Original Article

Farming in transition: land and property inheritance in a rural Polish population

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Abstract

This paper examines inheritance practices in a Polish agricultural population where fertility is rapidly declining and traditional farming is being abandoned. Specifically, I examine how flexible inheritance transfers are, and whether they can be understood as part of a parental investment strategy in which parents strategically allocate resources to their children in ways that are likely to optimise their reproductive and/or social success. Using data on almost 2,000 women, I find that inheritance patterns are sex and birth order-biased, with a clear preference for male heirs and for ultimogeniture. However there is considerable flexibility depending on the size and sex composition of the family. There is evidence to suggest that parents are diversifying their investment strategies in negotiation with their offspring and in response to their future payoffs. Thus, male heirs tend to be less-highly educated than non-heirs. There is also evidence that male heirs inherit better-quality resources than do female heirs, consistent with a Trivers-Willard effect. I argue that fertility decline itself, by reducing the chances that an heir of the preferred sex is available, directly influences inheritance practices in farming populations. As land becomes less viable as a source of income, and an increasing proportion of females inherit, the abandonment of subsistence farming as a way of life is likely to accelerate.

Introduction

Evolutionary anthropologists assume that inheritance practices are culturally evolved strategies for ensuring that resources are transferred between the generations in ways that maximise inclusive fitness, paternity certainty, and intergenerational lineage stability (1-7). That humans make flexible, context-specific resource allocations is a cornerstone of evolutionary anthropology (8-11). As a result, we should expect parents to transfer their resources to their children in a way that maximises their likely reproductive

and/or social success in the future (12). However, few studies have examined the extent to which inheritance practices exhibit flexibility within a population while remaining locally responsive to the potential payoffs for offspring (4).

Inherited material resources are often crucial for marriage and reproductive prospects (13,14), and in traditional subsistence populations where fertility is high, most parents are likely to have an heir of the preferred sex, so inheritance rules (e.g. exclusive primogeniture favouring males) may be unlikely to deviate from the norm. In contrast, in populations that are transitioning between subsistence livelihoods, especially where fertility is declining such that a greater proportion of families are unlikely to have an heir of the preferred sex (15), there may be more room for flexibility.

According to Trivers and Willard (1973), in populations where men have more variable reproductive success than women, and where resources are important to that variability, high-status parents should invest their resources preferentially in sons compared to their daughters, and lower-status parents should do the opposite (12). This facultative adjustment based on the wealth and/or status of the parents and thus, the environment the child is likely to inhabit, is expected to maximise reproductive success of the favoured sex. An implication of this hypothesis is that under conditions of subsistence transition, parents should adjust their investment strategies to reflect new types of resources that become increasingly important for social and reproductive success. Indeed, flexibility is to be expected in this situation, because the transition to a new subsistence economy may require adjustments to the 'optimal' allocation strategy, or may devalue the particular resource being transferred.

In this paper I examine how inheritance practices may be changing during the course of a demographic and subsistence transition in a mid-transitional farming population in rural Poland. I assess whether inheritance patterns of both land and property in this population can be understood as part of a parental investment strategy in which parents strategically allocate resources to their children. The data come from semi-structured interviews with 1,995 randomly sampled women aged 18-91, living in 22 randomly sampled communities (21 villages and one town) in the Beskid Wyspowy region of the lower Carpathians in the southern province of Malopolska. The data were collected between June 2009 and November 2010.

The study site is located in an economically disadvantaged area of Poland, characterised by centuries of peasant subsistence farming, and which was historically one of the poorest regions in Europe (16). The area is now undergoing a rapid transition away from farming and towards a more exclusive dependence on labour-market income sources. Although Poland has had a below-replacement fertility rate since the early 1990s, the study communities have remarkably higher fertility than national estimates would suggest (mean completed fertility in the sample is 3.81 [s.d. 2.15] children per woman). Households are multigenerational and range in size from one to 15 inhabitants, with an average of 5.36 inhabitants (s.d. 2.27) at the time of the survey.

