Land inheritance establishes sibling competition for marriage and reproduction in rural Ethiopia.

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[This is working paper, and the author would be grateful for any comments. Please do not cite without the author's permission]

Abstract

In this paper I explore patterns of sibling competition and co-operation for agricultural resources, marriage and reproduction in one contemporary Ethiopian agro-pastoralist society. Here recent changes in land tenure policy, which have altered transfers of land from parents to offspring in some households, present a framework to test the importance of intergenerational transfers of wealth in driving sibling competition.

In households where land is inherited, the number of elder siblings (particularly elder brothers) reduces a man's agricultural productivity, marriage opportunities and reproductive success (surviving offspring), as resources diminish and competition increases with each additional sibling. Where land is not inherited (but is distributed by the government), siblings do not have a measurable negative effect on male marriage and reproduction, and in some instances they may even be beneficial (brothers reduce the risk of out-migration and elder brothers increase marriage payments). In this case, the presence of heritable wealth is the driver for sibling competition, which over the long-term may initiate a demographic transition towards smaller family sizes.

Introduction

Human parents invest intensively in their offspring. Our evolved life history has been shaped by the costs of rearing large-brained children who experience a long period of juvenile dependency requiring both parental and grandparental support (Gurven and Walker 2006, Hill and Kaplan 1999, Mace 2000, Sear and Mace 2008). Parents also remain significant investors in their children's success long after sexual maturity, through activities such as securing marriage partners, care of grandchildren and direct transfers of resources, such as land, cattle and other material goods. Evolutionary life history theory predicts that since the energetic and time costs of raising simultaneous offspring (and grand-offspring) are high, and resources are finite, parents face a trade-off between number of offspring born and number that can be successfully reared. Parents are expected to bias their investment towards those offspring with the greatest fitness payoff per unit of their investment (numbers of surviving offspring and/or grand-offspring); and competition between siblings for parental investment should be greatest for key resources which are important determinants of future success [e.g. education (Gibson and Lawson submitted); and heritable wealth (Mace 1996; Borgerhoff-Mulder 1998)].

Anthropological studies in have found mixed evidence of sibling resource competition. and in some instances positive effects of siblings have been demonstrated, suggesting that costs to resource division within the family have the potential to be offset by beneficial co-operative activities between siblings. The biggest contrast can be observed between agricultural/pastoralist and hunter-gatherer societies. For example, siblings are positively associated with fertility among both African !Kung and South American Ache hunter-gatherer groups (Draper and Hames 2000, Hill and Hurtado 1996). Conversely, in many agricultural communities evidence for sibling competition is more apparent. Large numbers of siblings (particularly elder brothers) have been seen to reduce child survival (Gillespie, Russell, and Lummaa 2008, Meij et al. 2009, Penn and Smith 2007, Strassmann and Gillespie 2002) and later inhibit both marriage opportunities (marriage payments and bride choice) and reproductive success (Borgerhoff Mulder 1998, Low 1991, Mace 1996, Voland and Dunbar 1995). It is often assumed that sibling rivalry is more marked in these populations, because siblings are in greater competition for individually-owned and inelastic forms of heritable wealth, particularly land and livestock, which are crucial for offspring success.

In societies where intergenerational transfers of resources are less important (e.g. hunter-gatherers), siblings may become a relative asset to the household by contributing subsistence and domestic labour (Kramer 2005, Lee and Kramer 2002) or assistance with child-care of their younger siblings (Sear et al. 2002), and therefore have a positive effect on sibling reproductive fitness. It has also been suggested that some cultural and subsistence practices, such as polygamy (Caldwell 1976) or hunting and meat-sharing (Draper and Hames 2000), may create a network of extended of co-operating kin, who in addition help offset the costs of child-rearing. Political alliances formed through large families may increase access to hunting and foraging territories and provide assistance in community disputes (Draper & Hames, 2000).

