Polygamy and the Intergenerational Transmission of Education in Senegal *

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Abstract

Using a household survey specially designed to analyze the complexity of family structures, we describe the intergenerational transmission of education in polygamous and monogamous unions in Senegal. Results show that children of polygamous unions tend to receive less education, even after controlling for available resources (household income and the number of siblings). Though this may be due to unobserved preferences rather than to a causal impact of polygamy, other findings suggest that the institution of polygamy per se impacts investments in education. In particular, educated women do not transmit their education to their daughters when they live in polygynous unions.

Introduction

In Senegal, about a third of married women are involved in a polygamous union (or more precisely, a polygynous one [1]). Given the prevalence of this type of household structure, its persistence over time (Antoine and Nanitelamio (1995) show that is is not decreasing, even in urban areas), the question emerges as to whether this should be taken into account when studying household behaviour in general and education choices in particular. The question we want to address here is whether the marital status of the parents (monogamous or polygamous) affects the level of children's education, but also the intergenerational transmission of education.

Since the work of Gary Becker and his co-authors (Becker and Tomes (1976)), it is fairly common to consider the question of the simultaneous choice of fertility and education in terms of a quantity-quality tradeoff. Since polygamy is reflected in a higher number of children per man (empirical studies find that women engaged in a polygamous union tend to have lower fertility - Garenne and van de Walle (1989), Lesthaeghe (1989)), it could imply lower investment in human capital for a given level of resources. In other words, in the quantity-quality tradeoff, the choice of polygamy over monogamy could be a symptom of a higher preference for quantity of children relative to quality as expressed in their level of education. If this is the only impact of polygamy on education choices, then there should be no difference between children of polygamous parents and those of monogamous parents, controlling for the size of their sibship and the resources of the household. Another possibility is that polygamy is an institution that impacts directly education choices. Intergenerational transmission of education might take different forms according to the household structure. It could in particular shape the transmission of the education of the mother, who, in polygamous unions, is not common to all children. In addition, polygamous unions could also induce an allocation of human capital investment among children of the same father that differs from what can be observed in monogamous unions. These questions are at the heart of the present paper. We focus on the role of parental education and investigate whether intergenerational transmission occurs in the same way when the parents are involved in a polygamous union.

It is interesting to note that although there is quite a significant economic literature on polygamy (see for ex Jacoby (1995)), there is hardly anything on the impact of polygamy on intra-household allocation of resources. The question of the way investment in education is distributed among children of the same father is therefore not answered. There is no theoretical prior in the literature about the greater or lesser equality between children in polygamous households than monogamous ones. On the one hand, different mothers might have different capacity to generate investment in their children (through own characteristics and resources or through bargaining power within the household), thereby inducing inequality. Non-cohabitation of co-wives (Adepoju (1997), Goody (1989)) might enhance this source of inequality among offsprings

[1] While a polygamous union is a union with more than two spouses, the term "polygynous union" designates more specifically the case of a man with more than one wife. We will use both terms indifferently in this paper

of the same father. On the other hand, the father might want to treat his wives, and therefore their children, equally, to the point of compensating the relative disadvantages if they exist, leading to greater equality. The only example of an attempt to deal with intra-household resource allocation in polygamous households is a working paper by Mammen (2009), using Ivory Coast data, that tries to assess whether the simple unitarian household model describes accurately observed choices in polygamous households or whether the collective household model should be preferred. Unsurprisingly, she finds that the later choice proves better adapted, in particular by showing that the mother's rank in marriage (interpreted as a measure of the mother's bargaining power) affects education choices for a given child.

We rely on a statistical model to try to isolate the impact of polygamy from that of potential confounders. Our findings suggest a relatively strong specificity of educational choices within polygynous unions: children of polygamous unions tend to receive less education, even after controlling for available resources (household income and the number of siblings). Though this may be due to unobserved preferences rather than to a causal impact of polygamy, other findings suggest that the institution of polygamy per se impacts investments in education. In particular, educated women do not transmit their education to their daughters when they live in polygynous unions.

The next section describes the data and provides descriptive statistics on the prevalence of polygamy in Senegal. The following section presents the statistical framework. The main results are given in section 3, while section 4 attempts to clarify potential mechanisms. Section 5 offers concluding comments.

1 Context and data

1.1 The survey

The data used in this paper come from an original survey entitled *Pauvreté et Structure Familiale*(hence: PSF) conducted in Senegal in 2006/2007. The PSF survey results from cooperation between a team of French researchers and the National Statistical Agency of Senegal. [2] The survey is described in detail in DeVreyer, Lambert, Safir, and Sylla (2008)

It is a nationally representative survey conducted over 1800 households spread over 150 clusters drawn randomly from the census districts so as to insure a geographically representative sample. About 1750 records can be exploited.

