta, Parkhurst, Ogden, Aggleton, & Mahal, 2008; UNAIDS, 2010).

There is disagreement in the literature on whether poverty eradication would reduce HIV transmission in Sub-Saharan Africa. Some studies find that poverty is associated with increased risk of HIV infection (Aulagnier et al., 2011; Bulterys et al., 1994; Magadi, 2013; Seeley et al., 1994), others find decreased risk (Chao et al., 1994; Fox, 2010; Msisha, Kapiga, Earls, & Subramanian, 2008) and others find mixed or no associations (Durevall & Lindskog, 2012; Wojcicki, 2005). These conflicting findings might be partly explained by the fact that most studies have examined poverty at the household level. It is increasingly recognized that households are not egalitarian and that household wealth or income does not necessarily translate to women's wealth or income (Bobonis, 2009; Doss, 2013; Dunbar, Lewbel, & Pendakur, 2013). More importantly, studies on the effect of household wealth and income on health suggest that it matters who has control over the wealth or income (Aizer, 2010; Beegle, Frankenberg, & Thomas, 2001; Duflo, 2003; L. Haddad & Hoddinott, 1994; S. J. Lundberg, Pollak, & Wales, 1997; Maitra, 2004). Additionally, agriculture is the main economic activity for the majority of people in Sub-Saharan Africa, and land is therefore an important store of wealth and source of income (World Bank, 2010). However, most studies on poverty and HIV

do not include land assets in their measures of poverty.

Establishment and reinforcement of land rights for women may be a viable structural approach to HIV prevention in Sub-Saharan Africa. Women who have control of land have a larger say in household decisions and have more economic independence (Allendorf, 2007). Economic independence may enhance a woman's ability to negotiate safe sex with her partner and protect herself from HIV (Greig & Koopman, 2003; Loubiere et al., 2009). Unfortunately, large gender inequalities exist in Sub-Saharan Africa, with most land under the control of men (Tripp, 2004). Although reducing the gender inequality in land ownership may be one approach for HIV prevention, researchers have not examined whether land ownership could reduce women's vulnerability to HIV acquisition.

This paper examines how land ownership among women in Kenya, a Sub-Saharan African country, is related to HIV risk after controlling for household-level wealth and potential confounding factors. Specifically, I examine whether land ownership is associated with HIV infection and four HIV-risk behaviors: multiple sexual partnerships, engagement in transactional sex, unprotected sex, and unprotected sex with casual partners. The study focuses on women working in the agricultural sector who, due to their reliance on land for a livelihood, are most affected by land ownership (Peterman, 2011).

Literature Review

Reducing the gender inequality in land ownership may be one structural approach for HIV prevention. Conrad and Doss (2008) extend economic theory to explain the gendered nature of the HIV epidemic and the influence of access to property. In their framework, HIV sexual risk behavior is construed as a bargaining problem. Each individual engages in sexual risk behavior until the marginal benefit of the behavior exceeds the marginal cost. However,

since HIV infection is not immediately evident, perceptions of risk influence expectations of benefits and costs. In this framework, perceptions of risk include an individual's understanding of objective risks and ability to reduce those risks. Because of gender differences in access to resources, such as land, perceptions of risk are influenced by gender. For example, a woman may engage in unsafe sex because she is apprehensive about more apparent risks such as abandonment without resources. Unsafe sexual behaviors include unprotected sex, having multiple sexual partners, and exchanging sex for goods and services—i.e., transactional sex—which are known risk factors for HIV (National Institute of Allergy and Infectious Diseases, 2013). These risk behaviors are especially relevant in Kenya, the focal country of paper two in the dissertation, where they account for about 80% of all HIV transmission (Gelmon, Kenya, Oguya, Cheluget, & Hailee, 2009).

An individual's set of opportunities available outside a relationship determines bargaining power within the relationship. According to Conrad and Doss (2008) access to property empowers a woman by giving her the choice to leave a relationship in which she perceives increased risk for HIV or by enabling her to negotiate safer sex with her partner. Therefore, land ownership coupled with education about HIV risk, and equitable rights regarding what property women can take after separation or death of a spouse would increase women's ability to avoid HIV-risk behaviors. On the other hand, without access to land to secure their livelihoods, widows and women who leave relationships may resort to transactional sex and might not be able to protect themselves from contracting HIV (Villarreal, 2006).

Hypotheses

Based on this framework, I hypothesized that women's land ownership reduces HIV

acquisition in two ways. First, it reduces their involvement in risky economically-motivated relationships. If this mechanism is operative, land-holding women will be less likely to have concurrent sexual partners and less likely to engage in transactional sex, holding all other factors constant. Further, since transactional sex and other economically-motivated sexual acts are predominantly carried out by unmarried women and women who head their own households (Robinson & Yeh, 2011), the study tests whether this mechanism is operative by examining the association between land ownership and HIV infection status among women living in households headed by someone other than their husbands, e.g., the woman herself or her parents.

Second, women's land ownership increases their bargaining power within sexual relationships and thus increases their ability to protect themselves by using condoms. If this mechanism is operative, land-holding women will be more likely to use condoms than women without land, holding all other factors constant. An important factor to be considered is the relationship context since condom use in Kenya remains low and restricted to relationships where individuals' perceived risk of HIV acquisition is high (Bauni & Jarabi, 2003). Therefore, to test this mechanism, I examine the association between land ownership and: (1) condom use among women who perceived they had a high risk of getting infected, and (2) likelihood of engaging in unprotected sex with casual partners. Additionally, for women who are financially supported by their husbands, the increased bargaining power channel is the most likely mechanism for decreasing HIV acquisition (Buvé, Bishikwabo-Nsarhaza, & Mutangadura, 2002). Therefore, if this mechanism is operative, HIV prevalence among women living in husband-headed households will be lower among land-holding women.

Women's land ownership in Kenya

Women in most communities in Kenya traditionally had no rights to own or dispose of land but they enjoyed considerable access rights to land through their male relatives (Stamp, 1991). The land law introduced during the country's colonial period ignored these usufructuary rights, which eroded the already limited land rights for women(Stamp, 1991). Despite improvements to land policies in post-colonial Kenya, women's ownership of land remains lower than men's (Ministry of Gender, Children and Social Development, 2010). Since 1971, women and men are both eligible to own land in Kenya (Ikdahl, Hellum, Kaarhus, & Benjaminsen, 2005). However, the law does not provide for legal presumption of co-ownership of matrimonial property (Ikdahl et al., 2005). Furthermore, the general interpretation of the law tends to favor the patriarchal elements of the system inherited from the colonial administrators (Stamp, 1991), and abuses to women's property rights continue to occur (Walsh, 2003). The land registration process has also negatively affected women's rights to land ownership. The increased control over the process by the provincial administrations has made the system rigid to women and reinforced existing biases against women's rights (Aliber & Walker, 2006).

There have been reforms to reduce property rights abuses. For example, the 1991 Law of Succession Act enables wives and daughters to inherit land and some evidence suggests that women are turning to statutory institutions to register complaints to defend their land rights (Aliber & Walker, 2006). However, the land reforms in Kenya do not provide a natural experiment that can be utilized to estimate causal effects of land ownership. Instead I study the association between HIV and land ownership while controlling for a rich set of variables.

Methods

Data

Data for this analysis are from the 1998, 2003, and 2008-09 Kenya Demographic and Health Surveys (KDHS). KDHS are a set of nationally-representative population and health surveys conducted approximately every five years. Details on sampling and data collection are available publicly (Kenya National Bureau of Statistics & ICF Macro, 2010). Briefly, each survey drew a representative probability sample of approximately 10,000 households. All women aged 15 to 49 in the sampled households were eligible for the survey yielding response rates of 96%, 94%, and 96% in 1998, 2003, and 2008-09 respectively. The study sample is restricted to 5,511 women (22.5% of respondents) who reported working in the agriculture sector. HIV testing was introduced to KDHS in 2003 and conducted again in 2008-09, in every second household selected. Response rates for the anonymous HIV testing were 76% and 86% in the two years, respectively. I therefore restrict my analysis of HIV infection to the 1,589 women who were tested.

The main outcome of interest is HIV infection status coded as a dichotomous variable. HIV status was ascertained via blood samples tested using enzyme-linked immunosorbent assay tests. Confirmatory testing was conducted using Western blot (in 2003) and polymerase chain reaction (in 2008-09).

Four other outcomes are examined. The first, multiple sexual partnerships was measured as the total number of different people that respondents had sex with in the previous 12 months. Transactional sex was measured by asking: “Have you given or received money, gifts or favors in return for sex at any time in the last 12 months?” and responses coded as yes or no. Unprotected sex, also dichotomously coded, refers to whether a condom was used the last time the respondent had sex. This outcome is analyzed for women who perceived they had a high risk for acquiring HIV. Perceived risk was measured by asking whether

respondents thought their "chances of getting AIDS were small, moderate, great or no risk at all". A "moderate" or "great" response will be coded as high perceived risk. The woman's last sexual partner is considered a casual partner if it was an acquaintance or someone other than a spouse or regular partner. Information on the partner and condom use at the last sexual encounter is then combined to determine if the respondent engaged in unprotected casual sex.

The key independent variable, women's land ownership, was measured through a question asking whether the respondent worked on: a) her own land; b) family land; c) rented land; or d) someone else's land. I collapse the latter three categories into one reference category.

The control variables are age, rural residence, years of education, whether the woman had children, marital status (categorized as never married, married, cohabiting, widowed, divorced, and separated), a categorical variable representing province of residence (eight categories), and a categorical variable representing year of survey (categorized as 1998, 2003, and 2008-09). Household head is a binary variable indicating whether the woman's husband or a member of his family headed the household, or whether the woman herself, her parents or other people, headed it.

Analytical strategy

I use logistic regression to examine the association between land ownership and the dichotomous outcomes—HIV infection status, transactional sex, unprotected sex, and unprotected casual sex. To account for overdispersion of the discrete variable for number of sexual partners, I utilize a negative binomial regression when assessing its association with land ownership.

I control for women's age, education, marital status, rural residence, province of

residence, and year of survey in all models. The province of residence and year of survey controls account for spatial and temporal correlation between outcomes and women's land ownership. I adjust all results for the clustered survey design and incorporate survey sampling weights in all regression models. Specifically, I use the HIV testing sampling weights in HIV infection analysis and survey sampling weights for all other analyses.

In subsequent models, I include a control for household wealth to examine whether the associations between women's land ownership and the outcomes under study can explained by household-level wealth rather than women's (individual-level) land. KDHS constructs a household wealth index score based on household ownership of consumer goods, characteristics of the dwelling, source of drinking water, and type of toilet facilities (Filmer & Pritchett, 2001; Rutstein & Johnson, 2004). The wealth index score does not include landholdings. I rank the women in the sample according to their household's wealth score and then divide them into wealth quintiles, represented as a categorical variable.

In sensitivity analyses I examine the extent to which grouping together family land and other types of land affects results. I also examine the impact of restricting the sample based on the women's self-perceived risk for HIV and on receipt of HIV testing.

Results

Descriptive statistics

Table 3.1 Demographic and HIV risk characteristics of Kenyan women aged 15-49 who work in agriculture by type of land they work on

Variable	On own land	Not on own land	Total
Age in years, Mean (SD)	33.5 (8.6)	29.3 (9.3)	31.6 (9.1) **
Household wealth quintile			
Lowest	22.5%	19.0%	20.9% **
Lower	22.2%	18.7%	20.7%
Middle	20.5%	20.0%	20.3%
Fourth	17.9%	19.2%	18.5%
Highest	16.9%	23.1%	19.6%
Marital status			
Never married	1.8%	23.4%	11.3% **
Married	82.6%	56.3%	71.0%
Cohabiting	5.9%	6.1%	6.0%
Widowed	8.1%	5.2%	6.8%
Divorced	0.4%	2.8%	1.5%
Separated	1.3%	6.2%	3.5%
Education in years, Mean (SD)	6.1 (3.4)	6.3 (3.4)	6.2 (3.4) **
Rural residence	97.8%	94.7%	96.4% **
Has child/children	95.6%	80.5%	88.9%**
Household head			
Husband or husband's family	69.9%	49.2%	60.7%**
Province			
Nairobi	0.3%	0.6%	0.4% **
Central	13.3%	16.0%	14.5%
Coast	2.7%	3.8%	3.2%
Eastern	20.1%	14.6%	17.7%
Northeastern	0.0%	0.2%	0.1%
Nyanza	27.8%	23.6%	25.9%
Rift Valley	24.8%	29.4%	26.8%
Western	11.1%	11.9%	11.4%
Self-perceived risk of HIV/AIDS			
None/small	57.1%	64.5%	60.3%**
Moderate/great	42.8%	35.4%	39.6%
Already infected	0.1%	0.1%	0.1%
HIV infected	7.5%	7.3%	7.4%
Last sex act unprotected	97.0%	83.9%	91.3%**
Last sex act unprotected casual partner	1.3%	4.1%	2.4% **
Transacted sex in past year	2.1%	5.1%	3.4% **
Total past year partners, Mean (SD)	0.9 (0.3)	0.8 (0.5)	0.9 (0.4) **
N	3,014	2,497	5,511

Notes: Casual partner refers to acquaintances and people other than spouse or regular partners.** $p<0.01$,

*p<0.05, and + p<0.1 for test of difference between women working on own land versus not on own land.

Characteristics of the sample are presented in Table 3.1. About seven percent of those tested were HIV-infected and just over half (55%) of the sample worked on land they owned. Women working on their own land were older, less educated, more likely to be married, more likely to have children, and more likely to be in poorer households than those working on land they did not own. Women with land were also less likely to have engaged in transactional sex in the past year, less likely to have had unprotected sex with casual partners, and more likely, but not significantly, to be HIV-infected.

HIV-risk behaviors

I present results of the association between land ownership and HIV-risk behaviors in Table 3.2. All models control for age, marital status, years of education, rural residence, province of residence, and year of observation.

Model 1 shows that women who worked on their own land, compared to those working on land they did not own, had 3% fewer partners in the past year. This is a modest difference but it is characterized by a narrow confidence interval. Model 2 adds controls for household wealth and yields similar results. In this model greater household wealth is associated with more sexual partners.

Model 3 shows that landed women have 33% lower odds of engaging in transactional sex compared to women working on land they did not own. Model 4 includes controls for household wealth and the estimate remains unchanged. Greater household wealth is not linearly associated with past year transactional sex although women from households in the lowest wealth quintile have significantly higher odds of engaging in transactional sex compared to those in the lower and middle quintile.