Nonetheless, fertility is declining (23, 24).

A shortage of arable land and a long history of partible inheritance in this region, stretching back at least to the 18th century, has reduced plot sizes dramatically and made farming a relatively difficult enterprise. As far back as 1899, over 80% of peasant farmers in this region of Poland owned less than 5 acres of land (17). In the study area, holdings tend to be scattered across numerous strips of land, often far away from the farmhouse, making efficient farming difficult. Indeed the study communities are situated in an isolated area with poor soil and long, hard winters, which, as noted by other anthropologists, was never particularly well suited to farming (18). Plot sizes today remain small; mean total land ownership in the sample is 2.33 hectares (s.d. 2.81) and there is large inequality in plot sizes with a right-skewed distribution; median plot size is 0.25 hectares. Mean arable plot size is just under one hectare (mean = 0.90, s.d. 1.35). Land quality in the study communities is poor, with more than 80% of farming households in the sample owning land that is classified in the lowest official grades, from classes 4 to 6. Of the 53% of households who actually work the land they own, 9% say they cannot use any form of mechanized equipment because of the poor terrain, with 16% of all farmers doing most or all of the farm work by hand. Nonetheless, 65% of all sampled households derive some subsistence goods from their own cultivated produce, with 29% producing half or more of their household's food in the winter and 35% producing half or more of their own food in the summer. The same range of crops and products are cultivated today as in the peasant past, with most families growing potatoes, vegetables and fruits, and those owning livestock also growing wheat, rye, tricitale (a hybrid of the two) and mangel beets for animal fodder. Over 56% of farmers in the sample keep at least one cow, from which they can make their own cheese in addition to obtaining milk and cream (cattle are rarely used for meat). Bee keeping is also popular in the study area. 21% of farmers in the sample keep rabbits, 77% keep fowl, 8% sheep, 13% horses, and 15% pigs. Seasonal foods such as mushrooms and blueberries are gathered in the local forests, and those who own forested land can additionally use their wood for heating.

Despite the hardship that it involves, the desire to remain farmers, if at all possible, remains strong. 48% of respondents said they would like their family to continue farming into the future. However, the changes wrought in recent generations are marked: only 4% of the sample now obtains their main source of income from farming, compared to over 65% of respondents' families in childhood (Table 1). Table 1 describes the most important sources of income in the sample in (A) respondent's childhood households, and (B) their households at the time of the survey in 2009/2010. Currently, over 65% of respondents (n = 1,255) live in households still practicing subsistence farming in addition to other income-generating activities. However there is a great deal of variation in income-generating strategies in this population, with 28% of households subsisting

mainly on state benefits, pensions and subsidies, and 65% deriving their principal source of income from the wage-earnings of householders.

Following the German and Soviet occupations of Poland during the 20th century, the transition to a market economy in 1989-1991 led to an unprecedented increase in poverty and inequality among households in Poland (19). The farmers in the study region, whose land had not been successfully collectivised under state socialism, were able to partially buffer themselves against the dramatic economic changes under rapid trade and economic liberalization, known as 'economic shock therapy'. Nonetheless, during the period 1989-2001 when the Polish farm sector was opened up to market competition, national statistics show that 12% of all farmers in Poland, including those living in the study area, lived below the subsistence minimum[i], 26% lived below the relative poverty line[ii] and 68% lived below the social minimum[iii] (20). In 2000, ~29% of the rural population of Poland, which encompasses the study area, were still estimated to be living under the relative poverty line (19). Many state-provided institutions that were available under state socialism were withdrawn after transition to market economy, so farmers in this region no longer benefit from institutions such as mills, meaning they no longer make their own bread. The removal of state support following the collapse of socialism also led to a sharp fall in the use of fertilisers and pesticides, further reducing the productivity and efficiency of farms.