In addition to the usual information on individual characteristics, a detailed description of

[2]Momar Sylla and Matar Gueye of the Agence Nationale de la Statistique et de la Démographie of Sénégal (ANSD) on the one hand and Philippe De Vreyer (University of Paris-Dauphine and IRD-DIAL) Sylvie Lambert (PSE) and Abla Safir (now with the World Bank) designed the survey. The data collection was conducted by the ANSD thanks to the funding of the IDRC (International Development Research Center), INRA Paris and CEPREMAP

households structure and budgetary arrangements is obtained from the long interviews. Households were divided into subgroups (cells) according to the following rule: the head of household and unaccompanied dependent members, such as his widowed parent or children whose mother do not live in the same household, are grouped together. Then, each wife and her children make a separate cell. Finally, any other family nucleus such as a married child of the household head with his/her spouse and children also form separate cells. This decomposition emerged from field interviews as being the relevant way to split the households in groups. Educational outcomes are collected at the individual level, while consumption expenditures are available at the cell level.

Regarding polygamy, the survey registers information on all current spouses, whether they co-reside or not (a frequent situation in Senegal), and on all children (below age 24) of households members even if they do not live with their parents. For those children, some information on their mother is collected, even is she is not directly observed. As a result, it is possible to gather information, for any given adult man in the survey on all his children below age 24 and on most of their mothers, whether they are still married with this man or not.

Information is also gathered on past marital life of all members. This can be relevant when the relative position of different wives is studied, since whether the marriage we observe them into is the first one and whether they have children from a previous union might play a role in determining the say they have in various household's decisions.

1.2 Context

In Senegal, education level is low but steeply increasing over time. In fact, while adult literacy rate in 2003 was only 39%[3], raw primary enrollment ratio amounted to 80%. This latter figure shows a clear improvement compared to the previous generation but it partly hides the difficulties faced by the education system. Indeed, if raw admission rates amount to 80%, only 70% of ever enrolled children complete primary schooling. As a result, only half of the children receive a full primary education. Further, poverty in Senegal is widespread with two thirds of the population living with less than 2$ a day in 2005 (and still today).

Dumas and Lambert (2011) show that children in Senegal are not on an equal footing with regard to their chances of ever going to school and of attaining a given grade. Origin matters, in particular father's education, and influence both the probability of entering school and the final education level attained.

The question we ask in this paper is how polygamy enters into play. In fact, another specific feature of the Senegalese context is the prevalence of polygamy. About a quarter of the married men are engaged in polygamous union, but this number is much higher if we consider only married men above the age of 50 for example, where it reaches more than 40%. Regarding

[3]Source: Human Development Report, data for 2003.

married women, more than a third of them have a polygamous husband and therefore one or several co-wives. According to the islamic rule, in Senegal, the maximum number of wives a man can have is 4. The islamic custom also has it that each of these wives is to be treated fairly (and equally).

Nevertheless, the anthropological literature (Fainzang and Journet, 1988) emphasizes the fact that polygamy creates some competition for resources between co-wives. Rossi (2016) confirms reproductive rivalry between co-wives. Rank in marriage, number of children and of sons in particular, are factors that may be considered favorable in this competition.

Another element of context that is worth mentioning is the frequency of divorces and remarriages (Dial (2008), Lambert, Villar, and van de Walle (2017)) This has two consequences. First, as a result, a number of children do not live with both their parents. In addition, there is a widespread practice of child fostering. In total, children live with other children with whom they can share both parents, only one or none. This variation in family composition could be the source of variation in investment in human capital. Second, polygamy might not be a permanent state: a man is likely to be alternatively monogamous and polygamous, a status that will vary along with his new marriages, divorces and widowhood. Hence, the current marital status might not be relevant when analyzing past education decision.

1.3 Sample and some descriptive statistics

Our survey gives a picture of large households (slightly more than 8 members on average). As mentioned above, polygamy is widespread: 24% of married men and 37% of married women are engaged in polygamous union, consisting mostly in a husband and two wives (only 20% of polygamous unions have more than 2 wives). It is interesting to note that 31% of polygamous men have non-cohabiting wives. Among those, in only half of the cases are the two parts headed by the same person or by the husband for one and a wife for the other. i.e., for the other half, a married polygamous women is living in a household headed by a relative (mainly her father, brother or son).