Table 3.2 Regression of HIV risk behaviors on land ownership among Kenyan women aged 15-49

	Past year number of sexual partners (IRR)		Past year transactional sex (OR)		Unprotected casual sex[1] (OR)		Unprotected sex[2] (OR)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own land	0.97**	0.98*	0.67**	0.67**	0.66	0.64	1.05	1.02
	(0.95 - 1.00)	(0.95 - 1.00)	(0.46 - 0.99)	(0.46 - 0.99)	(0.36 - 1.21)	(0.35 - 1.18)	(0.57 - 1.92)	(0.57 - 1.84)
Household wealth quintile								
Lower		1.01		0.61**		0.80		0.84
		(0.97 - 1.06)		(0.37 - 1.00)		(0.40 - 1.62)		(0.39 - 1.80)
Middle		1.04*		0.52**		0.81		1.71
		(1.00 - 1.09)		(0.32 - 0.87)		(0.41 - 1.60)		(0.68 - 4.30)
Fourth		1.06**		0.96		0.48**		1.03
		(1.01 - 1.11)		(0.57 - 1.62)		(0.23 - 0.99)		(0.45 - 2.34)
Highest		1.08***		0.84		0.52		0.80
		(1.03 - 1.13)		(0.48 - 1.46)		(0.20 - 1.38)		(0.33 - 1.95)
p for trend for wealth		*0.001*		*1.000*		*0.137*		*0.959*
N	5,496	5,496	5,469	5,469	4,755	4,755	1,961	1,961

Notes: IRR = Incidence rate ratios. OR = Odds Ratios. Each column is derived from a unique regression model. All models adjust for age, marital status, years of education, rural residence, province of residence, and year of observation. 95% confidence intervals in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[1] Casual sex refers to sexual encounters with acquaintances and people other than spouse or regular partners.

[2] Sample restricted to women with high self-perceived HIV/AIDS risk.

Table 3.3 Logistic regression of HIV infection status on land ownership among Kenyan women aged 15-49 (odds ratios)

	All women		Women in husband-headed household		Unmarried women and women in non-husband-headed household	
	(1)	(2)	(3)	(4)	(5)	(6)
Own land	0.93	0.95	1.65	1.68	0.44**	0.46*
	(0.58 - 1.50)	(0.59 - 1.53)	(0.87 - 3.15)	(0.89 - 3.18)	(0.20 - 1.00)	(0.20 - 1.07)
Household wealth quintile						
Lower		1.56		1.52		1.52
		(0.72 - 3.38)		(0.55 - 4.27)		(0.58 - 4.02)
Middle		1.29		1.11		1.44
		(0.56 - 2.99)		(0.34 - 3.65)		(0.51 - 4.06)
Fourth		1.03		0.41		2.21
		(0.45 - 2.34)		(0.11 - 1.51)		(0.86 - 5.69)
Highest		1.88		1.77		2.05
		(0.77 - 4.59)		(0.46 - 6.74)		(0.72 - 5.87)
p for trend for wealth		*0.478*		*0.985*		*0.163*
Constant	0.06**	0.04**	0.09**	0.06**	0.09	0.06
	(0.00 - 0.99)	(0.00 - 0.61)	(0.01 - 0.84)	(0.01 - 0.51)	(0.00 - 4.20)	(0.00 - 2.65)
N	1,587	1,587	937	937	645	645

All models adjust for marital status, age, years of education, rural residence, province of residence, and year of observation. 95% confidence intervals in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The dependent variable in Table 3.2 Models 5 and 6 is a binary variable that is equal to one if the woman's last sexual was unprotected and with an acquaintance or someone other than a spouse or regular partner. Model 5 shows that land ownership was associated with 34% lower odds of engaging in unprotected casual sex although the estimate is not statistically significant. Model 6 includes controls for household wealth and yields similar results. Women from households in the lowest wealth quintile had higher odds of engaging in unprotected casual sex than those in other quintiles although the difference was only statistically significant when comparing the lowest and the fourth quintiles. Overall, there was no significant association between greater household wealth and unprotected casual sex.

Models 7 and 8 utilized the sample of women who perceived they had a high risk for acquiring HIV and show that there is no difference in the odds of having unprotected sex between landed women and women relying on land they do not own. There is also no association between household wealth and unprotected sex.

HIV infection

Results of statistical analysis of the relationship between land ownership and HIV infection status are presented in Table 3.3. The estimates in Model 1 of the association between land ownership and HIV infection status, controlling for marital status, age, years of education, rural residence, province of residence, and year of observation, suggests that there was no relationship. Stratifying the results by type of household head reveals that the estimate in Model 1 masks heterogeneity in the relationship between land ownership and HIV infection status. Model 3 shows that land ownership was not associated with HIV status among women living in husband-headed households and the point estimates suggest that landed women had higher risk. As shown in Model 5, for women not in a husband's household, working on own

land was associated with 56% lower odds of HIV-infection compared to working on someone else's land. Controlling for household wealth and leaves all the results unchanged. Additionally, household wealth is not associated with HIV infection.

Sensitivity Analysis

Restricting the sample to women who worked either on their own land or on family land left all the results qualitatively unchanged indicating that grouping together family land, rented land, and other people's land in the main analysis did not affect results. To examine whether results from the unprotected sex analysis were sensitive to the nature of self-perceived HIV risk, I further restricted the sample to women who did not trust their partner or who thought their partner had other partners, and obtained similar results to those presented in Models 7 and 8 in Table 3.2. I also conducted the risk behavior analyses on a sample restricted to women who were tested for HIV, as a test to examine whether those tested for HIV were different from those not tested, and obtained similar coefficient estimates.

Conclusion

This study examined the relationship between women's land ownership and risk for HIV, adjusting for potential confounders. I examined the association between land ownership and HIV infection status, and land ownership and two sexual risk behaviors: economically-motivated sex and unprotected sex. Consistent with reduced reliance on risky economically-motivated sexual relationships, I found that landed women had fewer sexual partners and were less likely to engage in transactional sex compared to women who worked on land they did not own. Additionally, the group most likely to engage in economically-motivated sexual relationships, i.e., women not in a husband's household, had lower odds of HIV infection if they owned land. I found no evidence to support the hypothesis that land ownership was

linked to decreased unprotected sex.

These findings suggest that the lower HIV risk that accompanied land ownership stemmed, in part, from landed women's reduced economic reliance on high-risk sexual partnerships and not from increased ability to negotiate safer sex practices. Land ownership may fail to increase women's bargaining power over safer sex due to social norms that hinder condom use, particularly within marriage (Bauni & Jarabi, 2003).

These findings also reflect a greater importance of women's own access to land over that of household-level wealth in women's risk for HIV. Household wealth was not associated with HIV infection status or with participation in unprotected sex or transactional sex, but was positively associated with number of sexual partners. Additionally, women in my sample who worked on their own land lived in poorer households than those working on family land or other types of land, suggesting that women's land ownership was not a mere reflection of the household's economic condition. This pattern has been observed in some African countries and could be due to the larger family size in households with landed women, which places a financial burden on the households (Deere & Doss, 2008). The findings emphasize that household-level wealth is not equivalent to wealth owned by women. Consequently, studies that examine the link between poverty and HIV should strive to differentiate between household- and individual-level measures of poverty.

This study has several limitations. First, even after including a set of control variables, selection bias cannot be ruled out. On one hand, land-holding women may be those who were already empowered even before land acquisition, which would bias estimates towards a stronger HIV protective effect of land ownership. On the other hand, land-holding women may survive longer after HIV infection, for example because of better nutrition (Allendorf,

2007), in which case we would expect HIV to be more prevalent among land-holding women. Second, a single survey question might not be sufficient to measure land ownership since land ownership is a multidimensional construct that encompasses factors such as legal authority to sell land, control over the use of the land, and control over land output (Doss, Grown, & Deere, 2008). Further, the self-reported levels of women's land ownership have not been validated because individual-level land ownership data are not available. Third, the cross-sectional nature of the data implies that reverse causality cannot be ruled out. In particular, use of HIV prevalence rather than incidence data would yield stronger associations if HIV-infection reduces women's ability to defend their land rights (Aliber & Walker, 2006).

Notwithstanding these limitations, this study is important since it is the first to examine the link between women's land ownership and HIV risk. The study findings point to gender inequalities in land ownership as an area for structural interventions. The recommendations put forth by the Food and Agriculture Organization of the United Nations (FAO) to address the gender gap in land ownership, such as educating women on their legal land rights, removing bureaucratic procedures that discourage joint ownership of land, and working with community leaders to align customary practices with rights for women, may therefore also address HIV risk (FAO, 2011).

Chapter 4 Son preference in parental time investments among Asian immigrants in the United States

Introduction

An extensive body of research documents the existence of son preference in many East and South Asian societies. These studies find that daughters are less likely to be born, and if born, less likely to live past childhood, go to school, receive medical treatment when sick, and live above subsistence compared to sons.[1] In this paper, I investigate if son preference or discrimination against daughters persists in families of East and South Asian origin in the U.S., a fast growing ethnic group in the country, by studying the quantity and quality of parental time investment in children.

Previous research shows that East and South Asian immigrants in the U.S. and Canada have boy-birth percentages at higher parity (second or higher births) that exceed what is biologically normal especially if previous children were girls, inferring that these immigrant parents exercised sex selection, and that bias against daughters continues to prevail even among East and South Asian families living in rich countries (Abrevaya, 2009; Almond & Edlund, 2008; Almond, Edlund, & Milligan, 2013). However, there is no research on whether parents of East and South Asian origin in the U.S. or in other non-Asian countries discriminate against daughters in their allocation of family resources including parental time on childcare and other activities with children, a critical, yet least studied, developmental

[1] See for instance, Chen, Huq and D'Souza (1981), Chung and Gupta (2007), Coale and Banister (1994), Das Gupta, Chung and Shuzhuo (2009), Guilmoto (2009) Jayachandran and Kuziemko (2011), Marcoux (2002), Nishikiori et al. (2006), Pande (2003), Sen (1990), UNESCO Institute for Statistics (2005), and World Bank (2011).

input that can impact abilities and outcomes later in life (Heckman, 2006). Examining East and South Asian immigrants in the U.S. can provide insights into whether the root cause of son preference in East and South Asia is economic or cultural. To a large extent culture and economics are inter-twined. Thus, it is difficult to ascertain whether gender discrimination within families is perpetrated by culture or economic necessity. However, by studying East and South Asians in the U.S. and comparing their behavior to U.S. natives or other immigrants who face similar macro-economic climate, this study addresses shortcomings of studies that are either based on samples in Asia or that compare people across different economies.

Bias against daughters is often linked to cultural norms that relegate daughters to a lower status than sons. For instance, in India, China, and Korea certain religious and funerary rituals can only be performed by sons (Chung & Gupta, 2007; Das Gupta et al., 2003). Family lineage in these and other patriarchal societies is traced through male offspring. Social institutions and norms in East and South Asian societies also limit the economic and educational opportunities of daughters and create a discriminatory environment against them.[2] Additionally, institutions that strengthen and perpetuate these cultural norms make investments in daughters bad economics. High cost of dowry, for instance, implies that daughters are a financial burden on families whereas sons draw dowry into the family. Daughters depart to join their husband's family after marriage and thus returns on any investments in daughters are unlikely to be reaped by their parents (Das Gupta et al., 2003; Dyson & Moore, 1983; Miller, 1985; Oldenburg, 1992; Rahman & Rao, 2004). Further,

[2] Studies of gender discrimination in China and India find that improved earnings and employment opportunities for women are linked to decreased female child mortality (Ram, 1984, Rosenzweig & Schultz, 1982), increased investments in education of girls (Jensen, 2010, Qian, 2008), and improvement in girls' nutrition (Jensen, 2010).

because of lack of institutions for elderly care in these countries, sons are considered the primary support in old age and therefore investments in sons have economic payoffs in old age (Chung & Gupta, 2007).

To the extent that economic factors are its primary cause, I expect to find little or no gender bias in parental investments in families of East and South Asian origin in the U.S. where labor market prospects for women are significantly better, where nearly universal Social Security benefits weaken dependence on sons for old age economic support, and where East and South Asian immigrants live in much improved economic conditions. On the other hand, if gender bias is rooted in culture, I expect parental investment in East and South Asian households to reflect son preference or greater son preference compared to other households.

A common assumption in the studies on the prevalence of son preference in allocation of family resources is that boys and girls live in families with similar characteristics. This assumption is untenable given previous research that has found prevalence of sex selection in East and South Asian families in Canada, South Africa and the U.S. Further, if fertility is driven by the desire to have a certain number of boys, as has been documented in East and South Asian countries, girls will end up in families with more children and therefore fewer resources per child. The simple difference in allocation of resources could be due to heterogeneity between families with sons versus those with daughters, and may not necessarily be an indicator of gender discrimination.

I use two strategies to verify that gender differences in parental investments are the result of parents' differential treatment of girls and boys and not family heterogeneity. First, I control for number of children in the family. Because quantity and quality of time with children is likely to differ by the age of the child, I do separate analyses for children by age

and estimate differences in investments between sons and daughters aged 0-5 and aged 6-17 years.

Second, I examine gender discrimination in parental time investment among second born children in families with male first borns. This specification assumes that the parents of male first borns will not engage in sex-selective abortion for their second child and thus gender of the second child will be randomly determined.

A concern of these strategies is that gender differences in parental investments may reflect differences between boys and girls (Behrman, 1997; Datar, Kilburn, and Loughran, 2010). I address this concerning by using U.S. natives or immigrants from non-Asian countries as comparison groups to investigate if there is a pattern in parental investments that is similar across parents from various regions of origin. If the gendered pattern of investment in children is similar across families of different regions of origin that would be an indicator that there may be some biological or emotional differences across genders that require parents to invest more time with children of a certain sex or that gender discrimination is not specific to East and South Asian cultures.

In supplementary analyses, I investigate if having a son influences the division of household labor between parents. Specifically, I study whether presence of a son aged 0-2 is associated with the time parents (mothers or fathers) spend on household chores and childcare. This analysis is restricted to families with at least one child less than two years old.

I use data from the American Time Use Survey (ATUS) from 2002-2012. A unique feature of these data is that they provide detailed information on how much time in a given day a parent spent with each child, how the time was spent, and who else was present during each activity. In the child-level analysis, I compare the total time and quality time that boys

and girls receive from one of their parents. A challenge to studying gender discrimination in allocation of family resources is that researchers often have to rely on household-level data to estimate individual-level allocation for which data are often not available (Kingdon, 2005). The advantage of using ATUS data is that I can study parental time investments made to each child in the family separately.