The maintenance of a way of life consistent with subsistence farming has become even more difficult since Poland's accession to the EU in 2004 (21). Almost 40% of Polish farmers with less than 10 hectares of land are estimated to be poor by the national office of statistics (22). In the study area, farmers with small plots of land have no means to compete with industrial farmers further afield, so price and trade liberalization does not allow them to gain much surplus income from seasonal cash cropping. The only relatively profitable source of income is from livestock production and dairying, which only the wealthiest farmers can afford. Poorer farmers in the study area tend to be older, and their families are usually the substratum most dependent on the land for subsistence because they tend to have lower levels of formal education and fewer prospects for off-farm work. Dependence on farm work as a source of food also necessarily leaves less time for off-farm work. Farmers at the poorest end of the socioeconomic scale – those with less than a hectare of land, yet who depend

[i] The subsistence minimum (defined in 1995 by the Institute of Labour and Social Studies, the Office of National Statistics and the World Bank) refers to the minimal level of subsistence needed to avoid physical collapse/illness, and is a measure of very low income. The subsistence minimum is more than twice lower than social minimum (see [3]).

[ii] The relative poverty line (as calculated by the Polish Office of National Statistics) is equal to 50% average expenditure per unit of consumption, weighted by number of householders.

[iii] The social minimum refers to a poverty measure of 'minimum material security' developed in former Soviet block countries. It was designed to capture the indispensable minimum level of consumption (both economic and cultural) needed for social participation and integration. This is not an explicit measure of poverty *per se*, but is used as a symptom of poverty.

TABLE 1.

Main sources of income as reported by respondents in (A) their childhood households', and (B) at the time of the survey in 2009/2010

	(A) Childhood (n = 1864)		**(B) 2009/2010** (n = 1993)	
Primary source of income	n	Proportion	n	Proportion
Farming	1,213	0.65	88	0.04
Wage remittance	624	0.33	1,297	0.65
Social welfare	14	0.01	559	0.28
Mixed - farm & wage	5	0.00	9	0.00
Mixed - farm, wage, welfare	8	0.00	10	0.01
Mixed - wage & welfare	.	.	29	0.01

on farming for some part of their subsistence – do not substantially benefit from the subsidies and credits designed by the EU to help restructure peasant agriculture, which are usually based on a per hectare basis (19, 21). Considering the fact that the mean arable plot size in the study region is less than 1 hectare (23), the farmers in the study area must be considered one of the most vulnerable sections of the population.

In a context where plots are small and labour important to the productivity of the land, inheritance usually passes to one heir only, with a generally stated preference for male heirs and a desire for multiple sons to work the land. Ultimogeniture (i.e. the youngest child inheriting) is assumed to be the prevailing inheritance practice, and it is common for one child to inherit the land while another inherits the house, depending on the composition and size of the family, and the plans for farming in the future. The land is not usually subdivided but is sometimes parcelled into construction plots for children to build their own houses on. Given the changing outlook for farming as the population becomes more dependent on wage-labour income, and as family sizes decrease, parents appear to be diversifying their investments away from the land, particularly focusing on the education of their children. This paper attempts to systematically analyse these ethnographic observations. As such, it is intended to provide a quantitative assessment of the typical direction of inheritance transfers, the sex-biases that exist in these transfers, and the possible future directions for land and property inheritance, and indeed farming, in this population.

Data description and analysis

For each respondent (n = 1,995) and her husband (n = 1,498), I created indicator variables of whether they had ever owned the family's house or land, or if they have not yet inherited, whether they stood to inherit them in the future. These binary inheritance-status variables (0 = did not inherit, 1 = inherited/stands to inherit) indicate whether each individual is or ever was heir to their own family's land and/or property. An individuals' inheritance status was calculated using three-generational data on the ownership of land and property in the family and on the direction of inheritance transfers (i.e. in each instance whether land or

property was inherited from the father's or the mother's side of the family). Since married couples often claimed they owned land or property jointly, the previous owners were used to determine from which side inheritance had been transferred. Where property/land was inherited from a now-deceased spouse, the living partner was coded as a non-heir, and the deceased husband/wife was instead coded as the heir.