Those large households are extended both horizontally and vertically, with 36% of household members that are neither the head, nor one of his wives or children. Two thirds of households include such "extended" family members.

In this paper, we chose to restrict the sample of interest to children whose father is observed and whose mother is currently married to their father. In addition, we will consider only children in the age range of 7-21 and will consider the father to be polygamous when he has, at the time of the survey, several wives. In order to perform robustness checks, we use a broader sample of all survey individuals, as they provide information on their education and the education of their parents, and report whether their father was polygamous or not. However, this information is probably less reliable (as in many cases the parents themselves are not interviewed) and, more

fundamentally, we do not know whether the father actually had several wives at the time his child went to school; given the age gradient of polygamy, this makes our measure of polygamy *at the time of investing in the child's education* quite noisy. As a second robustness check that goes in the opposite direction, we introduce a stricter definition of polygamy, considering the father to be polygynous only if he has, at the time of the survey, several wives with children in the 7-21 age range. This restriction is fairly drastic but it allows us to avoid several sources of confusion. For one thing, by restricting the sample to polygamous fathers who have children in the 7-21 age range from different wives, we concentrate on the case where competition for resources is likely to be the most relevant. Note also that by concentrating on current marriages we avoid to introduce situations whereby the father has children from different women but is currently married to only one of them; admittedly, potential difference in the educational investment in the various children in such a case cannot be ascribed to polygamy. The issue of recomposed family if a different one.

Our main sample includes a total of 1,974 children from 698 fathers and 804 mothers (table 1). About 35% of the fathers in this sample are currently married to several women (panel A); but only slightly more than 10% are married with two or more women with whom they have at least a child aged 7 to 21 (panel B): this illustrates the difference between the two "definitions" of polygyny. The table also displays the number of children per father and per mother. The number of children (aged 7 to 21) per mother is remarkably stable across family type (about 2.5 children per mother). As expected, the number of children (aged 7-21) per father is higher when the father has several wives (up to more than 8 children per father when the father has more than three wives with children between 7 and 21); such configurations are nonetheless very unfrequent (only 8 fathers in our sample).

As indicated, education is rather low in this context, and particularly so for the generation of the parents. In our sample, 60% of the fathers and 69% of the mothers have never been to formal schools (they might have attended koranic schools). This number is only 32.5% for the children aged 7 to 21 (hence born in the 1980s and 1990s). Another third (31.7%) of these children have completed more than 4 years of primary schooling and among them half have entered secondary school. Given this distribution, and because 4 years of schooling constitutes a relevant threshold as it is a minimum for achieving literacy, we will use a dummy for having attained 4 years of education as our main variable of interest.

In a first look at the difference between children of polygamous and monogamous father, table 2 presents the share of children having attained 4 years of education, by gender and marital status of their father. It appears that both boys and girls are significantly less likely to have reached this level of education when their father is polygamous. Table 3 and table 4 present the odds ratio of simple mobility tables, respectively according to the education of the father and to that of the mother. In this table, parental education is a dummy for having attended some formal schooling. These tables show that the coefficient of reproduction is lower in polygamous

households, and significantly so for girls. The result concerning the transmission of mother's education to their daughter is particularly striking as the corresponding odd ratio drops from 4.5 in monogamous households to 2.2 in polygamous ones (i.e. the daughter of an educated mother engaged in a polygamous union is only twice as likely as the daughter of an uneducated one to have herself attained 4 years od schooling). These raw results contain the essence of our main findings: children in polygamous unions are less educated than those with a polygamous father and mothers married to polygamous men do not transmit their education to their daughters as easily as their monogamous counterparts.

Table 5 characterizes polygynous men by comparison with monogamous ones. The controls in this linear probability model includes a set of dummies for ethnic group and religion (95% of the population is muslim). The variables of interest are the father's education, his age and the household place of residence (rural areas, Dakar or other cities) as well as total consumption within the household - a proxy for permanent income. This latter variable is here measured with a set of dummy variables indicating quintiles of the distribution of household consumption. The older the father, the more likely he is to be polygamous. The effect of being older than 60 is particularly large (the probability of being polygynous increases by almost 40 percentage points, compared to a man in his twenties) and probably combines a cohort effect and a life-cycle effect (levirate marriages inducing polygamy are more likely at later ages). Education reduces the probability of polygamy, though not drastically - which may be explained by the fact that education reduces the taste for polygamy (as a less "modern" family structure) but also increases resources that make it possible. Last, the incidence of polygamy increases with the household income (+17 pp for men residing in household with consumption level in the 4th quintile and +25pp for the 5th quintile) and in rural areas. Results for women are similar (table 6). The role of education is however larger: women with secondary education and more are much less likely than uneducated women to have a polygamous husband. Being in their first marriage does not seem to affect whether women end up in a polygamous union, but it is the single biggest determinant of being the senior wife (with an increase of 28pp in the probability of being of rank 1).[4]