Literature Review

Empirical Evidence on Gender Bias in Parental Investments in Children

Earlier research on gender bias in parental investment has centered on developing countries particularly in East and South Asia where girls have higher mortality rates than boys while the mortality gap is non-existent or reversed in other countries with comparable or even lower economic prosperity and higher poverty (El-Badry, 1969; Guilmoto, 2009; Sen, 1990; UN, 2011). Compared to boys, girls in East and South Asia receive fewer health inputs including less prenatal care (Bharadwaj & Lakdawala, 2013), less medical treatment when ill (Chen et al., 1981; Khanna, Kumar, Vaghela, Sreenivas, & Puliyel, 2003), and poorer nutrition (including shorter duration of breastfeeding) (Barcellos, Carvalho, & Lleras-Muney, 2014; Deaton, 2008; L. J. Haddad, Peña, Nishida, Quisumbing, & Slack, 1996; Marcoux, 2002) especially in families with several daughters (Das Gupta, 1987; Pande, 2003), which may, at least in part, explain the gender mortality gap.[3]

Research on another human capital investment, education, points to a pro-male bias in East Asia, South Asia, Middle East, North Africa, Sub-Saharan Africa but not in Latin America or Southeast Asia (Bauer, Wang, Riley, & Zhao, 1992; Dancer & Rammohan, 2007;

[3] Female infanticide— the starkest manifestation of parental bias— has also been observed in parts of East and South Asia but it is often difficult to establish its prevalence (George, Abel, & Miller, 1992, Miller, 1987).

Dayioğlu, Kirdar, & Tansel, 2009; Grant & Behrman, 2010; Kingdon, 2005; Lancaster, Maitra, & Ray, 2008; Li & Tsang, 2003; Ota & Moffatt, 2007). Mishra, Roy and Retherford (2004) argue that presence and extent of gender discrimination largely depends on the birth order of the index child and the sex composition of older living siblings. They find that discrimination against girls is most visible in families with no living sons, particularly at birth orders 3 and 4+. The lack of evidence of discrimination against girls in other families could be on account of gender selection or heterogeneity between families with boys versus girls.

Two papers have investigated presence of gender bias in parental time with children in developing countries. Barcellos, Carvalho, and Lleras-Muney (2014) examine gender bias using the Indian and South African Time Use Surveys and find that boys receive more childcare than girls in India but find no gender differences in South Africa. They explicitly assume absence of sex-selective abortion or infanticide, which is untenable given the extensive prevalence of sex selective abortion and reports of infanticide across India. Brown (2006) examines if parents spend more time helping boys versus girls on homework in rural China and finds no gender differences. However, Brown's (2006) analysis does not account for differences between boys' and girls' families.

In recent years, researchers have turned attention to gender bias in parental investments in western countries. Studies based on U.S. data have two primary findings. First, fathers invest more time in sons than daughters and mothers invest more time in daughters than sons (S. Lundberg, Pabilonia, & Ward-Batts, 2007; Mammen, 2011; Yeung, Sandberg, Davis□Kean, & Hofferth, 2001). Second, time investment in children varies by birth order: parents spend more time on first-born children than second-born children (Price, 2008).

In the U.S., researchers have also investigated how son preference affects parental

behaviors, including fertility, marital status and work. Empirical evidence shows that first-born daughters have more siblings than first-born sons (Dahl & Moretti, 2008; Lundberg, 2005) and fathers work more hours and earn more after the birth of a son, which likely influences resources available for investments in children (Lundberg & Rose, 2002).[4] The last finding has also been replicated in German data (Choi, Joesch, & Lundberg, 2008). Further, women in the U.S. with first-born daughters are less likely to be married and if married more likely to get divorced compared to those with first-born sons (Dahl & Moretti, 2008; Lundberg, 2005). These studies thus show that boys and girls grow up under different family conditions. Thus studies of parental investment in children that disregard family heterogeneity are likely to arrive at biased conclusions.

A second category of research has examined differences in children's own time use by gender. A majority of these studies have also focused on developing countries. Larson and Verma (1999) review this large literature and conclude that in most developing country settings, boys have more free time than girls. More recent studies find corroborating evidence in India (Motiram & Osberg, 2010), Malawi (Nankhuni, 2004), and in Tanzania, Uganda, South Africa, and Kenya (Kes & Swaminathan, 2006). Larson and Verma's review also finds that in almost all regions of the world, and in both developed and developing countries, girls spend more time in household labor than boys except in the United States where they find no gender differences. These studies too assume that boys and girls live in families with similar characteristics, an assumption that is rejected by previous research. When families prefer sons

[4] Pabilonia & Ward-Batts (2007) find that Asian immigrants to the U.S. work less, compared to whites, after the birth of a son versus that of a daughter, and they attribute it to decreased specialization within Asian families after the birth of a son. Gangadharan & Maitra (2003) find that couples of Indian descent in South Africa wait longer to have another child after the birth of a son, which is not the case for couples from other ethnic backgrounds.

and follow male-biased stopping rules in childbearing, girls will end up in larger households than boys and receive less parental investments even when parents themselves do not discriminate within the household Yamaguchi (1989). I control for such fertility preferences and other observed and unobserved family characteristics using a number of strategies including controlling for family size, models that restrict samples to families with male first-born children, and a comparison group approach comparing families of East and South Asian origin with those of other ethnic groups.

The focus of this study is on migrant families from eight East and South Asian countries where there is strong evidence of discrimination against girls: Bangladesh, China, India, Japan, Korea, Nepal, Pakistan, and Taiwan. The impact of discriminatory treatment of girls, starting from conception, can be summarized by looking at the number of women "missing" due to higher than expected female mortality (Sen, 1990). 6.9% of women are "missing" in Bangladesh, 6.7% in China, 7.9% in India, 7.8% in Pakistan, and 4.7% in Taiwan, which represents over 89 million women and girls missing (Klasen & Wink, 2002). China, India, Korea, and Taiwan have some of the world's highest sex ratios at birth indicating that sex-selective abortion against girls continues in these countries (World Economic Forum, 2014), and there are reports that sex-selective abortion is on the rise in Nepal (Lamichhane et al., 2011). Bias against girls is also evident among parents who do not exercise abortion. For instance, mothers in Bangladesh, China, India, and Pakistan are more likely to obtain prenatal care when pregnant with a boy than with a daughter particularly when previous children are girls (Bharadwaj & Lakdawala, 2013). Bias against girls extends beyond health and into other parental inputs, for example, in educational investments. Women's enrollment in primary education lags behind that of men in India, Korea, Nepal, and Pakistan

while the reverse is true in most countries in the world (World Economic Forum, 2014). Other countries commonly considered part of East and South Asia have weaker evidence of son preference and I therefore do not include them (World Economic Forum, 2014).

Methods

Data

The study uses American Time Use Survey (ATUS) data for 2003-2012. ATUS, conducted annually, is a nationally representative survey of how people spend their time. ATUS surveyed about 136,000 households from 2003 to 2012. From each eligible household one person aged 15 years or more is randomly selected to complete the survey. Respondents are asked to recall all their activities in the 24-hour period starting at 4 am the previous day, the location of each activity and who else was present during the activity.

ATUS collects demographic information of the respondent and each household member. I refer to the respondents' co-resident children and grandchildren under the age of 18 as children.[5] I exclude from my sample 82,995 respondents who do not have children. Because prevalence of single parent households may differ across ethnic groups, I further restrict the sample to two parent families.[6] I use information on the respondent's, respondent's mother's and respondent's father's country of birth to determine country of origin. Appendix Table B.1 presents the composition of the East and South Asian sample by country of origin. Eighty-five percent of the respondents originating from East and South Asia are first- and

[5] About 4% of the respondents in the sample are grandparents; all others are parents. For convenience I use the term parents to describe both.

[6] In the data only 7% of East and South Asian families are headed by single parents compared to 21-23% single parent headed families for the other three groups. In supplementary analysis, I repeated the analysis including all family types and the results were similar.

second-generation immigrants from five countries: China, India, Japan, Korea, and Taiwan. For comparison I study three other groups: U.S.-born respondents who have U.S.-born parents (henceforth referred to as U.S. natives),[7] first and second generation respondents from Latin America; and first and second generation respondents from Europe, Canada, Australia, and Pacific. For convenience, throughout this paper, I use the term Europeans to describe first and second generation immigrants from Europe, Canada, Australia, and Pacific. Because of small sample sizes the ATUS data does not allow examination of gender discrimination among migrants from North Africa and the Middle East/Western Asia, a set of countries with strong evidence of son preference.

Because ATUS collects data from only one person in the household, I observe children's time use as they interact with the respondent. I therefore have complete information on the time that a respondent parent and his or her children spend together. I create two child-level outcomes by summing for each child (1) total time that the child and parent spend together, and, (2) following Price (2008), quality time that the child spent with the parent, which is time spent on activities where the child is either the focus of the activity or is interacting considerably with the parent.[8] Further, I group quality time between parent and child into six categories, namely time spent in physical care of, or looking after, the child; time spent reading to/with the child; time spent playing with the child, including playing sports or doing arts and crafts; time spent talking/listening to the child; time spent in doing

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[7] Restricting the analysis to U.S. non-Hispanic Whites leaves the results largely unchanged.

[8] Following Price (2008), quality time are activities coded by ATUS as "physical care for children", "reading to/with children", "playing with children, not sports", "arts and crafts with children", "playing sports with children", "talking with/listening to children", "looking after children", "homework", "home schooling of children", "eating and drinking", "attending performing arts", "attending museums", and "participation in religious practices"

homework; and time spent eating together with the child, and I study prevalence of gender discrimination with regard to each activity.

Appendix Table B.2 presents descriptive demographic data on male and female children in East and South Asian families and the other three comparison groups and shows that these families are similar on many important characteristics such as child's age, number of children, whether the respondent (i.e., parent) is female and parent's age. Sons and daughters in the East and South Asian sample are similar on all characteristics, which may be partly because of the small sample size. U.S. native, Latin American, and European sons and daughters are significantly different on several characteristics. Latin American daughters are more likely to have had a sibling born after them, and are in larger households than Latin American sons whereas European daughters are more likely to be the first-born than European sons. To ensure that my analysis on parental time-investments in children is not influenced by these differences, I run models restricted to families with male first borns.

I also examine the influence of children's gender composition on parents' time allocation towards childcare and household chores. Time parents spend on childcare is the sum of time spent caring for children, helping children, and on activities related to children's education and health. Time on household chores is the sum of time spent on activities coded by ATUS as "household activities", "household services", and "grocery shopping".

Empirical strategy

I first study the differences in parental time that sons and daughters receive in families of East and South Asian origin living in the U.S. Equation (1) describes the model specification estimated on a sample of East and South Asian families drawn from the American Time Use Survey:

(1) $$T_{ij} = \alpha_0 * ChildMale * Mother + \alpha_1 * ChildMale * Father + \alpha_2 * Mother + u_{ij}$$

where T_{ij} is the total time that a parent from family j spends with child i and is a function of the child's gender (a dummy variable indicating the child is male), a dummy variable indicating that the observation is from a mother's time diary (denoted by Mother), a dummy variable indicating that the observation is from a father's time diary (denoted by Father), and u_{ij} is the error term.

The coefficients of interest are: α_0 that measures the difference in average time that mothers spend with their sons versus daughters and α_1 that measures the difference in average time fathers spend with their sons versus daughters. These two coefficients will yield unbiased estimates of son preference in parental time investments in children under two assumptions. The first assumption is that the gender of the child is randomly determined and, the second, that there is no difference between families with more sons and those with more daughters. These are restrictive assumptions. First, male-biased fertility stopping rules lead to girls having more subsequent siblings than boys. Second, the gender composition of children is influenced by the extent of parents' son-preference. Consequently, the gender composition of children in gender neutral families will be randomly determined whereas families with extreme son-preference will have only sons.

I use two approaches to address these concerns and examine the robustness of the results. First, I add controls for family size (i.e., number of children aged 0-5 and number of children aged 6-17 years). Second, I estimate equation (1) on families with male first borns and at least one subsequent child, and compare the time spent with male second born children and female second born children. The intuition is that families with male first borns have little

pressure to have a male second child and so the sex of the second child is randomly assigned or close to randomly assigned. However, the population of parents of male first borns is likely to be more sex-discriminatory than the overall population because the group includes parents who had sex-selective abortions before their first child and parents who would have had sex-selective abortions had their first child been a girl. Therefore, to obtain a lower bound of bias against girls, I estimate a similar model for second born children in families with first born girls.

A potential shortcoming of approaches discussed is that child gender is likely to pick up other differences across boys and girls that induce parents to invest differently. To address this concern, I estimate similar analyses on samples of U.S. natives or immigrants from non-Asian countries. Specifically, I conduct the analysis on: U.S. native families, families of European origin and families of Latin American origin. If the gendered pattern of investment in children is similar across families from different regions of origin that may suggest presence of biological or emotional differences across genders that require differential parental investments.

I am interested in studying both the overall quantity and quality of time that parents spend with their children. I begin the analysis with two outcomes: total time that the respondent (parent) spent with the child and quality time received by the child, which is measured as time spent on activities where the child is the focus of the activity or activities with considerable parent-child interaction such as helping the child in her homework, reading to the child, eating together, etc. I also estimate gender discrimination in six major types of quality time activities with children as described earlier. I run the analyses separately by child age: children aged 0-5 and children aged 6-17 years.

Next, I investigate if presence of a young son affects the time parents allocate on childcare and household chores. For this, I examine if presence of a young son aged 0-2 years is associated with (i) the average time that mothers spend on childcare and household chores, (ii) the average time that fathers spend on childcare and household chores. I restrict my analysis to families with children aged 0-2 since that is the age group that requires most childcare time. This analysis is conducted with parent-level data and controls for parent and household characteristics, namely: the respondent's gender (mother or father), education (dummy variables representing less than high school, high school, some college or associate degree, and bachelor's degree or higher), and age (dummy variables representing 16-20, 21-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-65, 66+), and number of adults, sons, daughters, and children 0-5.

