A. Data

Wealth (general considerations)

Since the 1930s land has been the primary source of wealth for Kipsigis as the primary source of subsistence and market produce (Manners 1967, Mwanza 1977). Livestock wealth is also economically and culturally significant, used in marriage payments, exchange networks, for domestic (and some commercial) dairy produce, and increasingly for sale to raise cash. Small stock (primarily goats) are used for meat; cattle are occasionally slaughtered for large ceremonies and celebrations, or in times of extreme hunger.

Transmission of wealth

Land is inherited by sons following a rule of equal division; daughters disperse at marriage. The equal division rule results from institutions for the intergenerational transmission of livestock. When Kipsigis began to claim permanent agricultural plots in the first three decades of last century, they applied cattle inheritance rules to land. Inheritance is in reality a fluid process, since young men do not inherit land or livestock at any single instance (marriage, death of father, etc). Rather in their late teens they start cultivating a small patch of land on their father's plot and gain use rights to certain livestock. At marriage an allocation of livestock and of farming/grazing land is made – capital assets that are still seen as "owned" by the father but effectively used by the son. In making these allocations fathers anticipate claims from sons who are still young (and even unborn), who are expected to settle on the family plot when they get older – i.e., they don't give out all their land and livestock without considering claims in the future. Occasionally land and livestock will be reclaimed from older sons to distribute among younger sons (of the same wife), an event which causes considerable friction but is justified in terms of the equal inheritance rule.

Sample

This is the oldest Kipsigis sample for which wealth can be determined retrospectively. It consists of 25 settlers (pioneers) who established farms of different sizes in Abosi (a zone where Kipsigis expanded, using force, into Maasailand between 1930 and 1949). The size of the originally settled plot could easily be determined, both because of the dramatic events at arrival, and by using data from a recent government survey to confirm estimates of the size of earlier settled plots (Borgerhoff Mulder 1990). Problems with this sample are that it is small, and that it reflects a period of expansionary and unsustainable growth of the Kipsigis population – see Interpretation, below).

The 25 pioneers varied considerably in age at settlement (20-46 yrs, mean 29.2 yrs) (**Table 1**). Of the 181 sons born to these men, 161 had reached 30 by 1991, and still remained in the area; (note that 25 pioneers produced such a high number of sons because of polygyny). A few sons had entirely disappeared from the area and were not traced. The sons varied in age in 1991 (30-67 yrs, mean 43 yrs). 30 years is used as cutoff because by that age most men have married and started reproducing; it also corresponds to mean age of father's at settlement, thereby providing an appropriate group with which to make intergenerational wealth comparisons.

Details of wealth measures

Land is measured in acres, as determined by the Government Land Office and field interviews, for both fathers' and sons' landholdings. For three fathers the plot sizes of their sons were not available from the GLO and an estimate was made assuming an equal split among sons. In all other cases where land had been surveyed, the shares were very egalitarian, rarely differing by more than 5% of the expected (egalitarian) share, rendering the above estimate legitimate. In a few cases sons bought new plots (in communities adjacent to Abosi), although in all cases they also continued to use the allocation from their fathers; in these cases the measure of son acres includes "inherited" and "purchased" land.

Livestock: cattle numbers, the principle source of livestock wealth, were recorded for all men in the sample in 1982-3 and in 1991 (1991 data are used). Father's wealth at settlement was determined through retrospective "lifestock history" interviews that were conducted with fathers as part of informal unstructured discussions about the man's marital and settlement history, and the origins of his family. There is no way to systematically check these measures, with the exception of informal cross checking with other similarly aged individuals who arrived in Abosi at the same time. Although the exact amounts of livestock reported were not always consistent, the ranking among men was almost identical. Because I was not writing during these retrospective interviews (often they were carried out while walking or driving) I am confident measures are quite reliable.

Education was measured as years in school, on the basis of the standard reached; because there was so little variation in father's education (only 4 of 25 pioneers had any education) □ (education) was not calculated for this sample.

Analysis.