Table 2. describes the general distribution of inheritance transfers in the sample. Out of a total of 1,620 married couples, 85% (n = 1,380 couples) inherited some land and 45% (n = 721 couples) inherited some property, with 15% (n = 240 couples) not inheriting anything. Of those couples inheriting land, the majority (51%) inherited from the husband's parents, and of those couples inheriting property, the majority (55%) inherited from the wife's parents. Couples frequently build their own homes upon marrying, so it is relatively uncommon for both property and land to be transferred together; only 22% of couples inherited both land and property together from the wife's parents, and 19% of couples inherited both from the husband's parents. There were no cases where both spouses in a couple were heirs to both property and land from both sets of parents, and only 13 cases (1% of couples) where both spouses inherited either land or property from both sets of parents.

TABLE 2.

Distribution of inheritance transfers among married couples.

	n	**% of couples**
Total couples	1620	100%
Couples inheriting land	1380	85%
Couples inheriting property	721	45%
Couples inheriting land from husband's family	710	51%
Couples inheriting land from wife's family	670	49%
Couples inheriting property from husband's family	323	45%
Couples inheriting property from wife's family	398	55%
Couples inheriting *both* land & property from wife's family	359	22%
Couples inheriting *both* land & property from husband's family	309	19%
Couples inheriting *either* land or property from both sides	13	1%
Couples not inheriting anything	240	15%

The fact that few couples inherit from both sides of the family partly reflects the incompatibility of maintaining two separate farms, often located in different villages, and maintaining or obtaining a marriage partner. However it may also indicate a preference by parents to differentially transfer inheritance to children depending on the inheritance status of their spouses. Since property is not transferred until later in the parents' lives, they may have ample time in which to optimise their transfer strategies to benefit as many children as possible.

Table 3 shows the ratio of wives to husbands inheriting both property and

land in each of the birth cohorts in the data. The table indicates that, over time, there has been a secular increase in the proportion of women inheriting both property and land, relative to their husbands. Given that fertility has been steadily declining across these age-cohorts (23, 24), this pattern suggests that women are indeed inheriting their parents' assets more often as overall family sizes in the population decline. Note that the most recent birth cohort shows a drop in the ratio of women inheriting, but this does not represent all women in this age-group as it necessarily only includes those women who have married young.

TABLE 3.

Ratio of wives to husbands inheriting land and property, ordered by birth cohort of the respondent. The ratio of women to men inheriting both land and property has been increasing over time.

	Land inheritance (n = 1380 couples**)**			**Property inheritance (**n = 721 couples**)**		
Wife's birth cohort	Husbands	Wives	Ratio wives to husbands	Husbands	Wives	Ratio wives to husbands
Born before 1930	19	15	0.79	4	4	1.00
Born 1931-1940	65	64	0.98	23	14	0.61
Born 1941-1950	80	103	1.29	33	32	0.97
Born 1951-1960	99	148	1.49	35	47	1.34
Born 1961-1970	113	149	1.32	49	67	1.37
Born 1971-1980	104	165	1.59	68	105	1.54
Born 1981-1992	190	66	0.35	186	54	0.29

To examine more rigorously whether inheritance transfers follow a predictable pattern, I used multivariate logistic regression to estimate the probability of inheriting the land and/or property of ones' parents based on the number of brothers (range = 0 to 11, mean ~2) and sisters (range = 0 to 11, mean ~2), on birth order, and on education for both women and men. 49 women and 32 men had no siblings. Education was measured as the highest formal level reached, ranging from 0 = none/some primary (n = 21 women; 17 men); 1 = full primary (n = 320 women; 358 men), 2 = vocational (n = 525 women; 849 men), 3 = secondary (n = 816 women; 300 men) and 4 = tertiary (n = 313 women; 99 men). The outcome variable in each case is a binary category (did not inherit = 0, inherited = 1), so that each model gives the log-odds of inheriting based on a unit increase in the predictor, net of other factors. To test whether the preference for ultimogeniture is more flexible when the sex-composition of the family is female-biased, I included interactions between the focal individual's birth-order and an indicator of whether they had any brothers or not.