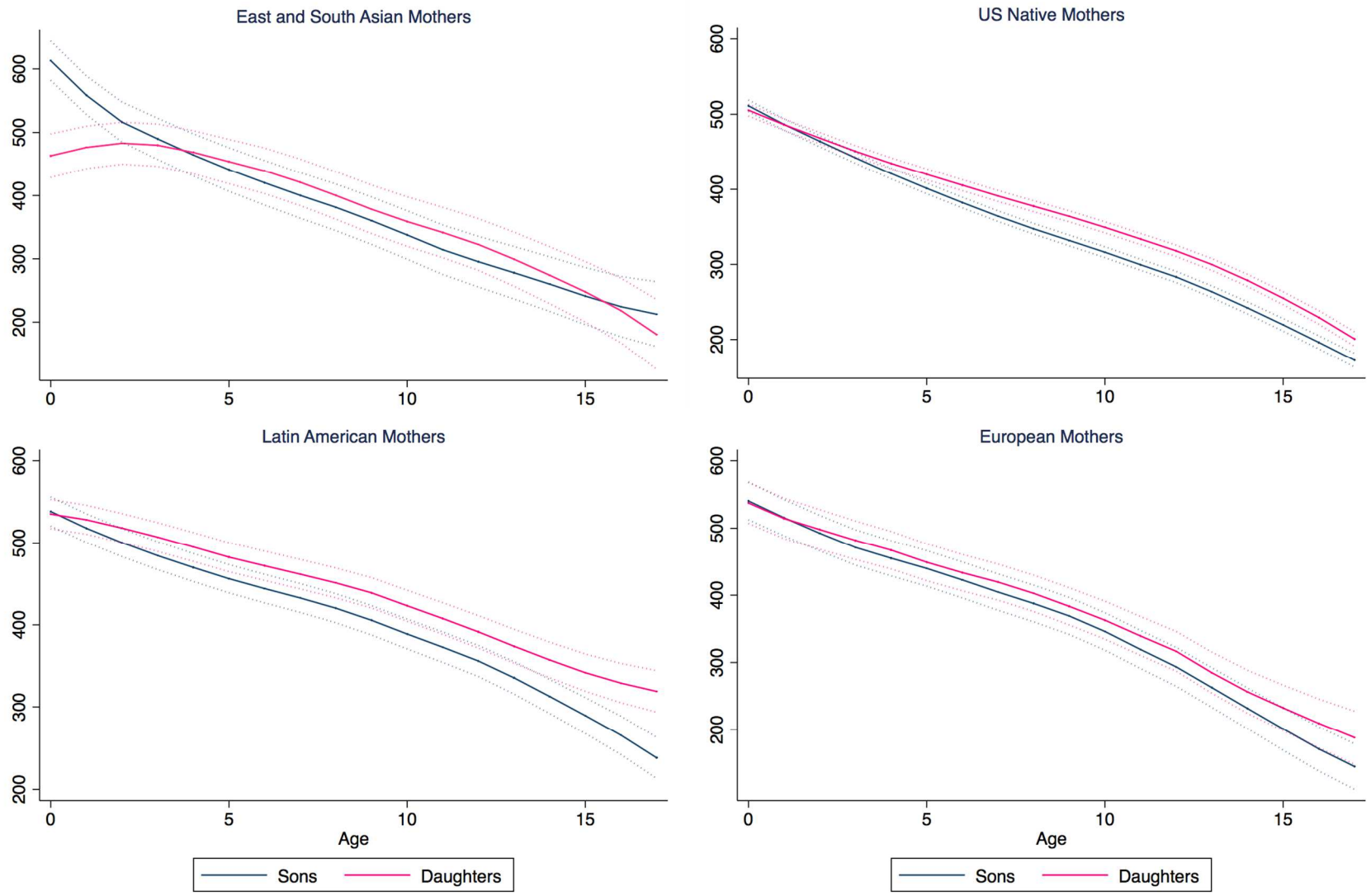

Figure 4.1 Locally weighted scatterplot smoothing (LOWESS) plots of total time spent with mother by age of child.
Note: Dotted lines show ± standard error at each year of age. LOWESS bandwidth = 0.6.

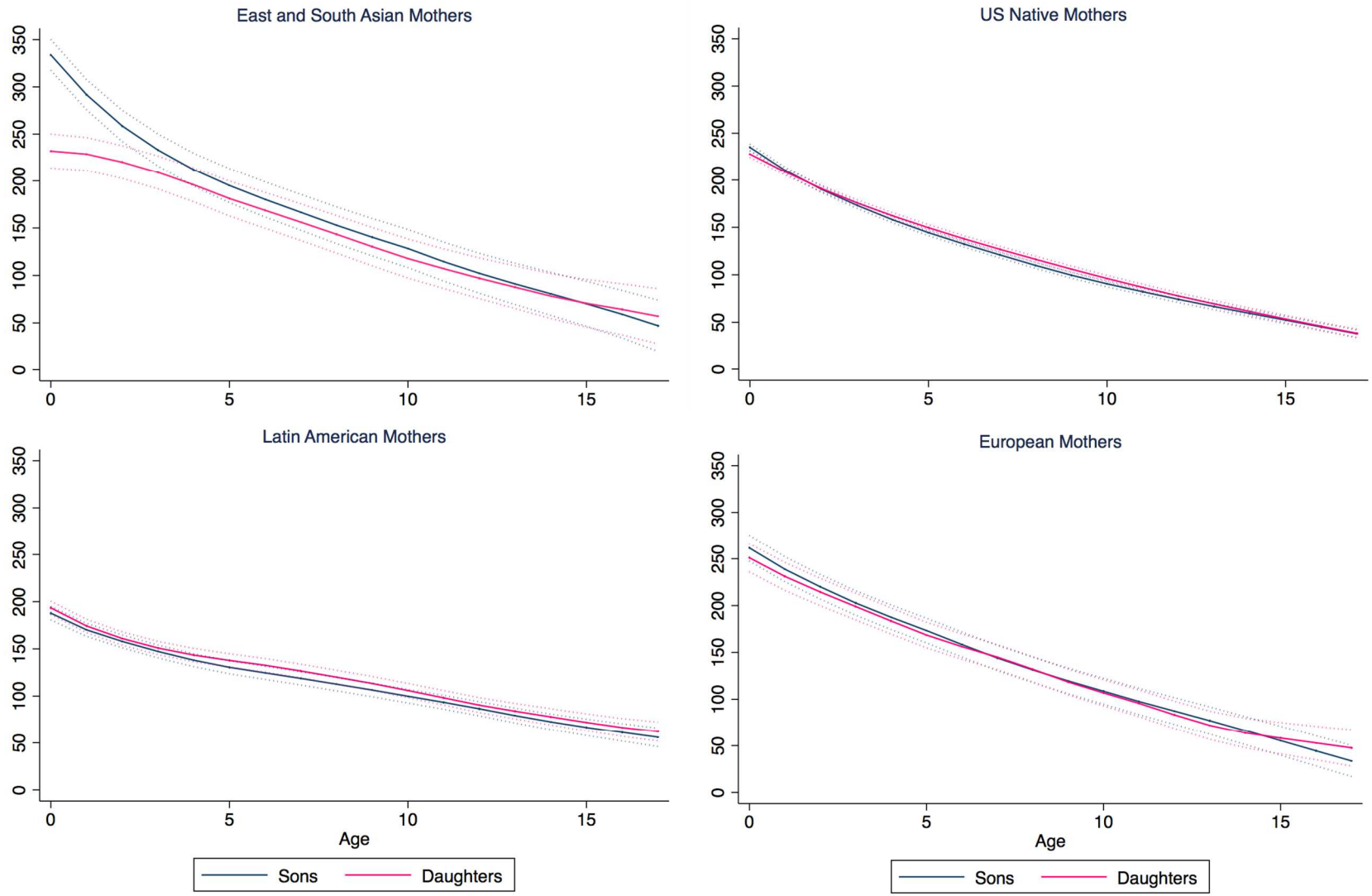

Figure 4.2 Locally weighted scatterplot smoothing (LOWESS) plots of quality time spent with mother by age of child.
Note: Dotted lines show ± standard error at each year of age. LOWESS bandwidth = 0.6.

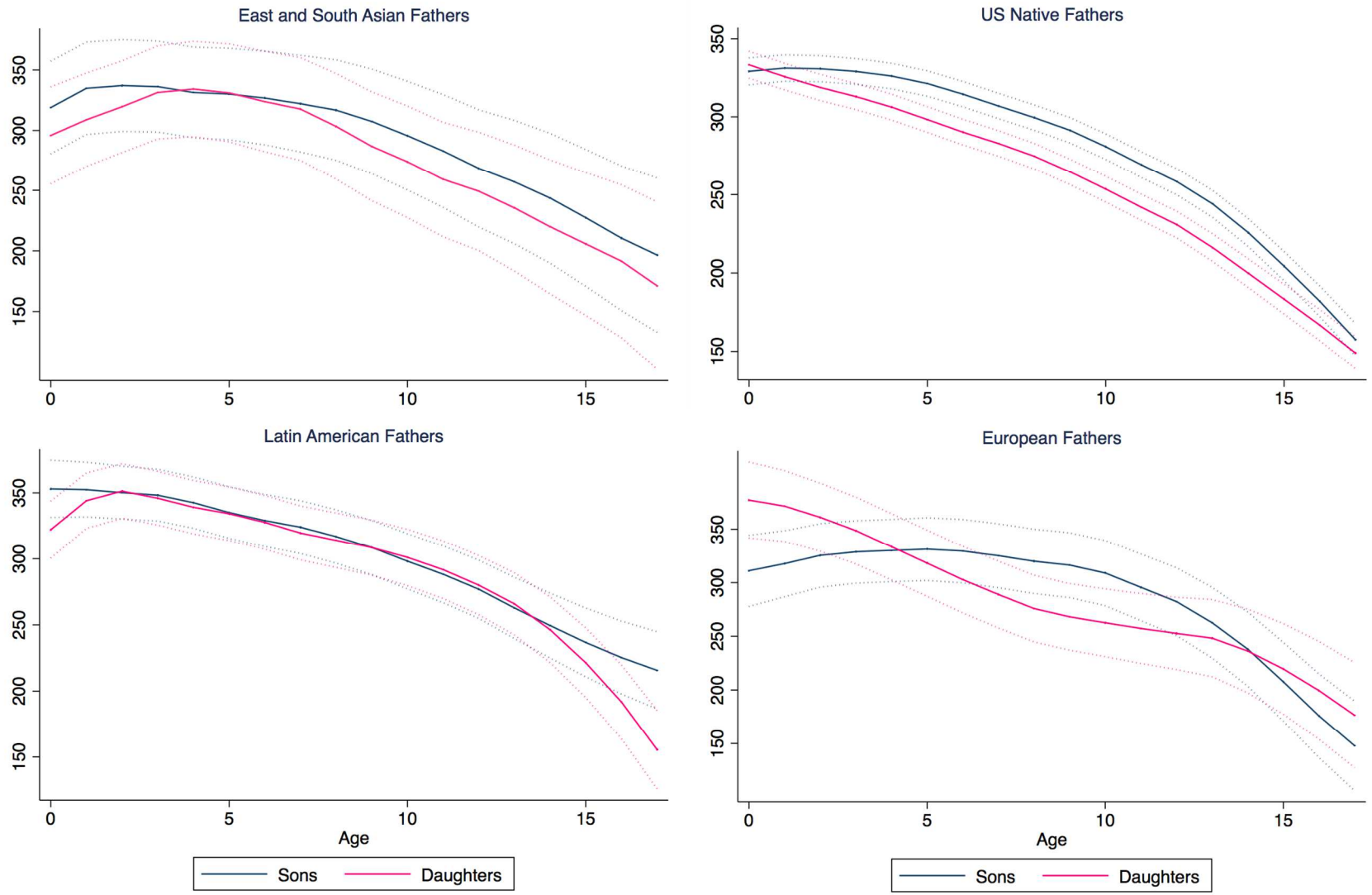

Figure 4.3 Locally weighted scatterplot smoothing (LOWESS) plots of total time spent with father by age of child.
Note: Dotted lines show ± standard error at each year of age. LOWESS bandwidth = 0.6.

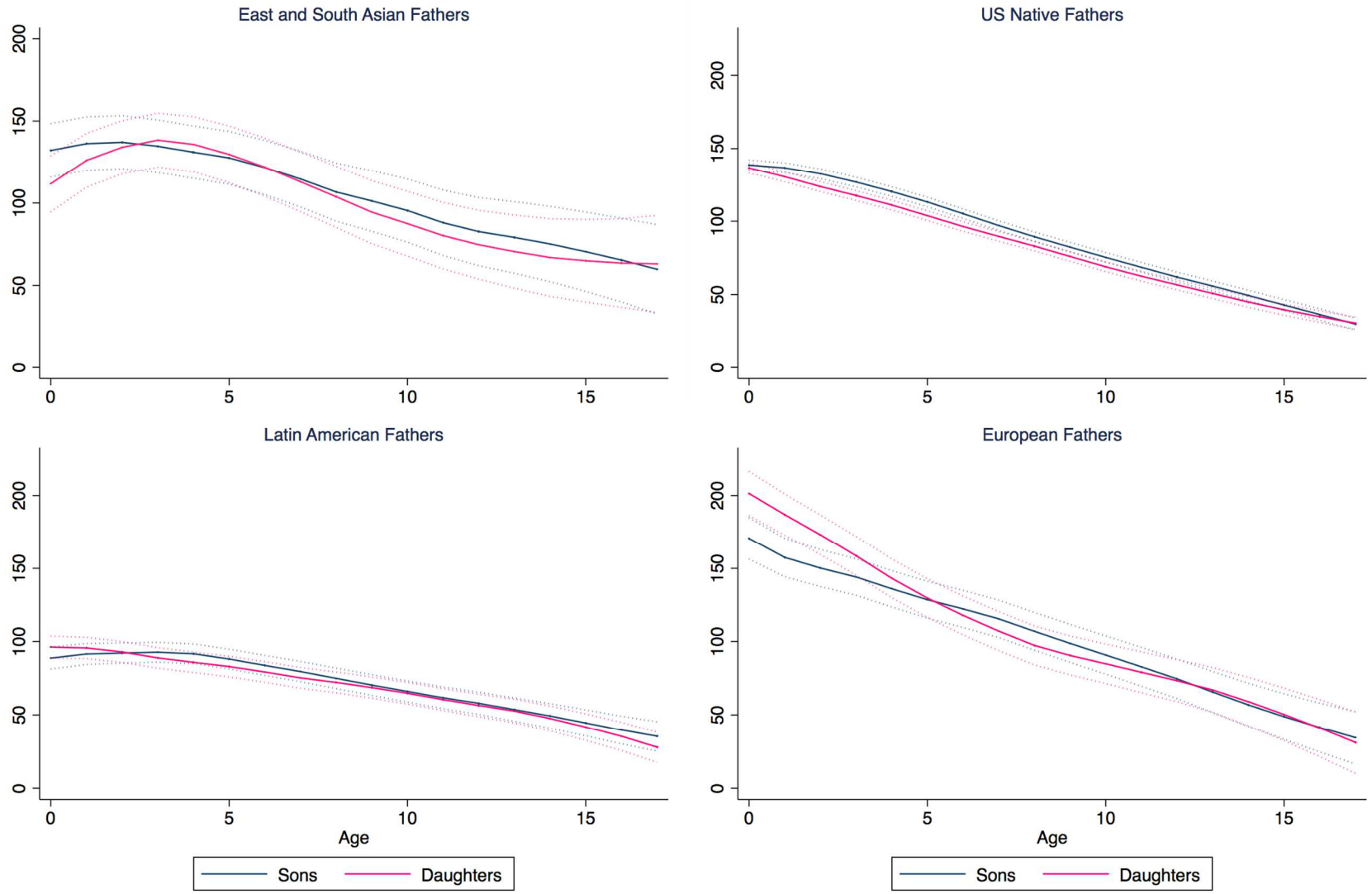

Figure 4.4 Locally weighted scatterplot smoothing (LOWESS) plots of quality time spent with father by age of child.
Note: Dotted lines show ± standard error at each year of age. LOWESS bandwidth = 0.6.