The means, standard deviations, and range of father's acres (FAC) and cows (FCOW) and son's acres (SONAC) and cows (SCOW) are shown for raw and logged values in **Table 2**, and their relationships are shown graphically in **Figures 1 and 2**.

B. Parameter Estimates

To calculate the □ for land the log values of both father's acres at settlement (LFAC) and son's acres (LSONAC) were used, and LSONAC regressed on LFAC in a model that included son's and father's age and their squared terms (see **Table 3a**). The estimated unstandardized regression coefficient $\square_{land}$ is .60 (se 0.07). Older sons hold somewhat fewer acres than do younger sons, but there is no effect of father's age on sons acres. To calculate the □ for livestock the log values of father's cows at settlement (LFCOW) and son's cows in 1991 (LSC0W) were used, and LSCOW regressed on LFCOW with the same control variables in the model (see **Table 3b**). The estimated unstandardized regression coefficient $\square_{cow}$ is .74 (se 0.13). There were no significant effects of father's nor son's age on cattle holding.

C. Interpretation

The □ coefficients for this sample, both for land and for livestock, are exceptionally high, reflecting the fact that Kipsigis who settled in Abosi faced a largely unsaturated habitat. Men with many wives, or with the livestock to acquire many wives, tended to claim and protect large plots, and these were inherited by their sons. Although wealthy men attracted more wives than did poorer men women did not settle with men following an entirely ideal free distribution with respect to acres (Borgerhoff Mulder 1990), and hence wealthy men in this sample tend to have sons who are wealthy.

The □ for land is lower than the □ for livestock. This was not initially predicted, since land wealth is more stable over time than livestock wealth, and cattle keeping societies are commonly thought to be "egalitarian" because of the vagaries of theft and disease. On reflection, however, there are reasons why this might be. First, land is not elastic – plots are subdivided among sons and rarely augmented with land purchases. Thus a man who marries more wives than is perhaps wise (there is a kipsigis word for this - overmarriage!) depletes the land holding of his sons. Second, livestock are elastic. While they are also depleted through equal inheritance and "overmarriage", it is possible that the son of a wealthy man is better able to build up and maintain a large herd himself, perhaps because of his access to more labor, to his father's cattle loaning partnerships (Peristiany 1939), or to other dimensions of social capital. Third men with sufficient land can set aside some areas to raise surplus crops for sale, the proceeds of which are invested in livestock as a buffer against future crop loss or other eventualities, as modeled in an earlier paper (Luttbeg, Borgerhoff Mulder, and Mangel 2000).

Finally the high □ coefficients may reflect sample selection. It is possible that men with ambitions for large farms and powerful families were particularly willing to enter into strange lands, to right and negotiate with Maasai, and to defend their homesteads and herds from the frequent reprisals.

Why are there no strong effects of age on wealth in this sample? As regards land wealth this in part reflects the fact that a man's acres are very stable over his life, since there is little market for land (see above). It also reflects the way land wealth for sons was coded in this study. A just-married man has a different amount of control over his share of his father's land than does a 35 year old man, who also differs in this respect from a 50 year old man. In this study all men were coded as "owning" their land even though they might not yet have had full control of their full share. The fact that younger sons own slightly more land than older sons requires further investigation (parity controls), since in a few cases I heard suggestions that a youngest son is given extra land "to look after his mother". As regards livestock, Kipsigis men generally accumulate cattle over their lifetimes, but also have to hand out animals for marriages and intervivos transfers. Some of the younger sons in this sample may also be benefiting from education, getting some employment, and investing in livestock (or even land) – this needs further investigation[1].

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[1] Actually in this particular sample there is no evidence that son's education is associated with cattle or land holding

D. How generalizable are these results? Extending to Gelegele and Chesinendet

The extremely high □ parameters estimated for the Abosi sample motivate a parallel analytical approach to a very different sample of Kipsigis men and their sons for which retrospective data are also available. This consists of a larger number of men who settled on two “settlement schemes” (Gelegele and Chesinendet) just prior to or at Independence, when British farmers went home. The process of settlement at KabGelegele and KabChesinendet was very different from at Abosi – not an ethnic expansion into a neighboring territory but rather an administrative subdivision of colonists land occasioned by new policy. Land grants typically were 30 acres at Gelegele, and generally smaller but more variable in Chesinendet.