In this paper I explore patterns of sibling competition and co-operation for land, marriage and reproduction in one contemporary Ethiopian agro-pastoralist society. Here recent changes in land tenure policy, which have altered transfers of resources from parents to offspring in some households, present a framework to test the importance of intergenerational transfers of wealth in driving sibling competition. In this community farmers can be divided into two groups: those who received their land from the government during a broadly equitable redistribution programme ("redistribution recipients"); and those who have inherited their land, or rights to use land, directly from parents ("inheritors"). In addition, I explore the potential for development policies and intervention programmes, such as land reform, to introduce significant changes both to family dynamics and desired family sizes.

Study population

The Arsi Oromo are agropastoralists who combine cattle rearing with maize, wheat and sorghum cultivation in the rural lowlying areas of Arsi region (zone), in Southern Ethiopia. First settling in the region during the 1950s, programmes of resettlement and villagisation intensified during the socialist agrarian reform of the 1970s (Cohen and Isaksson 1987). At this time the government introduced a programme of dramatic

country-wide changes to land tenure: nationalising rural land, abolishing tenancy and periodically re-distributing land among farmers to ensure that individual plot size and quality were broadly equal (under 10 hectares) (Rahmato 1985). The aim of this land redistribution programme was threefold: to safeguard the welfare of rural peasants (many were previously tied to feudal tenancy agreements); to prevent the concentration of land in the hands of a wealthy minority; and to inhibit rural to urban migration of the landless. Following the fall of the socialist government responsible for driving these reforms in the early 1990s, the timing and frequency of land redistributions (organised by the state mandated Peasant Associations) has varied from locality to locality across Ethiopia (Nega, Adenew, and Gebre-Selassie 2003).

In Arsi region, farmers have experienced land redistribution three times – in 1975, 1988 and most recently in 1990. Since this date, parents have returned to a system of bequeathing their land (or right to use it, as land is still state owned) to their offspring Today, farmers in the region acquire "use rights" to land through inheritance from fathers, with each son having the right to an equal share of land, which the federal legislation dictates should not be less than 0.5 hectares (Crewett and Korf 2008). High population growth (Gibson and Mace 2006), however, and a shortage of productive agricultural land has made equal shares of land over 0.5 hectares for each child unachievable [none of the Arsi Oromo respondents in this study had access to more than 4 hectares of land, and the average plot size was 1.6 hectares]. Despite this, farmers state their intention to pass on their land by sharing it among male children, most being unaware of regulations concerning minimum land holding size (Crewett and Korf 2008). Bitter competition over access to high quality land has become common among the younger generation that will inherit plots too small and/or of poor quality to support a family [41% of farms in the region are below the minimum size of land required to attain food security (Nega, Adenew, and Gebre-Selassie 2003)]. Elders report that land disputes have shifted from conflicts with neighbours, to previously rare land disputes between fathers and sons and between brothers (Crewett and Korf 2008). In the absence of other income-generating opportunities, some young and poorly educated and landless men are beginning to migrate-out of villages to seek employment in an emerging construction industry in neighbouring towns and cities.

Arsi Oromo inheritance patterns are patrilineal, post-marital residence is predominantly patrilocal (the bride moves to the groom's village at marriage) (Gibson and Mace 2005) and a third of men are polygynous (Gibson and Mace 2007). There is a strong cultural preference expressed for sons, both in education (Gibson and Sear, submitted) and in the division of heritable resources, such as land and cattle. Heritable resources (including land) are generally transferred from parents to offspring at two critical junctures: (a) upon the child's marriage and (b) upon the death of the head of household. At a son's marriage, parents provide land for the newly wed couple to farm and contribute bridewealth payments (mostly in cash) which must be transferred to the bride's family. High status marriage partners (due to wealth, family status) attract higher brideprice, and have higher reproductive success (Gibson and Mace 2007). Upon both parent's death, any remaining land is sub-divided between sons (while daughters are legally entitled to a share, they rarely receive it).

Demographic, socio-economic, marriage and education data used in this study were collected from 222 randomly selected households during a household survey undertaken by the author in 2003-4 in four neighbouring villages in Hitosa and Dodota *weredas* in Arsi Zone, Oromiya region. In the sampled households, ever-married men aged between 18-70 completed an additional survey recording information on livelihoods, inheritance and marriage practices.