Results

Figures 4.1 and 4.2 present the locally weighted scatterplot smoothing plots of total time and quality time mothers spent with children by child age.[9] Figure 1 shows a distinct son preference in mother's total time in East and South Asian families when the children are young, which erodes over time as children age and turns into a modest daughter advantage for school-age children. In contrast, son preference among young children is negligible among U.S. mothers and European mothers and negative among Latin American mothers, and there is evidence of daughter preference for school-age children for all the three groups. Point estimates indicate that East and South Asian mothers spend more time with their younger sons (<2 years) than do other ethnic groups, and less time with younger daughters than other ethnic groups. The trajectories of total time by age with sons and daughters are curvilinear for East and South Asian mothers and approximately linear for other groups. East and South Asian mothers allocate more quality time on young sons than daughters, but this difference disappears as children age (Figure 4.2). The quality time that mothers from other ethnic groups spend with their children appears to be gender neutral.

Figures 4.3 and 4.4 present similar graphs on father's time with children by age. There is son preference in East and South Asian and U.S. native fathers' total time allocation, but not in quality time allocation. Latin American fathers appear to be gender neutral over most of their children's childhoods and European fathers exhibit a daughter preference with young children which turns into a son preference as children begin school in allocation of total time and diminishes in allocation of quality time.

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[9] Appendix Table B.3 presents the average total time per day that parents (fathers, mothers) spend with their sons versus daughters.

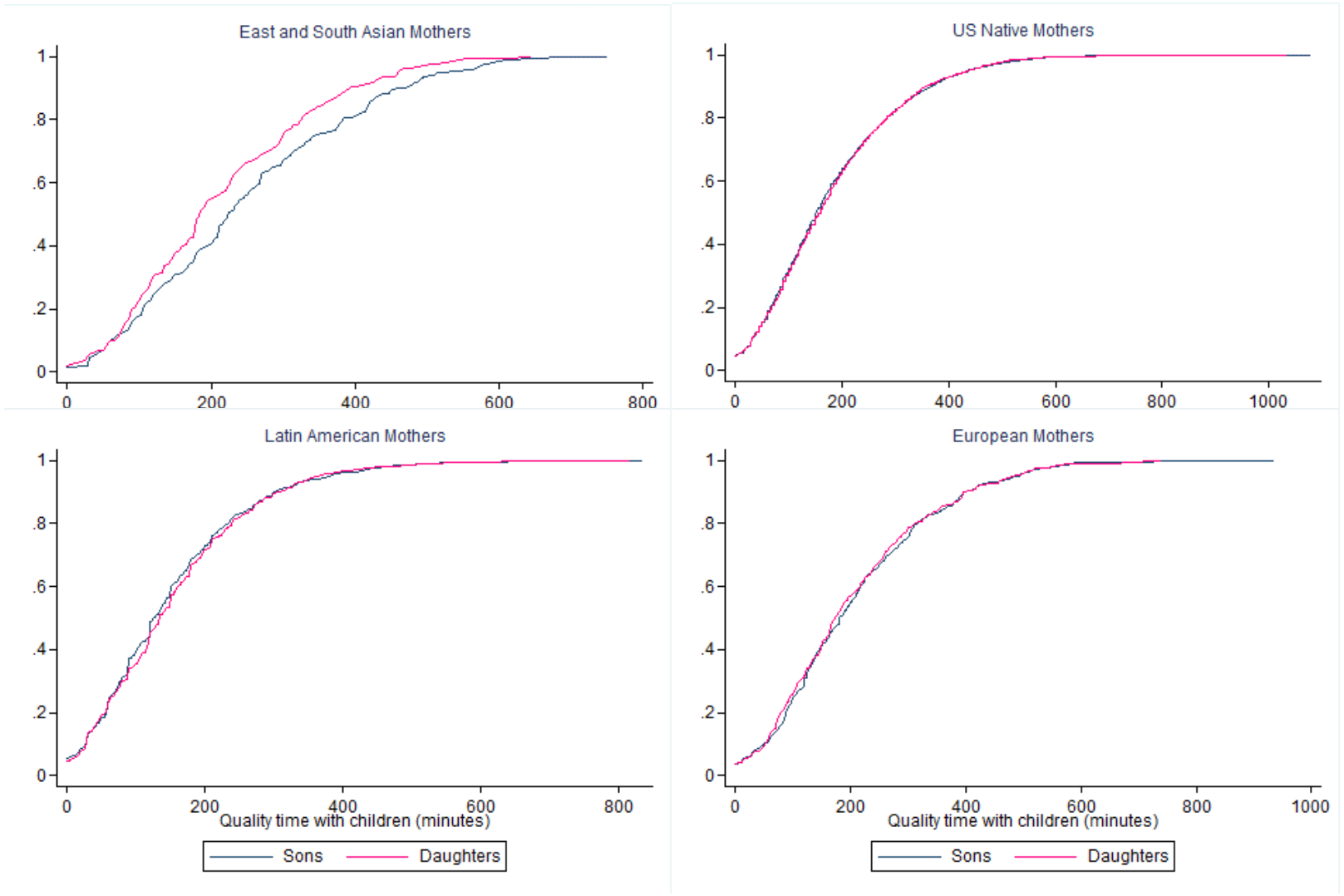

Figure 4.5 Cumulative distribution plots of quality time spent with mother among children aged 0-5 years.

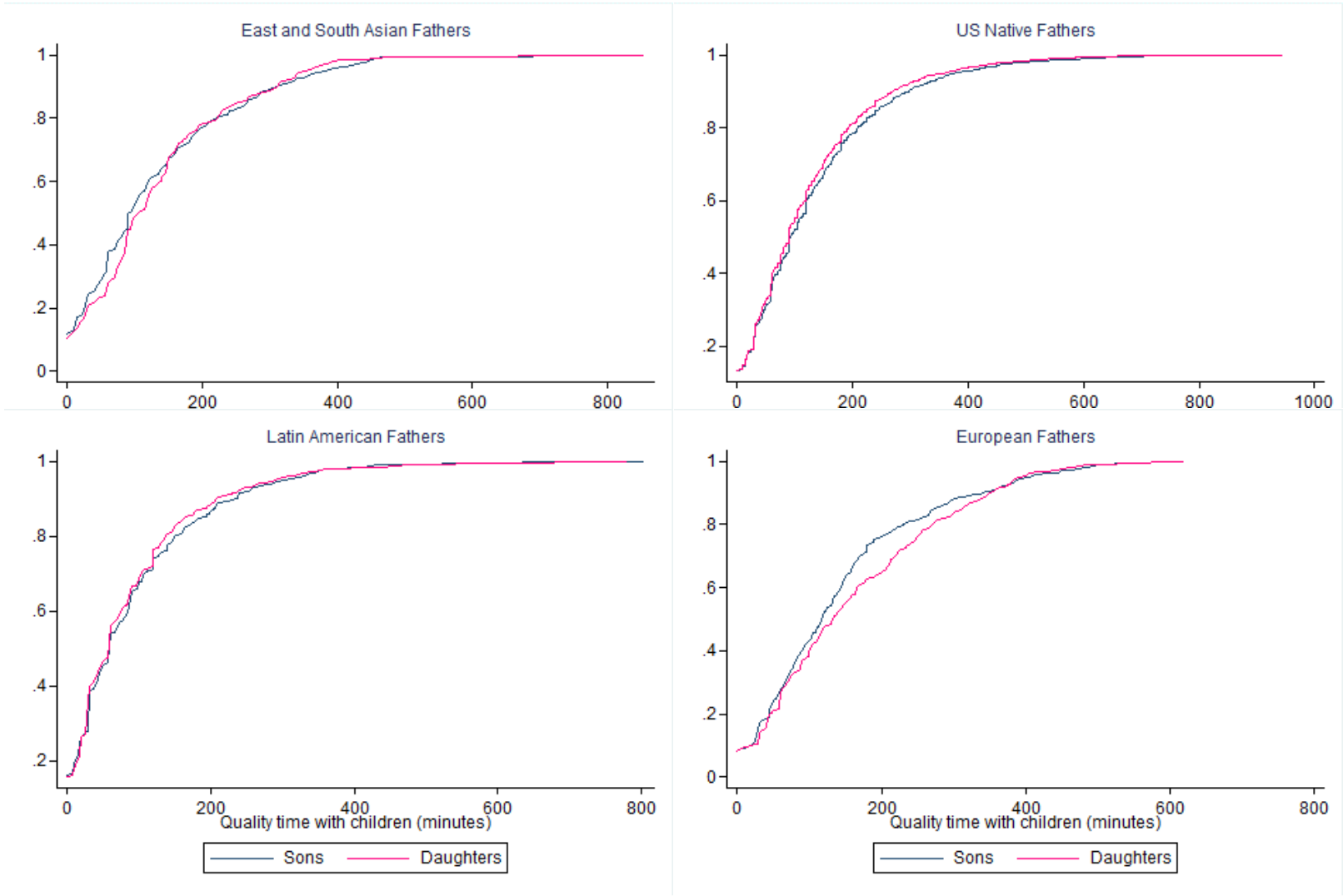

Figure 4.6 Cumulative distribution plots of quality time spent with father among children aged 0-5 years.

Figure 4.5 is an alternative summary of the data. The figure shows the cumulative probability plots of quality time spent by young children (aged 0-5) with their mothers. Among East and South Asian mothers, quality time with sons dominates quality time with daughters. There is no such clear separation between quality time with sons and daughters for mothers of the other ethnic groups. The separation between quality time with sons and with daughters among East and South Asian families is evident throughout the distribution indicating that statistical analyses will not be driven by outliers. Figure 4.5 also indicates that a negligible proportion of children (less than 1%) in all ethnic groups spend no quality time with their mothers alleviating concerns that results are influenced by zeros.

Figure 4.6 presents cumulative probability plots of quality time spent by young children (aged 0-5) with their fathers. U.S. native fathers spend slightly more quality time with their young sons than with young daughters whereas European fathers spend more quality time with their young daughters than with young sons. There is no clear evidence of gender bias among East and South Asian fathers and among Latin American fathers. Figure 4.6 also shows that less than 1% of fathers spend no quality time with their young children indicating that statistical analyses will not be driven by zeros in the data.

Tables 4.1 and 4.2 present regression results from the analyses outlined in equation (1). Because the quantity and quality of investments in children vary by child age, I do the analysis separately for children aged 0-5 (Table 4.1) and children aged 6-17 (Table 4.2). Model 1 controls for the gender of the respondent (mother or father). Models 2 adds controls for number of children aged 0-5 and number of children aged 6-17 years. The coefficient on the interaction term between male child and mother (father) estimates the average additional time that a mother (father) spends with sons compared to daughters.

Estimates in Panel 1, Model 1 show that fathers in East and South Asian families spend statistically the same amount of total time with young (aged 0-5) sons and daughters while mothers in these families spend 32 more minutes with young sons than with young daughters. These estimates will be biased if there are differences in family size between boys' and girls' families. I address this concern in Model 2, which controls for number of children, and the estimates remain unchanged.

I also find son preference in the quality time that East and South Asian mothers spend with their children. Model 2, the preferred model, suggests that East and South Asian mothers spend 35 more minutes of quality time with their young sons than with their young daughters, but fathers spend the same amount of quality time with sons and daughters.

Could it be that the son preference I observe in mothers' time with young children is because young boys in general have greater physiological and emotional needs than young girls? One way to answer this question is to study the pattern of parental time investments in other ethnic groups that are known to exhibit lower discrimination between sons and daughters. If the pattern of time investments are similar for these groups that would suggest that son preference is not unique to East and South Asian families and that there may be factors other than daughter discrimination that compel mothers to spend more time with sons than daughters.

Table 4.1 Estimates of son preference in parental time with children aged 0 – 5 years

	Total time		Quality time	
	(1)	(2)	(1)	(2)
Panel 1: East & South Asian Origin				
Male child*Father	8.9	8.9	-3.4	-4.0
	(23.7)	(23.6)	(10.3)	(10.2)
Male child*Mother	32.3*	31.4*	36.3***	34.9***
	(18.7)	(18.5)	(12.4)	(12.0)
Mean dependent variable (in minutes)	415.8	415.8	185.9	185.9
N	1,022	1,022	1,022	1,022
Panel 2: U.S. Native (3rd or higher generation)				
Male child*Father	13.7***	13.7***	9.2***	9.3***
	(5.0)	(5.0)	(2.5)	(2.5)
Male child*Mother	-6.9	-6.8	-1.3	-1.2
	(4.4)	(4.4)	(2.5)	(2.5)
Mean dependent variable (in minutes)	393.6	393.6	155.1	155.1
N	21,086	21,086	21,086	21,086
Panel 3: Latin American Origin				
Male child*Father	8.0	7.7	4.2	3.7
	(11.6)	(11.6)	(4.7)	(4.6)
Male child*Mother	-18.9*	-19.6*	-3.9	-4.9
	(10.1)	(10.1)	(5.0)	(4.9)
Mean dependent variable (in minutes)	431.5	431.5	125.9	125.9
N	4,212	4,212	4,212	4,212
Panel 4: European Origin				
Male child*Father	-26.3	-25.4	-16.4	-15.1
	(19.1)	(19.0)	(10.1)	(10.1)
Male child*Mother	-11.5	-11.4	4.4	2.4
	(16.6)	(16.7)	(10.4)	(10.2)
Mean dependent variable (in minutes)	415.6	415.6	183.5	183.5
N	1,472	1,472	1,472	1,472
Controls:				
Gender of parent	Yes	Yes	Yes	Yes
Number of children aged 0-5	No	Yes	No	Yes
Number of children aged 6-17	No	Yes	No	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a Panel are based on a separate OLS regression with minutes of total time with the child per day (or quality time per day) as the dependent variable. Robust standard errors clustered on family are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Panels 2 to 4 in Table 4.1 present results from this analysis. These estimates show that mothers and fathers of European origin spend the same amount of total and quality time with their young sons and daughters. Similar evidence of no gender preference is observed in the time allocation by U.S. native mothers and Latin American fathers. Fathers in American families, however, spend 14 additional minutes of total time and nine additional minutes of quality time with sons than with daughters and mothers in Latin American families spend the same quality time with sons and daughters but spend 20 more minutes of total time with daughters than with sons.