The settlement schemes differ from Abosi in both market access and time period sampled. Settlement scheme data starts at a later period 1960-1991. The schemes are located nearer cosmopolitan centres and/or have better road access. They are more closely linked into the market economy of the newly independent nation, exhibit more land purchases and sales, more commercial sale of dairy produce, and possibly more selling and buying of livestock. It also seems as if the rule of egalitarian inheritance of land is not so rigidly followed in the settlement scheme sample. In this sample too we start to see education emerging as an important dimension of parental investment.

The demographic details of the sample are shown in Table 1. The settlement scheme sample is larger than the Abosi sample, but it has poorer followup. Settlement scheme men were older when they got their land grants, but both they and their sons were younger in 1991 than were the Abosi men and their sons. This is because the Abosi data covers an earlier period than the settlement scheme data. The nice thing about the settlement scheme data is that the mean age of sons in 1991 was exactly the same as the mean age of their fathers at settlement.

Analysis

The descriptive statistics for the settlement schemes are shown for raw and logged values in **Table 4**. Fathers in Gelegele and Chesinendet are considerably poorer in land and livestock than are fathers in Abosi. Sons show much less marked difference in wealth between the two sites, no doubt reflecting the possibility for younger men in the schemes to buy cattle. Both fathers and sons show higher levels of education in the settlement schemes than in Abosi.

The relationship between father and son measures for land, cows and education are shown in scatter plots (**Figures 3-5**). Since this sample contained 20 fathers who were already deceased by 1991, this allowed investigation of the effects of paternal death on the association between father’s and son’s wealth, as indicated in Figures 3 to 5.

Parameters

To calculate the □ for land the log values of father’s acres was regressed on son’ acres, as for Abosi, in a model that included sons age, son’s age squared, father’s age, father’s age squared, and the survival status of the father **(Table 5a)**. Father’s acres was a strong predictor of son's acres ($\square_{land}$ .58, se 0.07). Father's age had a marginally negative effect on son's acres, whereas son's age was positively associated with his acreage. The $\square_{cows}$ was similarly calculated by regressing logged sons' cows on logged father's cows, including the same control variables (**Table 5b**). Again father's cows was a strong predictor of son's cows ($\square_{cows}$ .36, se .16). Older sons owned more cows than younger sons, but father's age had no effect. Interestingly sons with deceased fathers had marginally fewer cows than sons whose father was alive. The $\square_{education}$ was calculated by regressing logged sons' years of education on logged father's years of education. Father's education was a strong predictor of son's education ($\square_{education}$ 0.24, se .07, **Table 5c**). Neither father's nor son's age was associated with education, yet sons were more educated when their fathers had died.

E. Summary and Interpretation of both samples

The parameters are summarized in **Table 6.** The expectation that the □ for land would be lower for the settlement schemes was not met; it was indistinguishable from that for Abosi (.60 and .58). Clearly Kipsigis land transmission patterns are not sustainable, but during the sampled period land plots had not yet fragmented to such unsustainable units that we see in the old Reserve areas. Both Abosi and the settlement schemes samples reflect a period of territorial expansion in an environment perceived as unsaturated where polygyny does not serve, at least in a single generation, to equilibrate wealth differences among men. There were also periods of rapid economic expansion, particular the 1930s (resulting from British settlement farming) and the 1960s and 1970s, reflecting national growth trends.

The □ values for livestock are much lower in Gelegele and Chesinendet (.36) than in Abosi (.74). This most likely reflects the greater diversity of alternative expenditures in the settlement schemes – nicer houses, more agricultural equipment, etc. Cattle are also used to fund children's education to some extent, although the vast majority of education is in the primary years. Though primary school was technically free during this period, there were many associated costs, such as clothing, stationary, soap, and lost labor.