Research Question

In this paper, I explore the extent to which changes in wealth inheritance arising from government land policy have influenced sibling competition in a patrilineal agropastoral community. In this case I test for effects of birth order and sibling configuration (number of elder or younger, same sex or opposite sex siblings), which are considered more useful than overall number of siblings in this high fertility population, because wealth may be confounded with family size

1) Does birth placement influence farmers' heritable wealth (land productivity and risk of out migration)?
2) Does birth placement influence male marriage (age first marriage and bridewealth payment) and reproductive success (number of surviving children)?
3) Does the above vary according to land inheritance system, between households in which sons receive broadly equal plots of land from the government ("the redistribution recipients"), and those household in which parents divide up and shared out among their male offspring ("the inheritors").

Methods

Table 1 provides descriptive statistics for the five outcome variables, reflecting agricultural opportunities (land productivity and risk of out-migration), and marriage (age and bridewealth payment at first marriage) and reproduction (number of surviving offspring). In all cases GLM analyses were performed on continuous dependent variables, with the exception of a logistic model using a dichotomous variable to indicated any out-migration (defined as residence away from the village for reasons of employment) (1=ever migrated out for any reason, 0=never migrated out).

Analyses were undertaken using multivariate models to assess the partial effects of a range of socio-demographic factors known to influence the dependent variables. Independent variables included age on the survey date, household wealth measured in land holding size, surviving family size (excluding sibs that died before 15), birth order and sibling configuration: including overall surviving numbers of brothers and sisters or numbers of older brothers, older sisters, younger brothers and younger sisters (surviving to maturity). In addition, an independent variable, total number of father's wives, was included to identify any potential competition between parents and offspring for heritable resources in relation to marriage opportunities.

As stated previously a dichotomous covariate reflecting land tenure, was included in all the analyses. The "redistribution recipients" included individuals who received their land

from the government, during redistribution programmes (between 1975 and 1990) (n=71); while "inheritors" received their share of land (or rights to use that land) as inheritance from parents (since the fall of the socialist government in the early 1990's) (n=151).

To test how heritable resource acquisition influences sibling competition for land, marriage and reproduction across groups, two models were built. Model 1 explored all main effects of the predictor terms outlined above. Model 2 included both main effect and any significant interaction terms between independent variables. Interactions tested the effects of land tenure system on the relationship between birth placement and parental investment outcome. All statistical analyses, GLM and Logistical Regression, were performed using SPSS version 14.

Results

The results of the regression analyses are presented in Table 2 & 3. Regression analyses relating to livelihoods (agricultural productivity and risk of out-migration) are described in Table 2, and analyses of marriage and reproductive outcomes (age at first marriage, bridewealth payments and numbers of surviving offspring) are described in Table 3

Land productivity and out-migration

For all adult men, the strongest predictor of land size is land tenure system (Table 1). Men who have inherited their land holdings from their fathers have significantly smaller plots than those who received their land from the government [inheritors: 0.66±0.09 hectares; government redistribution recipients: 2.00±0.06 hectares]. At the survey date, however, not all inheritors had received their full entitlement of inherited land from their parents (i.e. their fathers were still alive). As such, a measure of agricultural productivity (maize, wheat and sorghum crop yield per hectare in the previous harvest) was used, reflecting the quality of land farmers had access to.

The strongest predictor of agricultural productivity (crop yield in kilogrammes per hectare) was land tenure system. Men who inherited their plots from fathers obtained significantly higher agricultural productivity than their men who received their land through government redistribution. This is supported by studies showing that with government redistribution, farmers invest less in technological improvements or conservation management because they have less secure rights over land tenure (Deininger and Jin 2006, Nega, Adenew, and Gebre-Selassie 2003). Model 2 indicates that brothers are in competition for productive agricultural land when it is inherited. Specifically, it is the number of elder brothers which is most detrimental to agricultural productivity under a system of land inheritance (Figure 1). Siblings have no effect measurable effect on agricultural productivity in instances where farmers received their plot of land from the government.