In Table 4.2, I examine whether there is any pattern of gender bias in parental time with school-age children (aged 6-17). Results from the preferred models (Model 2) show that East and South Asian parents spend statistically the same amount of time with school-age sons and daughters although the point estimates indicate fathers spend more time with sons and mothers spend more time with daughters. I find similar evidence of gender specialization in total time allocation on school-age children in U.S native and European families. Mothers in families of Latin American origin spend more total time and quality time with school-age daughters than sons; fathers, on the other hand, divide their time equally between sons and daughters. There is evidence of gender-specialization in quality time that parents spend with school-age children in U.S. native families, but the point estimates are small with parents spending four to five more minutes of quality time with children of their gender. In European and East and South Asian families, on the other hand, parental quality time with sons and daughters is statistically the same.

Table 4.2 Estimates of son preference in parental time with children aged 6 – 17 years

	Total time		Quality time	
	(1)	(2)	(1)	(2)
Panel 1: East & South Asian Origin				
Male child*Father	19.6	18.5	9.3	8.8
	(18.2)	(18.2)	(6.5)	(6.4)
Male child*Mother	-16.6	-15.9	9.6	10.0
	(16.7)	(16.5)	(7.3)	(7.2)
Mean dependent variable (in minutes)	307.1	307.1	104.2	104.2
N	1,322	1,322	1,322	1,322
Panel 2: U.S. Native (3rd or higher generation)				
Male child*Father	24.9***	25.1***	4.9***	5.1***
	(3.5)	(3.5)	(1.2)	(1.2)
Male child*Mother	-33.0***	-32.8***	-4.6***	-4.4***
	(3.3)	(3.3)	(1.2)	(1.2)
Mean dependent variable (in minutes)	282.7	282.7	77	77
N	39,649	39,649	39,649	39,649
Panel 3: Latin American Origin				
Male child*Father	1.7	4.4	1.4	2.6
	(9.3)	(9.2)	(2.7)	(2.7)
Male child*Mother	-38.6***	-37.5***	-6.8**	-6.3**
	(8.6)	(8.5)	(2.9)	(2.9)
Mean dependent variable (in minutes)	341.8	341.8	81.34	81.34
N	6,690	6,690	6,690	6,690
Panel 4: European Origin				
Male child*Father	27.5**	28.2**	2.6	3.1
	(13.7)	(13.7)	(5.1)	(5.2)
Male child*Mother	-23.6*	-24.3*	-0.8	-1.3
	(12.9)	(12.9)	(5.4)	(5.3)
Mean dependent variable (in minutes)	300.9	300.9	91.12	91.12
N	2,604	2,604	2,604	2,604
Controls:				
Gender of parent	Yes	Yes	Yes	Yes
Number of children aged 0-5	No	Yes	No	Yes
Number of children aged 6-17	No	Yes	No	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a Panel are based on a separate OLS regression with minutes of total time with the child per day (or quality time per day) as the dependent variable. Robust standard errors clustered on family are in parentheses. ***p<0.01, **p<0.05, *p<0.1

Table 4.3 Estimates of son preference in one-on-one quality time with children

	Children aged 0 - 5		Children aged 6 - 17	
	(1)	(2)	(1)	(2)
Panel 1: East & South Asian Origin				
Male child*Father	7.8	8.6	7.3**	6.5*
	(7.9)	(7.0)	(3.7)	(3.4)
Male child*Mother	20.0*	19.7*	5.4	5.4
	(11.7)	(10.3)	(4.5)	(4.1)
Mean dependent variable (in minutes)	75.67	75.67	22.29	22.29
N	1,022	1,022	1,322	1,322
Panel 2: U.S. Native (3rd or higher generation)				
Male child*Father	3.4**	4.4***	2.4***	2.5***
	(1.6)	(1.5)	(0.5)	(0.5)
Male child*Mother	2.0	1.5	-2.2***	-2.4***
	(2.0)	(1.8)	(0.6)	(0.5)
Mean dependent variable (in minutes)	48.23	48.23	14.43	14.43
N	21,086	21,086	39,649	39,649
Panel 3: Latin American Origin				
Male child*Father	2.6	1.3	2.5**	1.6
	(2.9)	(2.7)	(1.0)	(1.0)
Male child*Mother	1.5	-0.4	-0.2	-0.6
	(3.5)	(3.1)	(1.2)	(1.1)
Mean dependent variable (in minutes)	33.18	33.18	9.404	9.404
N	4,212	4,212	6,690	6,690
Panel 4: European Origin				
Male child*Father	2.7	4.1	-0.9	-0.8
	(6.8)	(6.1)	(2.8)	(2.7)
Male child*Mother	5.2	10.0	-2.1	-0.7
	(7.9)	(7.0)	(2.6)	(2.5)
Mean dependent variable (in minutes)	56.61	56.61	18	18
N	1,472	1,472	2,604	2,604
Controls:				
Gender of parent	Yes	Yes	Yes	Yes
Number of children aged 0-5	No	Yes	No	Yes
Number of children aged 6-17	No	Yes	No	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a Panel are based on a separate OLS regression with minutes of quality time with the child per day where only one child was present (other adults or non-household children might have been present) as the dependent variable. Robust standard errors clustered on family are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

The dependent variable in Table 4.3 is one-on-one quality time that parents spent with only one of their child. The estimates observed for one-on-one quality time yield similar conclusions to Tables 4.1 and 4.2 indicating that the results are robust to an alternative specification of parental time investment.

In Table 4.4, I examine whether there are differences in parental time investments on six quality time activities with young children: physical care, reading playing, talking, homework, and eating/drinking. All models control for number of children aged 0-5 and number of children aged 6-17. East and South Asian mothers spend about 16 more minutes of physical care, 12 more minutes of playtime, and six more minutes in eating and drinking (statistically insignificant) per day with their young sons compared to young daughters. On the other hand, East and South Asian fathers spend statistically the same amount of time on quality activities with young sons and daughters. A similar analysis for school-age children, presented in Appendix Table B.5, shows little evidence of differences in time spent on various quality time activities with sons and daughters in East and South Asian families.

The results presented are likely to be underestimates of gender bias since the gender composition of children is influenced by the level of son preference of parents. I address this limitation in Table 4.5 (Model 1) by examining quality time investment in second born children aged 0-5 among families with male first borns. This sample includes families that engaged in sex-selective abortion. Therefore, in Model 2, I obtain a lower bounds on the estimate of preferential treatment of sons by examining quality time investment in second born children among families with female first borns. An average of the two estimates weighted by sample size is presented in Model 3.

Table 4.4 Estimates of son preference in parental quality time with children aged 0 – 5 years

	Physical care	Reading	Playing	Talking	Home work	Eating
Panel 1: East and South Asian Origin						
Male child*Father	-2.3	0.1	0.1	0.9	-1.5	-2.6
	(4.2)	(1.1)	(5.8)	(0.7)	(1.4)	(4.9)
Male child*Mother	16.1*	-0.7	11.8*	1.2	1.8	5.7
	(8.9)	(1.6)	(7.0)	(1.1)	(1.6)	(4.8)
Mean of dependent variable	62.37	6.130	46.12	1.707	4.055	62.54
N	1,022	1,022	1,022	1,022	1,022	1,022
Panel 2: U.S. Native (3rd or higher generation)						
Male child*Father	3.3**	0.1	6.7***	-0.3	-0.2	-0.2
	(1.3)	(0.2)	(1.4)	(0.2)	(0.2)	(1.0)
Male child*Mother	-2.0	-0.0	2.3	-0.3	0.2	-1.6*
	(1.5)	(0.3)	(1.4)	(0.2)	(0.3)	(0.8)
Mean of dependent variable	57.06	4.690	39.20	1.634	1.727	48.56
N	21,086	21,086	21,086	21,086	21,086	21,086
Panel 3: Latin American Origin						
Male child*Father	-0.4	-0.4**	2.0	0.4	0.3	0.9
	(2.7)	(0.2)	(2.5)	(0.3)	(0.5)	(2.0)
Male child*Mother	-2.3	0.1	-1.0	0.1	0.5	-1.8
	(3.3)	(0.5)	(2.4)	(0.3)	(0.7)	(2.0)
Mean of dependent variable	43.76	1.808	23.51	1.086	2.829	51.64
N	4,212	4,212	4,212	4,212	4,212	4,212
Panel 4: European Origin						
Male child*Father	-1.8	0.5	-5.6	1.1*	-0.5	-6.5
	(4.2)	(1.1)	(6.7)	(0.6)	(0.5)	(4.1)
Male child*Mother	5.6	-0.7	-1.5	1.9*	-3.3**	0.2
	(5.9)	(1.7)	(6.3)	(1.0)	(1.4)	(3.7)
Mean of dependent variable	64.22	6.717	49.71	2.129	1.908	56.01
N	1,472	1,472	1,472	1,472	1,472	1,472
Controls:						
Parent's Gender	Yes	Yes	Yes	Yes	Yes	Yes
Number of children aged 0-5	Yes	Yes	Yes	Yes	Yes	Yes
Number of children aged 6-17	Yes	Yes	Yes	Yes	Yes	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a panel are based on a separate OLS regression with minutes of time with the child per day spent on the activity specified in the column heading as the dependent variable. Robust standard errors clustered on family are in parentheses.***p<0.01, **p<0.05, *p<0.1.

Table 4.5 Estimates of son preference in parental quality time with second born children aged 0 – 5 years

	Families with male firstborn (1)	Families with female firstborn (2)	Weighted average of (1) and (2) (3)
Panel 1: East & South Asian Origin			
Male child*Father	-9.0	-9.0	-9.0
	(24.7)	(24.1)	(17.3)
Male child*Mother	60.2**	36.3	48.8**
	(30.1)	(26.5)	(20.2)
Mean dependent variable (in minutes)	179	186.4	182.5
N	211	193	404
Panel 2: U.S. Native (3rd or higher generation)			
Male child*Father	7.2	6.3	6.8*
	(5.7)	(5.7)	(4.0)
Male child*Mother	3.8	0.5	2.2
	(5.5)	(5.9)	(4.0)
Mean dependent variable (in minutes)	153.9	151.3	152.6
N	3,907	3,861	7,768
Panel 3: Latin American Origin			
Male child*Father	-1.5	1.5	-0.0
	(10.7)	(11.9)	(8.0)
Male child*Mother	-12.2	-5.1	-8.8
	(11.5)	(11.8)	(8.2)
Mean dependent variable (in minutes)	130.5	125.8	128.2
N	771	727	1,498
Panel 4: European Origin			
Male child*Father	-28.0	-46.2**	-37.3**
	(25.8)	(21.2)	(16.6)
Male child*Mother	-24.2	4.1	-9.8
	(23.1)	(21.9)	(15.9)
Mean dependent variable (in minutes)	197.8	174.2	185.8
N	273	283	556
Controls:			
Gender of mother	Yes	Yes	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a Panel are based on a separate OLS regression with minutes of quality time with the child per day as the dependent variable. Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Estimates from Table 4.5 show that East and South Asian mothers with male first borns spend an hour more per day with young second born boys than with young second born girls. This estimate is 25 minutes larger than that in Table 1 although the difference between the estimates is not statistically significant. East and South Asian mothers with female first borns spend 36 more minutes (statistically insignificant) with young second born boys than with young second born girls. On the other hand, East and South Asian fathers spend equal amounts of quality time with young second born sons and daughters.

I also investigate if son-preference in East and South Asian mother's time that I observed in Table 1 differed by whether the mother is a first- or second-generation immigrant in the US. The results of this analysis, presented in Table 4.6, suggest that there are no statistically significant differences in estimates of son preference between first- and second-generation parents of East and South Asian origin. The point estimates of the interaction coefficient between second-generation mothers and male child is larger than the coefficient of the interaction between first-generation mothers and male child. In a separate analysis, conducted on a sample of children of first-generation East and South Asian parents, I find that years since immigration in the US has no association with son preference among East and South Asian families (Appendix Table B.6).

Table 4.6 Comparing first and second generation East and South Asian immigrants' son preference in parental time with children aged 0 – 5 years

	Total time		Quality time	
	(1)	(2)	(1)	(2)
Mother	58.6	66.0	43.3	49.1
	(65.1)	(66.5)	(35.0)	(34.5)
1st generation parent	-0.7	-0.6	-6.2	-1.4
	(51.1)	(51.7)	(23.1)	(23.3)
Mother*1st generation parent	106.1	98.7	39.0	31.8
	(69.5)	(70.8)	(37.4)	(37.0)
Father*1st generation parent*Male child	10.7	10.1	-7.1	-7.8
	(25.6)	(25.5)	(11.2)	(11.1)
Father*2nd generation parent*Male child	-2.5	0.9	21.4	20.9
	(62.8)	(62.6)	(26.3)	(25.7)
Mother*1st generation parent*Male child	23.3	23.0	28.8**	28.0**
	(19.5)	(19.5)	(13.1)	(12.7)
Mother*2nd generation parent*Male child	117.5**	110.9**	90.0**	84.4**
	(54.5)	(53.9)	(36.8)	(35.8)
Constant	325.2***	360.5***	141.4***	103.3***
	(47.6)	(54.1)	(21.3)	(27.0)
P-value For Test				
Coefficient of Father*1st generation parent*Male child = Father*2nd generation parent*Male child	*0.846*	*0.892*	*0.319*	*0.305*
Coefficient of Mother*1st generation parent *Male child = Mother*2nd generation parent*Male child	*0.104*	*0.125*	*0.117*	*0.138*
Mean dependent variable (in minutes)	415.8	415.8	185.9	185.9
N	1,022	1,022	1,022	1,022
Controls:				
Number of children aged 0-5	No	Yes	No	Yes
Number of children aged 6-17	No	Yes	No	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in each column are based on a separate OLS regression with minutes of total time with the child per day (or quality time per day) as the dependent variable. Robust standard errors clustered on family are in parentheses. ***p<0.01, **p<0.05, *p<0.1

Table 4.7 Gender differences in parents' time spent on childcare and household chores (Families with a child 0-2 years)