The significant □ values for education most likely reflect the distinct preferences of educated versus uneducated fathers. There is no indication in the data that parents substitute land or livestock bequests with education. In fact, to the contrary, sons who finish primary school (7 or 8 years) might be more likely to prosper in land and livestock as a result of their greater human capital and/or employment (needs further investigation)[2]. The fact that there is no indication in these models of more education among the younger men requires further investigation[3]. The strength of father's education is interesting in this context, suggesting that familial environment completely excludes the predictable effect of secular changes associated with school availability, at least early in the education revolution.

Death of a father affects sons' livestock and education in different ways. Sons with dead fathers own marginally fewer cattle but are educated for a longer time. One possible explanation is that sons whose fathers have died lack the herding guidance and/or political

[2] In the settlement scheme there is some evidence that son's education was marginally associated with land, but not with livestock; in Abosi, there were no effects of son's education on his wealth (see note 1, above)
[3] The raw correlations between years of son's education and both father's and son's age are both negative and significant (father's age r=-.36, p<0.001, n=235; son's age r=-.20, p<0.01, n=235).

influence to maintain large herds (animals are lost through disease, fines, witchcraft cases, etc). With a deceased father however it is possible that the mother plays a larger role in encouraging/insisting on schooling, particularly insofar as widowed women depend heavily on the contributions of their sons in later life.

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Table 1 Sample characteristics for Abosi and the settlement schemes

	Abosi	**Settlement Schemes**
N sons (fathers)	161 (25)	235 (59)
N sons with no follow up	20 of 181 total	140 of 375 total
Mean age father at settlement (range)	29.20 (20-46)	37.97 (27-50)
Mean age father in 1991	79.48 (66-93)	68.97 (58-81)
Mean age son in 1991 (range)	43.0 (30-67)	37.91 (30-56)
N deceased (percent)	Not sampled	5 (8.5%)
Period of data coverage	1930-1991	1960-1991

Table 2

Table 1a. Raw measures – Abosi

MEASURES	FAC	SONAC	FCOW	SONCOW	FED	SONED
N	25	161	25	161	25	161
Mean	71	7.92	58.48	11.29	.68	1.84
Std. Deviation	68.59	5.012	37.80	9.18	1.84	2.93
Variance	4704.17	25.125	1429.01	84.31	3.39	8.63
Coefficient of variation (1)		.633		.813		
Range	292	28	140	64	8	12
Maximum	300	30	150	65	8	12
Minimum	8	2	10	1	0	0

(1) std. deviation divided by the mean

Table 1b. Logged values – Abosi

MEASURES	LFAC	LSONAC	LFCOW	LSONCOW
N	25	161	25	161
Mean	1.67	.811	1.67	.906
Std. Deviation	.405	.282	.311	.392
Variance	.164	.080	.097	.154
Coefficient of variation				

Table 3 Regressions for Abosi

A. Acres

. reg LSONAC LFAC FA1991 FA21991 SA1991 SA21991, cluster(MAN)

Regression with robust standard errors Number of obs = 161
F(5, 24) = 21.59
Prob > F = 0.0000
R-squared = 0.6523
Number of clusters (MAN) = 25 Root MSE = .1691

LSONAC	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
LFAC	.5997407	.0652785	9.19	0.000	.4650125	.7344689
FA1991	-.0808441	.0781422	-1.03	0.311	-.2421216	.0804334
FA21991	.0004612	.0004902	0.94	0.356	-.0005505	.0014729
SA1991	-.0472689	.0224165	-2.11	0.046	-.0935342	-.0010036
SA21991	.00048	.000247	1.94	0.064	-.0000298	.0009899
_cons	4.348171	2.9939	1.45	0.159	-1.830935	10.52728

B. Cows

. reg LSCOW LFCOW FA1991 FA21991 SA1991 SA21991, cluster(MAN)

Regression with robust standard errors Number of obs = 161
F(5, 24) = 17.59
Prob > F = 0.0000
R-squared = 0.3659
Number of clusters (MAN) = 25 Root MSE = .31727

LSCOW	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
LFCOW	.7422823	.1320233	5.62	0.000	.4697997	1.014765
FA1991	-.1127158	.0852589	-1.32	0.199	-.2886816	.06325
FA21991	.0006642	.0005447	1.22	0.235	-.0004599	.0017883
SA1991	-.0088936	.0356639	-0.25	0.805	-.0825003	.0647131
SA21991	.0001666	.0003979	0.42	0.679	-.0006546	.0009877
_cons	4.40414	3.329311	1.32	0.198	-2.46722	11.2755

Table 4.