There is further evidence to suggest all brothers compete with one another in patterns of dispersal out from the village. Number of surviving brothers is positively associated with a farmer's likelihood of ever migrating away from the village to find alternative forms of employment. This effect, however, appears to be driven entirely by higher levels of

competition between brothers in households in which land has been inherited (Model 2 and illustrated in Figure 2). For redistribution recipients there is an indication that the opposite may be true, with brothers acting more co-operatively, in this case their presence reducing an individuals' risk of out-migration.

Marriage
Overall, there appears to be no effect of birth order or family size on male marriage opportunities; however Model 2 reveals that land tenure system has a strong influence on the size and direction of any sibling effects. For inheritors there is linear reduction in age at marriage with increasing birth order which is absent for redistribution recipients (Figure 3). The same is true for marriage payments (Figure 4); male inheritors are in greatest competition with their older siblings, especially elder brothers. Some evidence of more co-operative sibling relationships can be found among those receiving land from the government. Here number of elder siblings (particularly elder brothers) is positively associated with the size of first marriage payments, suggesting between brother transfers of money. One additional main effect indicates that in this polygynous community, parent and offspring are also in conflict for access to reproductive opportunities. For an adult man, the number of women his father married is inversely related to the size of his own first bridewealth transaction.

There is some evidence to suggest that marriage may have changed in this population overtime. Older males in the sample have a later age at first marriage and paid lower bridewealth payments to their bride's family than younger males (although the latter may simply reflect inflationary increases across the time period). Beyond any secular changes overtime, men who inherit their land from their parents experience a greater delay in age at first marriage than men who have obtained their land through government redistribution schemes.

Surviving Offspring
Overall, with age and wealth adjusted, there is no evidence the birth placement within the household influenced number of surviving offspring in the next generation. However, Model 2 indicates that birth order effects vary according to land tenure system. Specifically, there is a reduction in numbers of surviving offspring with order of birth for males who inherit their land from their parents, but not for males who obtained land through government distribution. Figure 5 indicates that it is first born inheriting males who overall achieve the largest numbers of surviving offspring.

Male wealth as measured by size of land holding is the strongest predictor of family size, in this non-contracepting population. Age is also a strong predictor of number of surviving offspring, which may simply indicate that older men had acquired larger families then younger men who had not been married long on the survey date.

Discussion

In this paper, I provide clear evidence that it is the transmission of intergenerational wealth which drives male sibling competition for marriage and reproduction among the Arsi Oromo. In households where land is inherited, number of elder siblings (particularly

elder brothers) reduces a man's agricultural productivity (crop yield per hectare), marriage opportunities (increases age and reduces bridewealth payments at first marriage) and reproductive success (surviving offspring), as resources diminish and competition increases with each additional sibling. Conversely, where wealth is not heritable (but distributed by the government), siblings do not have a measurable negative effect on marriage and reproduction, and in some instances they may even be beneficial (brothers reduce the risk of out-migration and elder brothers increase, perhaps by contributing to, first marriage payments).

A number of other studies in agricultural and pastoral communities have found similar negative effects of birth order on migration (Beise and Voland 2008, Voland and Dunbar 1995), marriage (Borgerhoff Mulder 1998, Mace 1996) and reproductive success (Low 1991, Mace 1996). While many have proposed that these effects are due to competition within the family for heritable resources, the current study demonstrates clearly within a single population that it is that the presence or absence of heritable wealth which is the driver for this competition.

Since the end of government land redistribution programmes in the early 1990s, Arsi Oromo agropastoralists have experienced greater competition between brothers for high quality land and mates, not dissimilar to that recorded in other agricultural and pastoral societies, where land and livestock are crucial for offspring success. Despite current government legislation to encourage the equal division of heritable resources among children, parents have adopted a pattern of wealth inheritance which favours first born sons, who obtain better quality land and higher bridewealth payments. Primogeniture may be one strategy to avoid the further subdivision and fragmentation of their land (Hrdy and Judge 1993). In addition, first born sons receive more education than all later born offspring (Gibson and Sear, submitted), assume the role of head of household when their fathers' die (taking responsibility for widowed mothers and younger unmarried brothers), and inherit all non-divisible resources, e.g. the plough and gun.