Results

Ultimogeniture is the generally preferred inheritance practice

The logistic regression models show that there is indeed a strong preference for ultimogeniture for both land and property transfers, as indicated by significant birth-order effects for both sexes (Table 4A and 4B). For men, each increase in birth order (i.e. being later-born) is associated with a 20% increase in the odds of inheriting land (OR =

1.20, 95% CI [0.10, 0.25]), a 21% increase in the odds of inheriting property (OR = 1.21, 95% CI [0.09, 0.28]), and a 21% increase in the odds of inheriting both land and property together (OR = 1.21, 95% CI [0.10, 0.29], Table 4B). These effects are independent of controls for education and birth cohort.

TABLE 4.

Multivariate logistic regressions of the probability of inheriting either land, property or both land and property together for (A) women and (B) men.

(A) Women

	Land						Property						Land & Property					
Predictor	OR	95% CI		z-value	pr >|z|		OR	95% CI		z-value	pr >|z|		OR	95% CI		z-value	pr >|z|	
Intercept	0.51	-1.28	-0.08	-2.22	0.026	*	0.47	-1.50	-0.02	-2.01	0.045	*	0.39	-1.70	-0.16	-2.38	0.017	*
Birth cohort																		
Born before 1930	2.64	0.27	1.67	2.73	0.006	**	0.31	-2.43	-0.17	-2.09	0.037	*	0.36	-2.28	-0.02	-1.81	0.070	
Born 1931 - 1940	1.80	0.16	1.01	2.70	0.007	**	0.40	-1.49	-0.38	-3.27	0.001	**	0.44	-1.39	-0.27	-2.84	0.004	**
Born 1941 - 1950	1.33	-0.08	0.64	1.54	0.124		0.40	-1.37	-0.47	-3.93	0.000	***	0.46	-1.26	-0.34	-3.35	0.001	***
Born 1951 - 1960	1.07	-0.25	0.39	0.44	0.660		0.28	-1.71	-0.88	-6.04	0.000	***	0.26	-1.80	-0.91	-5.91	0.000	***
Born 1961 - 1970	1.22	-0.11	0.51	1.28	0.202		0.39	-1.32	-0.58	-4.98	0.000	***	0.39	-1.35	-0.57	-4.84	0.000	***
Born 1971 - 1980	0.89	-0.42	0.18	-0.76	0.448		0.52	-0.99	-0.33	-3.90	0.000	***	0.51	-1.02	-0.34	-3.85	0.000	***
Born 1981 - 1992 (ref)	.	.	.	.	.		.	.	.	.	.		.	.	.	.	.	
Birth order	1.17	0.09	0.23	4.27	0.000	***	1.19	0.08	0.27	3.48	0.000	***	1.22	0.10	0.30	3.86	0.000	***
Any brothers (ref = yes)	1.51	-0.10	0.93	1.59	0.113		2.33	0.25	1.45	2.75	0.006	**	2.29	0.21	1.45	2.61	0.009	**
Number of brothers	0.76	-0.37	-0.18	-5.48	0.000	***	0.76	-0.41	-0.15	-4.23	0.000	***	0.76	-0.41	-0.14	-3.96	0.000	***
Any sisters (ref = yes)	1.61	0.18	0.78	3.14	0.002	**	1.78	0.23	0.93	3.25	0.001	**	1.59	0.10	0.83	2.53	0.011	*
Number of sisters	0.78	-0.35	-0.15	-4.81	0.000	***	0.80	-0.36	-0.10	-3.37	0.001	***	0.77	-0.41	-0.13	-3.74	0.000	***
Education	1.06	-0.06	0.18	0.99	0.324		1.05	-0.10	0.20	0.66	0.510		1.06	-0.10	0.21	0.70	0.481	
Birth order*Has no brother:	0.90	-0.33	0.12	-0.89	0.375		0.73	-0.62	-0.04	-2.15	0.032	*	0.73	-0.63	-0.02	-2.01	0.044	*
Model fit and summary																		
Sample size	1995						1995						1995					
AIC	2432						8122						1730					