Table 4a. Raw values – Gelegele & Chesinendet "settlement schemes"

MEASURES	FAC	SONAC	FCOW	SONCOW	FED	SONED
N	59	235	59	235	59	235
Mean	32.53	5.74	19.86	9.37	1.49	4.54
Std. Deviation	22.37	4.00	14.65	10.21	2.81	3.18
Variance	500.50	16.01	214.71	104.16	7.87	10.09
Coefficient of variation (1)						
Range	90	22	70	80	10	12
Maximum	90	23	70	80	10	12
Minimum	6	1	0	0	1	0

Table 4b. Logged values – Gelegele & Chesinendet "settlement schemes"

MEASURES	LFAC	LSONAC	LFCOW	LSCOW	LFED	LSONED
N	59	235	59	235	59	235
Mean	1.40	.653	1.20	.859	.20	.643
Std. Deviation	.335	.319	.355	.404	.365	.333
Variance	.112	.102	.126	.163	.133	.111

Table 5 – Regressions for Gelegele and Chesinendet

A. Acres

. reg LSONAC LFAC FA1991 FA21991 SA1991 SA21991 FDEAD, cluster(FCODE)

Regression with robust standard errors Number of obs = 235
F(6, 58) = 30.54
Prob > F = 0.0000
R-squared = 0.3907
Number of clusters (FCODE) = 59 Root MSE = .25254

LSONAC	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
LFAC	.5835378	.0745462	7.83	0.000	.4343174	.7327582
FA1991	-.204476	.115897	-1.76	0.083	-.4364691	.0275171
FA21991	.0014303	.0008506	1.68	0.098	-.0002723	.0031329
SA1991	.1242743	.033706	3.69	0.001	.0568045	.1917441
SA21991	-.0015224	.0004297	-3.54	0.001	-.0023825	-.0006622
FDEAD	.0481728	.0662583	0.73	0.470	-.0844575	.1808032
_cons	4.598309	3.74909	1.23	0.225	-2.906309	12.10293

B. Cows

. reg LSCOW LFCOW FA1991 FA21991 SA1991 SA21991 FDEAD, cluster(FCODE)

Regression with robust standard errors Number of obs = 235
F(6, 58) = 3.54
Prob > F = 0.0047
R-squared = 0.1411
Number of clusters (FCODE) = 59 Root MSE = .37902

LSCOW	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
LFCOW	.3642511	.162668	2.24	0.029	.0386357	.6898666
FA1991	-.2225897	.1949206	-1.14	0.258	-.6127656	.1675862
FA21991	.0015888	.0014101	1.13	0.265	-.0012339	.0044115
SA1991	.1583178	.044546	3.55	0.001	.0691494	.2474863
SA21991	-.0019362	.0005643	-3.43	0.001	-.0030659	-.0008066
FDEAD	-.3119254	.1783916	-1.75	0.086	-.669015	.0451641
_cons	5.02831	6.558526	0.77	0.446	-8.100007	18.15663