	Time on Caring for Children			Time on Household Chores		
	(1)	(2)	(3)	(1)	(2)	(3)
Panel 1: East & South Asian Origin						
At least 1 son 0-2yrs*Father	6.0	-0.1	1.8	9.0	11.2	12.5
	(14.1)	(14.4)	(15.1)	(10.3)	(11.1)	(11.1)
At least 1 son 0-2yrs*Mother	72.0***	63.5***	61.8***	-4.4	-9.4	-10.6
	(19.5)	(20.0)	(19.3)	(17.4)	(17.8)	(17.6)
Mean dependent variable (in minutes)	154.8	154.8	154.8	122.0	122.0	122.0
N	483	483	483	483	483	483
Panel 2: U.S. Native (3rd or higher generation)						
At least 1 son 0-2yrs*Father	9.1**	6.5*	6.3*	3.5	2.4	2.2
	(3.8)	(3.8)	(3.8)	(4.0)	(4.0)	(4.0)
At least 1 son 0-2yrs*Mother	12.0***	8.5**	9.2**	-4.3	-5.0	-4.4
	(4.1)	(4.0)	(4.0)	(3.9)	(3.8)	(3.8)
Mean dependent variable (in minutes)	144.0	144.0	144.0	129.0	129.0	129.0
N	9,005	9,005	9,005	9,005	9,005	9,005
Panel 3: Latin American Origin						
At least 1 son 0-2yrs*Father	3.6	2.6	3.3	-1.8	-2.8	-2.2
	(6.6)	(6.5)	(6.6)	(7.9)	(7.9)	(8.0)
At least 1 son 0-2yrs*Mother	6.6	2.1	2.6	-3.7	-1.3	-0.8
	(8.2)	(8.0)	(7.8)	(9.6)	(9.5)	(9.4)
Mean dependent variable (in minutes)	97.68	97.68	97.68	148.9	148.9	148.9
N	1,812	1,812	1,812	1,812	1,812	1,812
Panel 4: European Origin						
At least 1 son 0-2yrs*Father	-2.9	-7.5	-6.9	-14.6	-18.8	-18.2
	(14.0)	(14.3)	(14.4)	(13.6)	(14.1)	(14.2)
At least 1 son 0-2yrs*Mother	34.7*	27.0	27.5	3.1	3.3	3.8
	(17.7)	(17.2)	(17.1)	(14.4)	(14.5)	(14.3)
Mean dependent variable (in minutes)	168.0	168.0	168.0	124.1	124.1	124.1
N	618	618	618	618	618	618
Controls:						
Parent's gender	Yes	Yes	Yes	Yes	Yes	Yes
Parent and household characteristics	No	Yes	Yes	No	Yes	Yes
Mother is employed	No	No	Yes	No	No	Yes

Note: Figures in each column are based on a separate regression with time spent on household chores or time spent on caring for children as the dependent variable. Parent characteristics are respondent's education (dummy variables representing less than high school, high school, some college or associate degree, and bachelor's degree or higher) and age (dummy variables representing ages 16-20, 21-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-65, and 66+). Household characteristics are: number of adults, number of children aged 0-5, and number of children aged 6-17 years. Time is reported in minutes per day. Robust standard errors are in parentheses.
***p<0.01, **p<0.05, *p<0.1.

Next, I investigate if the time parents allocate to childcare and household chores differs between parents with very young (aged 0-2) sons and those with only very young daughters (Table 4.7). Each column presents the results of a unique OLS regression using parent-level data. Model 1 provides unadjusted differences in time spent by respondents from different ethnic origins and Model 2 adds the following controls for individual and household characteristics: respondent's age and education, number of adults in the family, number of sons, number of daughters, and number of children aged 0-5. Model 3 adds a control for whether mother is unemployed. The estimates from the three models are similar.

In East and South Asian families, mothers with a son aged 0-2 allocate 62 additional minutes to childcare per day than mothers with only young daughters; they also spend 11 fewer minutes in household chores, but the latter is statistically insignificant (Model 3).[10] There is no statistical evidence that East and South Asian fathers' participation in household chores or childcare is influenced by the gender of their young child. In native U.S. families, both mothers and fathers allocate more time to childcare if they have a young son than a young daughter, but there is no evidence of such gender preference in other ethnic groups.

Conclusion

I investigate if son preference or discrimination against daughters persists in families of East and South Asian origin that have migrated to the U.S. by studying the quantity and quality of parental time investment in children, a critical, yet least studied, developmental input that can impact abilities and outcomes in later life. My analysis has five main findings. One, East and South Asian mothers spend 39 more minutes per day of total time and 30 more

[10] I also conducted this analysis restricting samples to families with first born children aged 0-2 years. The point estimates were similar but mostly statistically insignificant.

minutes of quality time with their young (aged 0-5 years) sons than with their young daughters. There is no corresponding evidence of gender discrimination in time that mothers of other ethnic groups spend with their young children. I find that East and South Asian fathers are gender neutral in their allocation of total and quality time with young children.

Two, the analysis suggests that there is gender specialization in parental time between children aged 6-17 in that fathers spend more time with sons than daughters and mothers spend more time with daughters than sons across various ethnic groups. I also find evidence of gender specialization in quality time that parents spend with their children, but the point estimates are small for all groups and statistically insignificant for East and South Asian families.

Three, activity specific analyses suggest that East and South Asian mothers with children aged 0-5 spend 16 additional minutes on the physical care and 12 additional minutes playing with their young sons than with similarly aged daughters.

Four, in analysis restricted to families with a male first born child, I find that East and South Asian mothers spend about 60 minutes of additional quality time with sons aged 0-5 than with similarly aged daughters. These results suggest that failing to account for family heterogeneity underestimates the extent of discrimination against girls.

Five, I find no evidence that East and South Asian mother's additional time allocation for young sons versus daughters varies by mother's generation, and among first-generation families, I find no evidence of a decline in preference for young sons as mother's years in the U.S. increase.

In the final analysis, I investigate if the presence of a son affects the time parents allocate in childcare and household chores in families with children aged 0-2. I find that

mothers in East and South Asian families spend 62 additional minutes in childcare and 11 fewer minutes (statistically insignificant) in household chores if they have a young son.

Why might mothers, and not fathers, discriminate against girls? Indian immigrant women in the U.S. who seek prenatal sex selection services cite pressure from family members, threat of abuse, and an upbringing that emphasizes the importance of sons as reasons for the women's desire for sons (Puri, Adams, Ivey, & Nachtigall, 2011). An argument proposed by Das Gupta et al. (2003) is that young mothers in several East and South Asian societies are accorded little value except as mothers of future men. In old age, mothers enjoy higher status in the family but only if they have the support and loyalty of their sons. Consequently, a young mother has an incentive to nurture her sons, being careful to communicate her love, hard work, and sacrifice for them and that she expects the sons to remain loyal in return.

The study highlights that son preference in parental investments in East and South Asian families persists after immigration to the U.S. I find no evidence that the gender discrimination in mothers' investments in young children declines across generations. These findings suggest that parenting behavior of East and South Asian parents continues to favor sons even after migration. The results also highlight that studies are needed to examine how the preferential treatment of sons affects the health, development, and wellbeing of East and South Asian children.

Chapter 5 Conclusions

I examine whether policies that target gender inequality within families are necessary in order to improve the wellbeing of women and girls by studying the gender dynamics of the allocation of household resources. In Chapter 2, I study the impact of Ethiopia's gendered land certification programs on household consumption patterns, birth spacing, and infant and under-five mortality. I find that the inclusion of women in land certification programs increased household consumption of food, health care, women's clothing, and girls' clothing, and decreased in girls' infant and under-five mortality, largely in households with illiterate mothers. In Chapter 3, I examine the relationship between women's land ownership and participation in risky sexual behavior and HIV infection status. I find that women's land ownership is associated lower likelihood of survival sex but not with likelihood of engaging in safer sex. Land ownership is also associated with reduced HIV infection among women most likely to engage in survival sex. These findings also reflect a greater importance of women's own access to land over that of household-level wealth for predicting women's risk for HIV. Chapter 4 examines the prevalence of son preference in families of East and South Asian origin living in the United States. The results show that East and South Asian mothers spend more total time and more quality time with their young sons than with young daughters while fathers' time with young children is gender neutral.

These findings highlight that households can be sites for gender inequality and discrimination and that improvements in the economic conditions of households are not shared equally among household members. On the other hand, the findings also illustrate that gender-sensitive policies have the potential to transform intrahousehold dynamics, make progress towards gender equality, and help realize health policy objectives.

Currently, only three of Ethiopia's regions have implemented joint land certification. An implication of the findings from Ethiopia is that the federal and regional governments should bolster their efforts to safeguard women's land tenure rights. Expansion of joint land certification to all regions and addressing gender gaps in the intergeneration transfer of land are likely to help sustain the gains made so far.

The study findings on East and South Asian immigrants in the U.S. suggest that son preference persists after migration and that assimilation into the U.S. does not eradicate gender biases in parental investments. Given the stubbornness of gender-biased cultural norms and values, it is necessary that programs to address gender gaps among these immigrants be implemented. Further study is required to understand the long term implications of son preference and to identify what policy levers can be used to promote gender equality.

Women's property rights are a promising area to consider in the design of policies to promote the wellbeing of women and girls. However, women's property rights do not guarantee that policy objectives will be met. There is variation, at least in Ethiopia, in how women respond to improvements in property rights. However, gender discrimination should still be addressed even when efforts do not help realize policymakers' economic and health objectives because discrimination is a violation of human rights.

Relevance to Social Work

Over 100 million girls and women are "missing" around the world as a result of unequal access to resources, and recent trends show increasing numbers of "missing" women and girls (Klasen & Wink, 2002; Sen, 1990). The marginalization of women and girls are a concern to social work, which is a discipline that has traditionally concerned itself with

improving the welfare of the disadvantaged. Since the household is the fundamental economic and social institution where resources are allocated to individuals, this dissertation emphasizes that gender dynamics within households are relevant for attaining education, health, and agriculture policy objectives. The findings from this dissertation also indicate that the subjugation of women with regards to their land tenure rights has consequences for their health and that of their children. The findings further demonstrate the persistence of gender inequalities after migration to a more egalitarian society and highlight the need for attention to the issue in countries, such as the U.S., which are not traditionally viewed as gender discrimination hot spots.

Gender-sensitive land tenure policies can be a tool for improving the agency of women and for promoting the well-being of women and girls in agrarian societies such as rural Ethiopia and Kenya. More research examining the determinants of household gender dynamics is needed to identify other policy tools of improving the well-being of women and girls.

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Appendix A Appendix for Chapter 2

Appendix A1: 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 $\boldsymbol{P} = (P_1,..., P_K)$ and $\boldsymbol{p} = (p_1,..., p_k)$ be the *K*- and *k*-vectors of prices for the public and private goods respectively. A household will purchase $\boldsymbol{Q} = (Q_1,..., Q_K)$ and $\boldsymbol{q} = (q_1,..., q_k)$ quantities of public and private goods respectively such that *a* receives $\boldsymbol{q}^a = (q_1^a,..., q_k^a)$, *b* receives $\boldsymbol{q}^b = (q_1^b,..., q_k^b)$, and *c* receive $\boldsymbol{q}^c = (q_1^c,..., q_k^c)$ private goods. The utility function of *a* is denoted $U^a(\boldsymbol{Q},\boldsymbol{q}^a,\boldsymbol{q}^b,\boldsymbol{q}^c)$ and of *b* by $U^b(\boldsymbol{Q},\boldsymbol{q}^a,\boldsymbol{q}^b,\boldsymbol{q}^c)$. 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 $(\boldsymbol{Q},\boldsymbol{q}^a,\boldsymbol{q}^b,\boldsymbol{q}^c)$, is pareto efficient. Thus, for any other allocation, denoted $(\overline{\boldsymbol{Q}}, \overline{\boldsymbol{q}}^{\boldsymbol{a}}, \overline{\boldsymbol{q}}^{\boldsymbol{b}}, \overline{\boldsymbol{q}}^{\boldsymbol{c}})$, that is feasible within the budget constraint, if $U^a(\overline{\boldsymbol{Q}}, \overline{\boldsymbol{q}}^{\boldsymbol{a}}, \overline{\boldsymbol{q}}^{\boldsymbol{b}}, \overline{\boldsymbol{q}}^{\boldsymbol{c}}) > U^a(\boldsymbol{Q},\boldsymbol{q}^a,\boldsymbol{q}^b,\boldsymbol{q}^c)$ it must be that $U^b(\overline{\boldsymbol{Q}}, \overline{\boldsymbol{q}}^{\boldsymbol{a}}, \overline{\boldsymbol{q}}^{\boldsymbol{b}}, \overline{\boldsymbol{q}}^{\boldsymbol{c}}) <$

$U^{b}(\boldsymbol{Q},\boldsymbol{q}^{a},\boldsymbol{q}^{b},\boldsymbol{q}^{c})$ (and conversely). The household allocation problem is therefore the solution to the maximization problem:

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

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

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

where $\bar{U}^{a}$ is some utility for individual *a* that is determined by prices ($\boldsymbol{P}$, $\boldsymbol{p}$), total household expenditure x, and distribution factors $\boldsymbol{z}$. I.e., 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:

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

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

μ, is a function of prices ($\boldsymbol{P}$, $\boldsymbol{p}$), total household expenditure x, and distribution factors $\boldsymbol{z}$. 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 A.1 Summary characteristics of Ethiopian children born between 1992 and 2011

	Mean	S.E.
Female	0.486	0.002
Age	7.092	0.068
Birth order	3.971	0.024
Succeeding birth interval months	32.241	0.162
Died before age 1 years	0.091	0.002
Died before age 5 years	0.153	0.003
Mother's age at birth	26.296	0.065
Mother is literate	0.166	0.006
Mother has above median empowerment	0.534	0.007
Rural household	0.924	0.005
Observations	73,228	

Note: Data adjusted for survey design.
Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys.