(B) Men

	Land						Property						Land & Property					
Predictor	OR	95% CI		z-value	pr >|z|		OR	95% CI		z-value	pr >|z|		OR	95% CI		z-value	pr >|z|	
Intercept	1.40	-0.32	1.00	1.01	0.314		1.13	-0.67	0.91	0.30	0.764		0.96	-0.86	0.76	-0.11	0.913	
Birth cohort																		
Born before 1930	1.28	-0.40	0.89	0.74	0.457		0.22	-2.54	-0.65	-3.22	0.001	**	0.24	-2.43	-0.52	-2.94	0.003	**
Born 1931 - 1940	1.46	-0.13	0.90	1.44	0.150		0.30	-1.89	-0.56	-3.59	0.000	***	0.33	-1.78	-0.43	-3.18	0.001	**
Born 1941 - 1950	2.38	0.37	1.37	3.42	0.001	***	0.51	-1.28	-0.07	-2.19	0.029	*	0.55	-1.22	0.02	-1.90	0.058	
Born 1951 - 1960	2.59	0.50	1.42	4.08	0.000	***	0.63	-0.98	0.08	-1.69	0.091		0.70	-0.89	0.20	-1.27	0.206	
Born 1961 - 1970	2.52	0.48	1.39	4.01	0.000	***	1.25	-0.26	0.73	0.91	0.365		1.33	-0.21	0.80	1.10	0.272	
Born 1971 - 1980	2.06	0.28	1.18	3.15	0.002	**	1.27	-0.24	0.74	0.95	0.341		1.33	-0.21	0.80	1.12	0.264	
Born 1981 - 1992 (ref)	.	.	.	.	.		.	.	.	.	.		.	.	.	.	.	
Birth order	1.20	0.10	0.25	4.68	0.000	***	1.21	0.09	0.28	3.92	0.000	***	1.21	0.10	0.29	3.97	0.000	***
Any brothers (ref = yes)	0.65	-1.01	0.13	-1.51	0.132		0.42	-1.66	-0.13	-2.23	0.026	*	0.47	-1.54	-0.01	-1.91	0.056	.
Number of brothers	0.81	-0.29	-0.13	-5.42	0.000	***	0.79	-0.34	-0.13	-4.53	0.000	***	0.80	-0.32	-0.12	-4.20	0.000	***
Any sisters (ref = yes)	0.98	-0.37	0.33	-0.12	0.905		0.86	-0.60	0.29	-0.65	0.515		0.85	-0.62	0.29	-0.68	0.500	
Number of sisters	0.92	-0.18	0.01	-1.78	0.075		0.92	-0.21	0.03	-1.43	0.154		0.92	-0.20	0.04	-1.27	0.205	
Education	0.74	-0.40	-0.20	-5.91	0.000	***	0.74	-0.43	-0.17	-4.47	0.000	***	0.74	-0.44	-0.17	-4.50	0.000	***
Birth order*Has no brother:	0.98	-0.17	0.14	-0.20	0.841		1.10	-0.08	0.27	1.06	0.288		1.09	-0.10	0.26	0.91	0.365	
Model fit and summary																		
Sample size	1498						1498						1498					
AIC	1967						1418						1385					

For women, each increase in birth order (i.e. being later-born) is associated with a 17% increase in the odds of inheriting land (OR = 1.17, 95% CI [0.09, 0.23]), net of other factors in the model (Table 4A). However there was a significant interaction between birth order and the binary indicator of having no brothers in the models on women's' inheritance of property, and land and property together. This interaction reveals that the preference for ultimogeniture in these latter transfers is less pronounced when there are no male heirs to inherit,

i.e. there is a flattening out of the birth-order effect when women are the only possible heirs (Table 4A). There were no significant interactions when it came to women's inheritance of land or indeed in any of the models on male inheritance probabilities.