C. Education

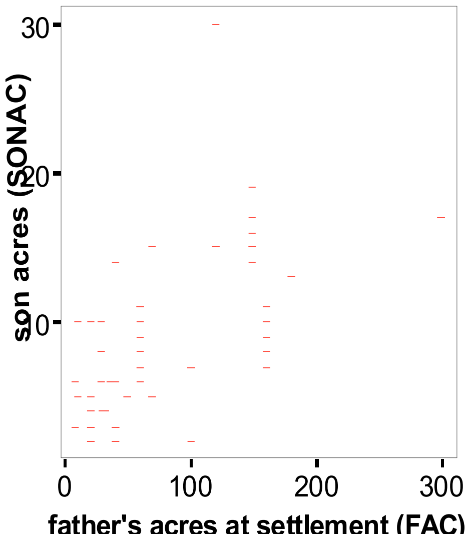
```
. reg LSONED LFED FA1991 FA21991 SA1991 SA21991 FDEAD, cluster(FCODE)
Regression with robust standard errors          Number of obs =     235
                                               F(  6,    58) =   14.77
                                               Prob > F      =  0.0000
                                               R-squared     =  0.2470
Number of clusters (FCODE) = 59                Root MSE      =  .29349
------------------------------------------------------------------------------
             |               Robust
      LSONED |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        LFED |   .2421315   .0730298     3.32   0.002     .0959465    .3883165
      FA1991 |  -.1310957   .1881018    -0.70   0.489    -.5076224     .245431
     FA21991 |   .0009804    .001392     0.70   0.484    -.0018061    .0037669
      SA1991 |   .0199789   .0386376     0.52   0.607    -.0573628    .0973205
     SA21991 |  -.0005279   .0005141    -1.03   0.309     -.001557    .0005011
       FDEAD |   .2098662    .037533     5.59   0.000     .1347356    .2849967
       _cons |   4.953386   6.419782     0.77   0.443    -7.897203    17.80398
```

Table 6 Summary of coefficients

Pop & sample	**Parameter (1)**	**Acres**	**Livestock**	**Education**
Kipsigis I				
	□	**.60 (.07)**	**.74 (.13)**	na
	□ Sibling correlation	-	-	
Kipsigis II				
	□	**.58 (.07)**	**.36 (.16)**	**.24 (.07)**
	□ Sibling correlation	-	-	

(1) Unstandardized coefficient for logged data

Figure 1a. Scatterplot of son's acres on father's acres (pearson's correlation coefficient 0.758, p<0.001, n=161).
Figure 1b Scatterplot for logged values of same variables



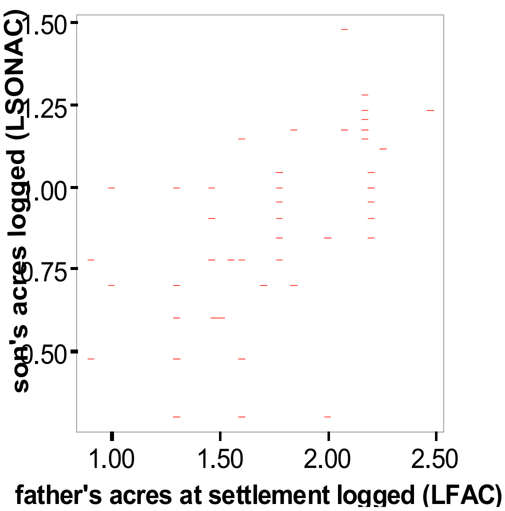
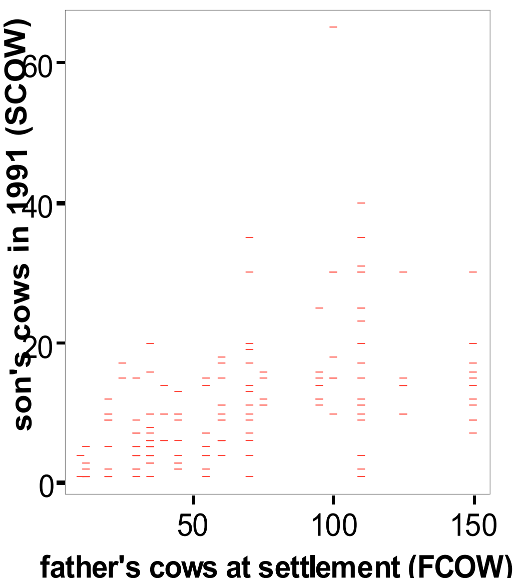


Figure 2a. Scatterplot of son's cows on father's cows (pearson's correlation coefficient 0.498, p<0.01, n=161).
Figure 1b Scatterplot for logged values of same variables