Table A.2 Effect of land certification programs on clothing expenditures spent on men, women, boys, and girls

	(1) Men's	(2) Men's	(3) Women's	(4) Women's	(5) Boys'	(6) Boys'	(7) Girls'	(8) Girls'
Proportion of total clothing expenditure								
Post	-0.002	-0.001	-0.000	-0.000	0.011*	0.010	-0.008*	-0.009*
	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)	(0.007)	(0.005)	(0.005)
Post*JointCertificate	-0.019***	-0.024***	-0.017***	-0.013**	0.017***	0.020**	0.019***	0.016***
	(0.003)	(0.002)	(0.003)	(0.006)	(0.006)	(0.008)	(0.006)	(0.002)
Post*JointCertificate*Wife-Literate	-0.035***	-0.034***	0.003	-0.008	-0.021**	-0.016*	0.052**	0.057***
	(0.006)	(0.010)	(0.024)	(0.027)	(0.009)	(0.009)	(0.022)	(0.019)
R^2	0.188	0.193	0.193	0.202	0.228	0.232	0.240	0.245
Log monthly expenditure								
Post	0.127***	0.152***	-0.142***	-0.197***	0.330***	0.300***	0.003	-0.031
	(0.048)	(0.046)	(0.050)	(0.050)	(0.056)	(0.043)	(0.066)	(0.061)
Post*JointCertificate	0.179	0.120	0.578***	0.608***	0.040	0.004	0.286***	0.267***
	(0.113)	(0.115)	(0.076)	(0.081)	(0.068)	(0.046)	(0.075)	(0.048)
Post*JointCertificate*Wife-Literate	0.197	0.216	-0.286***	-0.285***	-0.264**	-0.261***	-0.128	-0.078
	(0.175)	(0.149)	(0.089)	(0.092)	(0.112)	(0.069)	(0.100)	(0.093)
R^2	0.525	0.532	0.494	0.503	0.574	0.588	0.546	0.561
Controls:								
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies*WifeLiterate	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
Observations	6,697	6,618	6,697	6,618	6,697	6,618	6,697	6,618

Notes: 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. Monthly expenditure in 2009 Birr constant prices. 1 USD = 9.80 Birr in Jan 2009. Bootstrapped standard errors clustered on region in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3 Effect of land certification programs on consumption of human capital inputs, excluding village close to Eritrean border

	(1) Food non-purchased	(2) Food purchased	(3) Clothing	(4) Healthcare	(5) Education
Proportion of total household consumption					
Post	0.044***	-0.051***	0.019***	0.003	-0.001**
	(0.006)	(0.012)	(0.006)	(0.003)	(0.001)
Post*JointCertificate	0.012	-0.020	-0.023***	0.010*	-0.001
	(0.033)	(0.046)	(0.002)	(0.005)	(0.001)
Post*JointCertificate*WifeLiterate	-0.096***	0.051***	-0.010	-0.024	0.000
	(0.025)	(0.012)	(0.011)	(0.015)	(0.003)
R^2	0.363	0.302	0.244	0.195	0.237
Log monthly consumption					
Post	-0.341***	-0.057	0.249***	0.348***	0.419***
	(0.108)	(0.119)	(0.033)	(0.017)	(0.051)
Post*JointCertificate	0.464***	0.003	-0.043**	0.129*	-0.229***
	(0.103)	(0.118)	(0.021)	(0.075)	(0.014)
Post*JointCertificate*WifeLiterate	-0.672***	-0.018	0.240	-0.316***	-0.184
	(0.139)	(0.037)	(0.211)	(0.098)	(0.113)
R^2	0.283	0.361	0.441	0.550	0.543
Controls:					
Household FE	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Year dummies*WifeLiterate	Yes	Yes	Yes	Yes	Yes
# 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
Observations	6,345	6,345	6,345	6,345	6,345

See Table A.2 notes.

Table A.4 Estimates of effect of including women in land certification on preceding birth interval (in months) of children

	(1) Δ pre- to post-certification	(2) Difference-in-differences	(3) Difference-in-differences-in-differences	(4)
Children with illiterate mother				
Post*JointCert*Rural	-2.000***	-4.025***	4.339	4.848*
	(0.733)	(0.867)	(2.882)	(2.647)
Post*Rural		-2.364***	-15.888***	-15.874***
		(0.482)	(3.622)	(3.746)
Observations	21,867	46,246	49,073	49,073
Children with literate mother				
Post*JointCert*Rural	-0.865	-2.014	8.283	11.119**
	(0.868)	(1.952)	(5.543)	(5.261)
Post*Rural		-5.576***	1.675	0.374
		(1.725)	(5.473)	(5.176)
Observations	3,532	5,070	7,952	7,952
Controls:				
Post	Yes	Yes	Yes	Yes
Type of certification (head-only/joint/none)	No	Yes	Yes	Yes
Rural	No	Yes	Yes	Yes
Birth year dummies	No	Yes	Yes	Yes
Post*JointCertificate	No	Yes	Yes	Yes
Time since land certification	No	No	Yes	Yes
Rural*Type of certification	No	No	Yes	Yes
Rural*Birth year dummies	No	No	Yes	Yes
Rural*Time since land certification	No	No	Yes	Yes
Gender	No	No	No	Yes
Birth order	No	No	No	Yes
Type of certification-specific birth-year trends	No	No	No	Yes
Year of survey dummies	No	No	No	Yes

Notes: Post is a dummy equal to 1 if household observed after exposure to a certification program.
JointCertificate is a dummy equal to 1 if the child is in regions that issued certificates jointly to head and spouse.
Bootstrapped standard errors clustered on region in parentheses.
Source: 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys.

Appendix B Appendix for Chapter 4

Table B.1 East and South Asian children by respondent's (parent's) country of origin

Country	*n*	%
Bangladesh	63	2.69
China	507	21.63
India	926	39.51
Japan	168	7.17
Korea	269	11.48
Nepal	9	0.38
Pakistan	110	4.69
Taiwan	139	5.93
Multiple East & South Asia Countries	153	6.53
N	2,344	100

Table B.2 Summary characteristics of children aged 0-17 years

	East & South Asian Origin Families		U.S. Native Families (3rd or higher generation)		Latin American Origin Families		European Origin Families	
	Son	Daughter	Son	Daughter	Son	Daughter	Son	Daughter
Age, yrs	7.05	7.08	8.09	8.06	7.63	7.63	7.85	7.85
Birth order 1	0.55	0.54	0.48	0.48	0.42	0.46	0.42	0.38
Birth order 2	0.36	0.36	0.35	0.35	0.36	0.30	0.32	0.32
Birth order 3+	0.10	0.10	0.17	0.17	0.23	0.24	0.26	0.30
Previous birth interval 1 year	0.05	0.05	0.06	0.06	0.07	0.08	0.07	0.07
Previous birth interval 2 years	0.11	0.12	0.15	0.15	0.13	0.13	0.16	0.16
Previous birth interval 3 years	0.09	0.08	0.12	0.12	0.11	0.10	0.11	0.12
Previous birth interval 4 years	0.07	0.06	0.07	0.07	0.08	0.08	0.07	0.06+
Previous birth interval 5+ years	0.12	0.14	0.12	0.12	0.20	0.21	0.11	0.09+
No previous birth	0.55	0.54	0.48	0.48	0.42	0.41	0.48	0.51+
Subsequent birth interval 1 year	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.06
Subsequent birth interval 2 years	0.10	0.12	0.14	0.14	0.12	0.13+	0.15	0.16
Subsequent birth interval 3 years	0.08	0.09	0.11	0.11	0.10	0.10	0.10	0.11
Subsequent birth interval 4 years	0.06	0.06	0.06	0.06	0.07	0.07	0.06	0.06
Subsequent birth interval 5+ years	0.11	0.09	0.09	0.09	0.15	0.15	0.07	0.07
No subsequent birth	0.60	0.59	0.54	0.54	0.50	0.48+	0.55	0.55
Household size	4.24	4.29	4.52	4.52	4.91	4.98+	4.48	4.41
Number of children	2.02	2.03	2.35	2.34	2.51	2.58+	2.32	2.26
Number of other boys	0.52	0.54	0.69	0.67+	0.78	0.78	0.74	0.65+
Number of other girls	0.50	0.49	0.65	0.67+	0.73	0.80+	0.58	0.61
Sons-only family	0.57	-	0.50	-	0.46	-	0.54	-
Daughters-only family	-	0.54	-	0.49	-	0.42	-	0.50
Mixed-sons-&-daughters family	0.43	0.46	0.50	0.51+	0.54	0.58+	0.46	0.50+
Respondent (parent) is female	0.52	0.52	0.53	0.53	0.55	0.55	0.53	0.54
Respondent's (parent's) age	39.99	39.94	39.26	39.28	36.96	37.14	40.43	40.35
Mother is unemployed	0.46	0.46	0.33	0.33	0.53	0.54	0.40	0.36+
N	1,215	1,129	30,809	29,926	5,606	5,296	2,149	1,927

Note: + indicates that mean for sons and means for daughters are different at the 10% significance level. The test accounts for correlation between siblings within families using robust errors clustered on family.

Table B.3 Average minutes per day with parent, by child's gender

	East & South Asian Origin Families		U.S. Native Families (3rd or higher generation)		Latin American Origin Families		European Origin Families	
	Son	Daughter	Son	Daughter	Son	Daughter	Son	Daughter
Time with mother								
Panel A: Children aged 0-5								
Total time	511	479+	452	459	491	510+	479	490
Quality time	251	214+	181	182	152	156	211	206
N	276	257	5,695	5,563	1,196	1,131	424	353
Panel B: Children aged 6-17								
Total time	325	342	295	328+	370	409+	314	338+
Quality time	121	111	84	89+	94	101+	99	100
N	361	335	10,761	10,330	1,886	1,758	720	688
Time with father								
Panel C: Children aged 0-5								
Total time	333	325	330	316+	350	342	327	353
Quality time	133	136	129	120+	93	89	148	164
N	253	236	4,975	4,853	968	917	371	324
Panel D: Children aged 6-17								
Total time	288	268	262	238+	286	285	284	257+
Quality time	95	86	69	64+	63	62	83	80
N	325	301	9,378	9,180	1,556	1,490	634	562

Note: The figures (expressed in minutes/day) are based on the time diary of one parent per household. Physical care is time spent on activities categorized as "physical care for children" or "looking after children". Playing is time spent on "playing with children", "playing sports with children", and "arts and crafts with children". + indicates that minutes spent with a parent by sons and daughters are different at the 10% significance level.

Table B.4 Estimates of son preference in parental quality time with second born children aged 6 – 17 years

	Families with male firstborn (1)	Families with female firstborn (2)	Weighted average of (1) and (2) (3)
Panel 1: East & South Asian Origin			
Male child*Father	-4.6	21.3	8.7
	(17.4)	(15.1)	(11.5)
Male child*Mother	34.0*	28.4*	31.1**
	(18.4)	(16.0)	(12.2)
Mean dependent variable (in minutes)	94.29	91.87	93.05
N	212	223	435
Panel 2: U.S. Native (3rd or higher generation)			
Male child*Father	3.3	1.8	2.5
	(2.8)	(2.6)	(1.9)
Male child*Mother	-8.8***	-6.7**	-7.7***
	(2.8)	(2.8)	(2.0)
Mean dependent variable (in minutes)	75.48	73.41	74.46
N	6,899	6,691	13,590
Panel 3: Latin American Origin			
Male child*Father	-7.2	2.6	-2.4
	(6.6)	(6.4)	(4.6)
Male child*Mother	-0.5	-3.8	-2.1
	(6.4)	(7.0)	(4.7)
Mean dependent variable (in minutes)	77.87	79.46	
N	1,163	1,111	
Panel 4: European Origin			
Male child*Father	-6.2	-12.1	-9.1
	(11.6)	(9.8)	(7.6)
Male child*Mother	8.2	0.8	4.6
	(12.0)	(12.9)	(8.8)
Mean dependent variable (in minutes)	84.78	83.47	84.14
N	453	435	888
Controls:			
Gender of mother	Yes	Yes	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a Panel are based on a separate OLS regression with minutes of quality time with the child per day as the dependent variable. Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1

Table B.5 Estimates of son preference in parental quality time with children aged 6 – 17 years

	Physical care	Reading	Playing	Talking	Home work	Eating
Panel 1: East and South Asian Origin						
Male child*Father	4.4*	0.2	4.4*	-1.0	4.2	-2.5
	(2.5)	(0.6)	(2.5)	(0.9)	(2.7)	(3.8)
Male child*Mother	0.5	1.4	4.1	-3.0*	3.1	5.4
	(2.8)	(0.9)	(2.6)	(1.6)	(2.8)	(3.5)
Mean of dependent variable	17.89	2.504	10.42	4.081	12.93	53.06
N	1,322	1,322	1,322	1,322	1,322	1,322
Panel 2: U.S. Native (3rd or higher generation)						
Male child*Father	1.8***	0.1	2.3***	0.2	-0.3	0.8
	(0.5)	(0.1)	(0.6)	(0.2)	(0.3)	(0.6)
Male child*Mother	-2.1***	0.0	-0.1	-0.5**	-0.2	-1.5***
	(0.6)	(0.1)	(0.4)	(0.2)	(0.3)	(0.6)
Mean of dependent variable	19.02	1.549	8.362	3.199	4.905	37.73
N	39,649	39,649	39,649	39,649	39,649	39,649
Panel 3: Latin American Origin						
Male child*Father	0.9	0.0	0.9	0.2	0.7	1.0
	(1.2)	(0.2)	(1.3)	(0.3)	(0.6)	(1.7)
Male child*Mother	-4.6***	0.0	-1.5	-0.6	1.0	-0.2
	(1.6)	(0.3)	(1.2)	(0.4)	(0.9)	(1.6)
Mean of dependent variable	17.14	1.140	8.548	2.112	5.916	45.34
N	6,690	6,690	6,690	6,690	6,690	6,690
Panel 4: European Origin						
Male child*Father	-1.3	-0.1	3.8*	-0.3	0.1	0.4
	(2.5)	(0.4)	(2.3)	(0.5)	(1.5)	(2.6)
Male child*Mother	-0.8	-0.2	-0.6	1.7	-0.9	-1.1
	(2.8)	(0.6)	(1.6)	(1.1)	(1.4)	(2.6)
Mean of dependent variable	20.97	2.030	9.425	3.919	6.996	45.22
N	2,604	2,604	2,604	2,604	2,604	2,604
Controls:						
Parent's Gender	Yes	Yes	Yes	Yes	Yes	Yes
Number of children aged 0-5	Yes	Yes	Yes	Yes	Yes	Yes
Number of children aged 6-17	Yes	Yes	Yes	Yes	Yes	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in the top two rows of each column in a panel are based on a separate OLS regression with minutes of time with the child per day spent on the activity specified in the column heading as the dependent variable. Robust standard errors clustered on family are in parentheses.***p<0.01, **p<0.05, *p<0.1.

Table B.6 Estimates of the association between parental time with children aged 0 – 5 years and years in the US, among East and South Asian first generation immigrant families

	Total time		Quality time	
	(1)	(2)	(1)	(2)
Mother	138.6***	138.8***	64.5***	62.7***
	(39.8)	(39.5)	(22.5)	(22.1)
Male child*Father	42.7	38.5	-7.7	-12.6
	(44.4)	(44.1)	(17.9)	(17.6)
Male child*Mother	11.6	11.0	23.0	24.8
	(30.4)	(30.3)	(21.7)	(21.0)
Years in the US	-2.4	-2.2	-0.4	-0.3
	(1.6)	(1.6)	(0.7)	(0.7)
Years in the US*Mother	1.9	1.9	1.4	1.5
	(2.3)	(2.2)	(1.3)	(1.2)
Years in the US*Male Child	-2.4	-2.2	0.0	0.4
	(2.4)	(2.4)	(1.0)	(1.0)
Years in the US*Mother*Male Child	3.4	3.1	0.4	-0.1
	(3.1)	(3.1)	(1.8)	(1.7)
Mean dependent variable (in minutes)	420.3	420.3	184.6	184.6
N	883	883	883	883
Controls:				
Number of children aged 0-5	No	Yes	No	Yes
Number of children aged 6-17	No	Yes	No	Yes

Note: Data on parent's time with each child in the family are obtained from the time diary of one parent (father or mother) per family. Figures in each column are based on a separate OLS regression with minutes of total time with the child per day (or quality time per day) as the dependent variable. Robust standard errors clustered on family are in parentheses. ***p<0.01, **p<0.05, *p<0.1