Parents prefer to transfer land to males

There appears to be a strong sex-bias favouring men in inheritance transfers, since only the number of brothers, but not sisters, has an effect on a man's odds of inheriting any assets. For every additional brother, men have a 19% reduced odds of inheriting land (OR = 0.81, 95% CI [-0.29, -0.13]), a 31% reduced odds of inheriting property (OR = 0.79, 95% CI [-0.34, -0.13]) and a 20% reduced odds of inheriting both assets together (OR = 0.80, 95% CI [-0.32, -0.12], Table 4B). Interestingly, in the case when there is only one male in the family, i.e. when a man has no brothers, he has significantly decreased odds of inheriting property (OR = 0.42, 95% CI [-0.66, -0.13], or land and property together, (OR = 0.47, 95% CI [-0.54, -0.01] Table 4B), although his probability of inheriting land remains unchanged.

In contrast to the results for men, a woman's odds of inheriting are negatively affected by both the number of brothers and sisters she has, such that for every additional brother, her odds of inheriting all assets are reduced by 24% (Table 4A), and for every additional sister her odds of inheriting land are reduced by 22% (OR = 0.78, 95% CI [-0.35, -0.15]), her odds of inheriting property reduced by 20% (OR = 0.80, 95% CI [-0.36, -0.10]) and her odds of inheriting both land and property together reduced by 23% (OR = 0.77, 95% CI [-0.41, -0.13], Table 4A). In contrast to the result for men, there are no significant differences in inheritance probabilities for women where they are the only daughter in the family.

Parents transfer inheritance to less-educated sons

For men, there is a strong negative correlation between education and the odds of inheriting all assets (Table 4B), indicating that lower, rather than higher-educated sons are more likely to inherit. Every unit increase in male education is associated with a 26% reduction in the odds of inheriting land (OR = 0.74, 95% CI [-0.40, -0.20]), a 26% reduction in the odds of inheriting property (OR = 0.74, 95% CI [-0.43, -0.17]), and a 26% reduction in the odds of inheriting both land and property together (OR = 0.74, 95% CI [-0.46, -0.17]). For women in contrast, education is not significantly associated with inheritance probabilities (Table 4A).

Male heirs have more viable farms than do female heirs

There is some evidence in favour of a Trivers-Willard effect in the transfer of farms in this population, such that men who inherit land receive better-quality resources than women who inherit. Table 5 shows that men inherit significantly larger total plot sizes and more hectares of viable farmland than do women. Men who have inherited also have significantly more dairy cattle – the primary means of earning surplus income from farming – than do women who inherit.

TABLE 5.

Farm viability varies depending on the sex of the heir. When men inherit, farms are significantly larger, of better quality and have more cattle than when women inherit.

	Wife inherits			**Husband inherits**					
	mean	s.d.	n	mean	s.d.	n	t-value	p-value	
Total land (hectares)	**2.12**	2.72	668	**3.17**	3.03	705	-6.75	0.000	***
Arable land (hectares)	**0.79**	1.19	645	**1.20**	1.37	666	-5.69	0.000	***
Number of dairy cattle	**0.68**	1.62	670	**1.09**	2.14	710	-4.04	0.000	***

Welch t-tests assuming unequal variances. All differences are significant at the $p < 0.001$ level

Discussion

This analysis reveals an interesting picture of inheritance transfers in this transitioning population. The broad finding is that inheritance preferences are flexible and can be understood as part of a responsive parental strategy to allocate resources amongst their children, potentially in a way that optimizes their social and/or reproductive outcomes. Ultimogeniture is the predominant inheritance pattern, but when only female heirs are available and the resource being transferred is property or land and property together, ultimogeniture is less important. Inheritance transfers are generally strongly biased toward sons, however men are less likely to inherit property, or property and land together, when there is only one son in the family. The same is not true in the analogous situation for daughters.