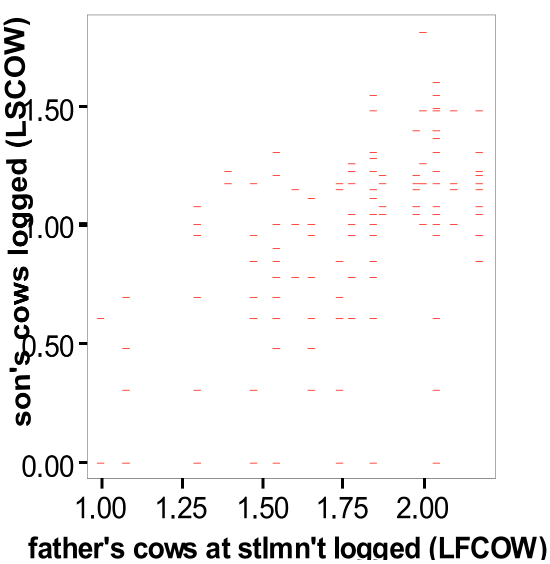


Figure 3 Scatterplot of son's acres on father's acres (pearsons correlation coefficient 0.453, p<0.001, n=235). Living father (n=222): pearsons correlation coefficient 0.455, p<0.001; deceased father (n=13) 0.548, p<0.05.

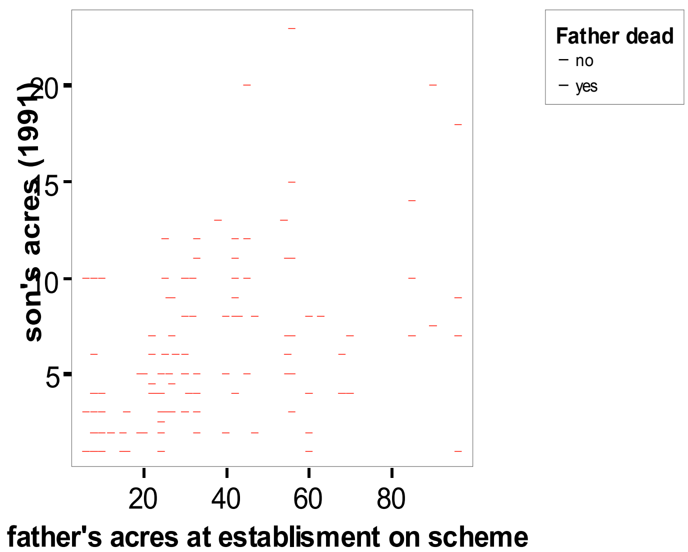


Figure 4 Scatterplot of son's cows on father's cows (pearsons correlation coefficient 0.251, p<0.001, n=235). Living father (n=222): pearsons correlation coefficient 0.264, p<0.001; deceased father (n=13) -0.392, ns.

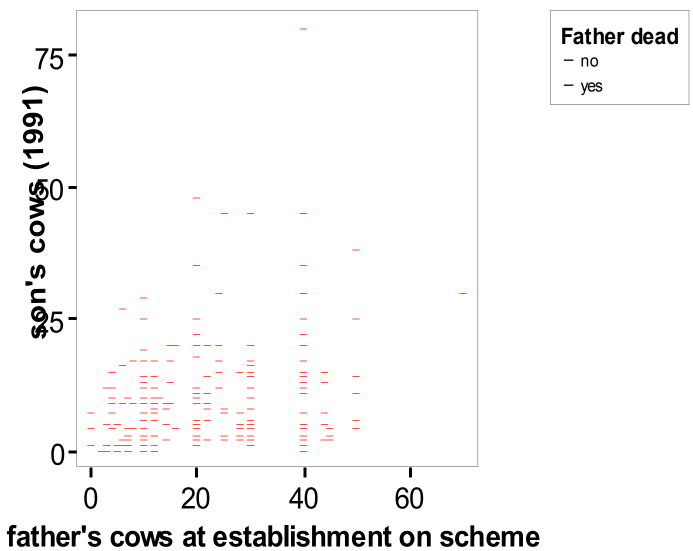


Figure 5 Scatterplot of son's education on father's education (pearsons correlation coefficient 0.335, p<0.001, n=235). Living father (n=222): pearsons correlation coefficient 0.291, p<0.001; deceased father (n=13) 0.870, ns.