The relationship between wealth inheritance, birth order and reproductive success fits with predictions from evolutionary parental investment theory. Firstly, that wealth transfers from parents to offspring translate into reproductive success. Secondly, that transfers diminish as competition increases which each additional offspring. And finally, that first born offspring are invested in at the expense of all later born offspring, as they are closer in age to starting reproduction, thereby shortening the generation time (Jeon 2008).

Sibling competition for heritable wealth and other reproductive decisions are highly inter-related (Mace 1998). Children with no prospect of any inheritance may contribute little or nothing to parents' long-term fitness. Further, the cost of raising those children may even reduce the potential reproductive success of their siblings by reducing household wealth. Increase in sibling competition for high quality land and mates among the Arsi Oromo, over the longer term, may lead to a reduction in desired family sizes, and increased investment in a smaller number of children. Sibling resource competition is likely to

represent a crucial antecedent to a demographic transition to smaller families (Kaplan 1996);Gibson and Lawson, submitted).

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Table 1: Description of study sample

	All n=222	Inheritors n=71	Government redistribution recipients n=151
Age	41.26 ± 12.99	28.94±5.77	47.06±11.23
Education**	2.62± 3.18	2.38±0.54	2.72±0.32
Land size (hectares)**	1.56 ± 0.99	0.66±0.09	2.00±0.06
Land productivity (kg/hectare)	1100± 0.65	1957.18±130.72	717.47±78.48
Out-migration (%)	17.5%	14.9%	19.0%
Age at first marriage**	21.67± 6.20??	22.52±1.04	21.25±0.60
Bridewealth payments in Ethiopian birr**	1579 ± 1429 (142USD)	1381.77±230.8 (125 USD)	1116.79±134.50 (100 USD)
Surviving offspring**	5.49 ± 3.41	6.15±0.49	5.23±028

** age adjusted

Table 2: Competition for land

	Out migration	Land productivity (yield per hectare)
Model 1 LOG REG Intercept	**-3.84±1.17*** **	**1072.94±341.6** **
Age	**0.04±0.02***	2.83±5.99
Father's wives	-0.29±0.23	16.49±68.87
Land size	0.34±0.26	**-244.51±87.06*** **
Number of brothers	**0.16±0.10***	-36.75±30.71
Number of sisters	-0.05±0.10	8.85±23.44
Land tenure Inherited Redistributed	0.66±0.67 ref	**924.48±200.82*** ** ref
Model 2		
Number of brothers	0.05±0.11	0.208±35.31
Number of sisters	-0.05±0.11	12.35±24.37
Land tenure Inherited Redistributed	-1.37±1.34 ref	**1565.28±289.80*** ** ref
Brothers*Inheritors	**0.43±0.21** **	**-104.47±58.45*** Older brothers only **-192.28±98.17** **

*<0.1, **<0.05, ***<0.001

Table 3: Competition for marriage and reproduction

	Age at first marriage	Bridewealth received in cash	Surviving offspring
Model 1 GLM			
Intercept	2.64±3.99	**1779±548.9*** **	**-3.96±1.15*** **
Age	**0.45±0.07*** **	**-17.15±9.29***	**0.15±0.02*** **
Father's wives	1.08±0.79	**-206.18±106.9***	-0.15±0.22
Land size	1.06±0.98	113.68±134.99	**1.58±0.29*** **
Birth order	0.17±0.26	-26.4±33.37	0.02±0.07
Family size	-0.28±0.18	40.36±24.98	0.08±0.05
Land tenure			
Inherited	**5.87±2.27****	264.98±313.85	0.93±0.66
Redistributed	ref	ref	ref
Model 2			
Birth order	-0.11±0.28	17.43±35.92	0.08±0.07
Land tenure			
Inherited	-0.29±0.18	**43.17±24.55***	**1.98±0.88****
Redistributed	ref	ref	ref
Birth order* Inheritors	**1.27±0.57****	**-229.8±77.1*** ** Older brothers only **-430.33 ±145.34*** **	**-0.29±0.16***