Why is there a switch to daughter-preference when there is only one son available for transfers of property, or property and land together? The answer may lie in the strong differences in the odds of inheritance between more- and less-educated sons. Men, but not women, are less likely to inherit across the board when they are more highly educated. This might be because highly educated men are more likely to decline inheritance transfers, preferring instead to pursue non-farming livelihoods, which they are better qualified to do, or alternatively this may reveal a parental transfer strategy that is strongly responsive to men's prospects for income-earning potential. When there is only one son in the family, the incentives to stay at home and work the land are not strong, since sons are often expected to provide for the household, but the remittances from other sources of labour are usually much higher than those from either farming alone or a combination of farm and off-farm work (25). Indeed parents may avoid transferring property or both land and property to sons in this situation to enable them to maximise their advantages in the labour market.

This negotiation between farming and men's education may therefore reflect a parental investment strategy that favours strategic investment in sons depending on the types of resources that may be most advantageous to them. Certainly, when parents do transfer land to sons, the land is of better quality and the farms are more productive. Since men who inherit higher quality resources are expected to have higher fitness returns than women who inherit high quality

resources (12), this result is consistent with a Trivers-Willard effect.

Inheriting the family house brings with it caretaking responsibilities for ageing parents, which usually increases rather than decreases the financial burden on heirs in this population (for similar arguments see 26, 27). Any siblings who do not marry usually also remain in the family home. In practice, property is often bequeathed near the end of the parents' lives. If the heir in question has not married by then, this situation often exacerbates rather than ameliorates poverty, since leaving the village to work is not an option, and finding a marriage partner can remain problematic, since another farm or income source will be needed. Not having the resources to build one's own house is also increasingly seen as a sign of poverty, one that usually befalls poorer couples and unmarried people. These factors may also account for the finding that women are more likely to inherit property, and property and land together, when there is only one son in the family.

Taken together, the results suggest that inheritance patterns in this population reflect a negotiation between parental investment strategies and the wishes of their sons, such that some sons receive parental investments in the form of land inheritance, and others pursue education. The fact that almost no couples receive inheritance transfers from both sides of the family strongly indicates that parents take into account the inheritance prospects in the spouse's family when planning their transfer strategy to their own children. Although plot sizes in this population are generally small (< 5 hectares), conditions for farming are undoubtedly better when there are multiple males available to work the land. Thus, in families where a critical mass of sons is not available to make farming a viable income source, it would make sense both for parents to transfer these resources to daughters, and for sons to invest more highly in their own education. The outcome is that that women are increasingly inheriting their parents' assets, and when they do, the farms are less viable.

In the changing context of farming in this population, farmers who want to maintain their livelihoods must transfer their farms in a way that is most beneficial to the family. However, as a result of diversifying parental investment strategies to include the education of children, in a context of shrinking family sizes, women are increasingly inheriting farms. Since farming is neither a dependable nor a lucrative income source, both husbands and wives will increasingly seek alternative income-generating options, but those who depend on the land for subsistence are also likely to become increasingly impoverished. These dynamics have a number of implications.

In line with the Trivers-Willard hypothesis (12), it may make sense for parents to preferentially cede their farms to women as they increasingly invest their resources in the education of their sons, potentially leading to higher rates of male out-migration. There are at least three outcomes for inheritance practices and post-marital residence patterns in the future as a result. First, the prevalence of uxorilocal (wife's family) over virilocal (husband's family) post-

marital residence may increase where land and subsistence farming remains important to livelihood, since men will more often have to move to their spouse's village. Second, future transfers may start to be directed away from the nuclear family in order to secure male heirs, or plots may be sold (a relatively unlikely possibility given the poor quality of the land for either farming or construction). The third and most likely outcome is that the pace with which farming is being abandoned will rapidly increase as the proportion of female heirs increases. A large proportion of the families in the villages I surveyed had stopped systematically producing food in the last 3 to 5 years, and slaughtered or sold off their livestock. Difficult terrain and short growing seasons means that labour is a strongly limiting factor for farm productivity in this population. Thus while land is usually considered the most important limiting factor in European traditional agricultural systems (compared to African ones where land is not especially limited), labour is becoming more of an impediment to farming here as family sizes decline. Whichever turns out to be the case, it is clear that incremental changes in fertility decline itself will directly influence the inheritance practices, dispersal patterns and the dissolution of the farming way of life in this population.

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