*<0.1, **<0.05, ***<0.001

Figure 1: The effect of older brothers on land productivity (crop yield per hectare) by land tenure system (adjusted for age, wealth, number of father's wives and sibling sex ratio at birth)

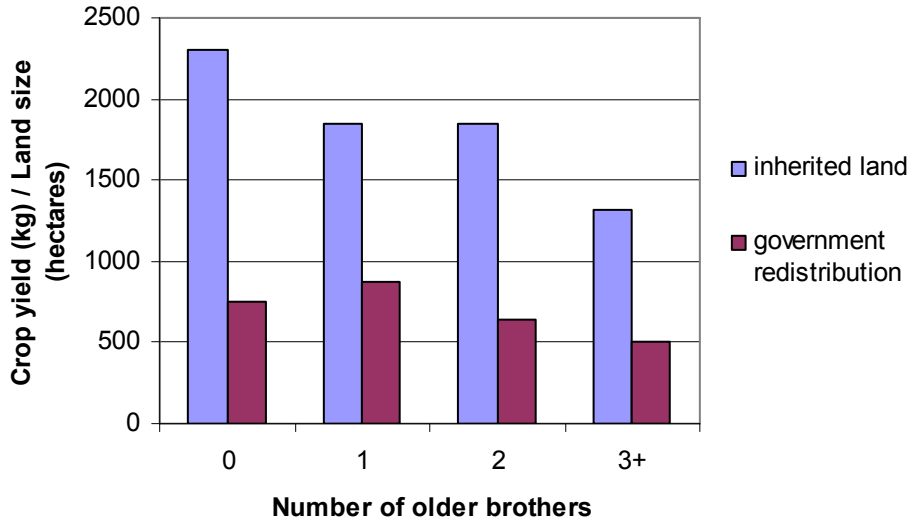

Figure 2: The effect of brothers on risk of out-migration by land tenure system

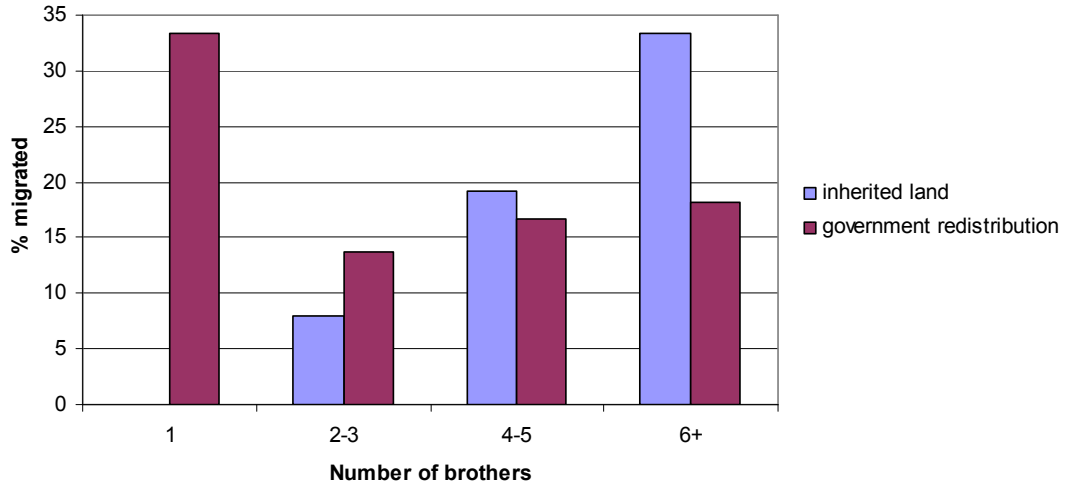

Figure 3: The effect of order of birth on age at first marriage by land tenure system (adjusted for age, land size, number of father's wives and sibling sex ratio at birth)

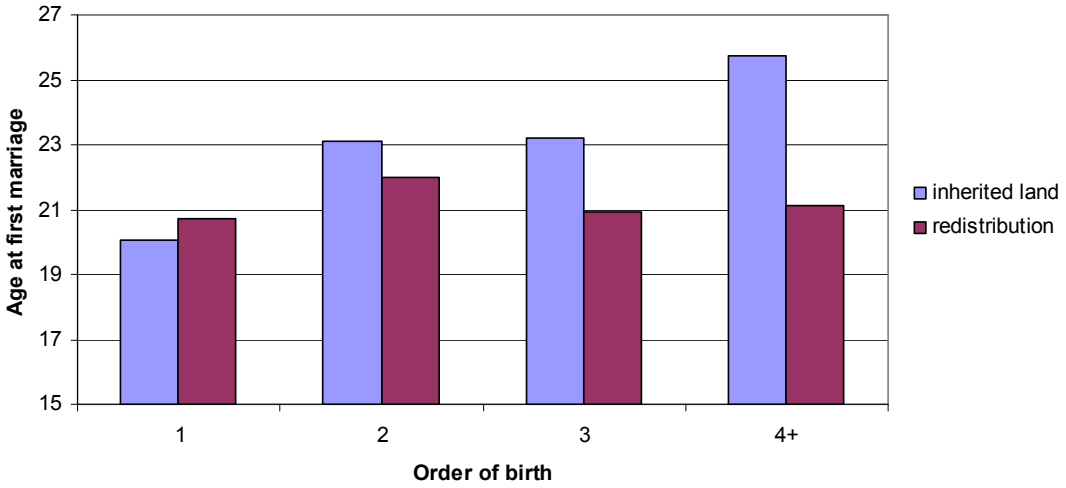

Figure 4: The effect of older brothers on size of bridewealth payments at first marriage by land tenure system (adjusted for age, land size, number of father's wives and sibling sex ratio at birth)

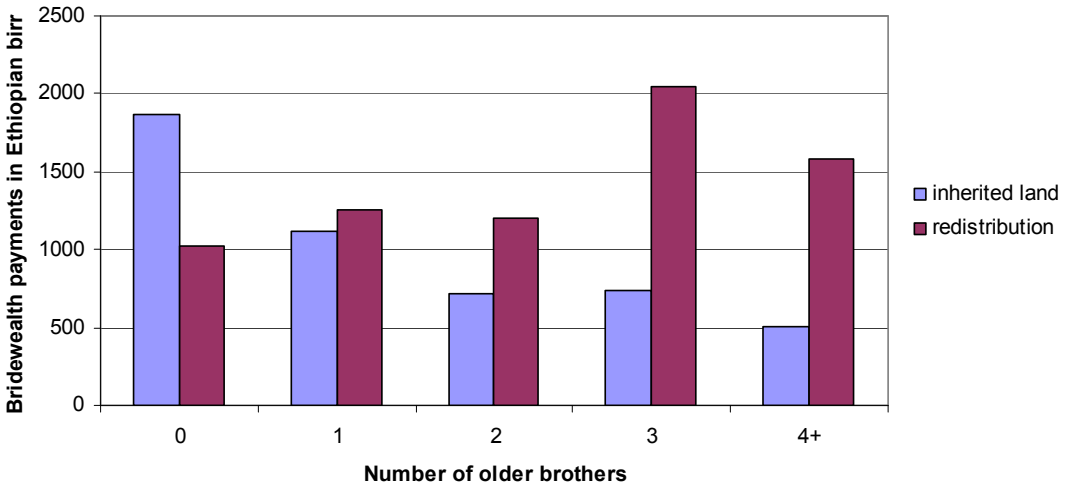

Figure 5: The effect of birth order on reproductive success by land tenure system (adjusted for age, land size, number of father's wives and sibling sex ratio at birth)