2 Transmission of parental education

The empirical analysis will proceed in two steps: in a first step, the focus will be on whether investment in education differ in polygamous and monogamous households. At this step, all the characteristics of the polygamous institution (and in particular the characteristics of the other mother) will be summed up by an indicator variable for polygamy. In a second step, we try to enter into the details of which features of polygamy matter.

[4]Results not shown but available with the authors

2.1 Polygynous vs. monogamous households

As a first step in the empirical analysis, we therefore address the following question: do children of polygamous households receive the same investment in education as those of monogamous parents? This question has two aspects: first, do children of polygamous parents receive a different level of education, after controlling for other relevant characteristics; second, does the effect of parental and household characteristics depend on whether the household is a polygamous one?

To address the first question, we simply estimate the following model.

$$edu = \alpha + \beta poly + x\gamma + \epsilon \tag{1}$$

In our preferred specification, *edu* is a dummy variable for completing four years of education (see above). In this specification we concentrate on the subsample of children aged above 12, so as to insure reaching 4 years of education is possible. Since the focus is on intergenerational transmission of education, the main determinants of education in x is the education attainment of the two biological parents. We gradually introduce a number of controls to clear the correlation of polygamy from the main potential confounders. In a first step, the number of children of the father in the 7-21 age range and the total household consumption quintile (as a proxy for permanent income) allow to control for resource constraints. Characteristics of the marriage are then introduced: whether this union is the first one for the mother, what was her age at marriage and whether she bore children before this marriage. Additional controls are the total household size, an indicator for rural households, ethnic group and religious dummies, and a full set of dummies for the child's age. Note that characteristics that are relevant only for polygamous households (like the education level of the other mothers or the rank in marriage) are by construction absent from this model. The effects of all polygamous household specific features are captured by the *poly* indicator. Un-bundling these effects comes as a second step in the analysis.

As noted above, the brothers and sisters considered in the estimation are restricted to those aged 7 to 21, as those are the most likely to compete for resources for education. The polygamous indicator characterizes households in which the father has several wives at the time of the survey. Robustness checks with other definitions of the *poly* variable are discussed below. Children whose mother has divorced their father are excluded from the sample. β, β_p and γ_p thus characterize children of polygynous households as opposed to monogamous households, when the mother is still married with the child's biological father.

Columns 1 to 4 in table 8 shows the results of model (1) for boys. Other things equal, a son of a polygynous father has significantly lower chances to complete 4 years of primary education. That difference is not due to other characteristics such as his parents' education, the household's

income or the number of brothers and sisters. Of course, the estimate does not necessarily have a causal interpretation, as it may capture unobserved determinants of educational investments, such as parents' taste for education. It is nonetheless a first indication that polygamy may influence the transmission of education. But the size of the effect remains modest compared to other effects (about half of the effect of having a father with some primary education, or less than half of the effect of living in a household with consumption in the 2 upper quintiles). The impact of the number of brothers and sisters is statistically insignificant and economically small.[5]

Results for girls (columns 1-4 in table 9) show a slightly different picture. The polygamy coefficient is still negative, but no longer statistically significant, and the point estimate is smaller in absolute value than for boys. The relative role of father's and mother's education are reversed, with the impact of the mother's education being nearly twice as large as for boys. Moreover, the effect of the number of brothers and sisters, larger than for boys, is significant, while the effect of the household's income is also much larger: overall, these two facts suggest a stronger competition for educational resources, more in line with the standard Beckerian model.

Even though columns (3) and (4) in tables 8 and 9 take a first step in controlling for the household resources and composition, it is possible that the polygyny coefficient still captures the fact that households with polygynous unions have lower resources available for education. Indeed, the specification in model 1 is quite parametric and measures for household resources and composition are rough. It is therefore interesting to move one step further and ask whether one can isolate a difference linked to polygyny that is not confounded by differences in household resources and composition. Of course, household composition and polygyny are closely related and are likely to be jointly chosen in most cases. However, there may be situations where households with the exact same composition (same age and gender of household members) have different *relationships* between members. For instance, imagine that two households are composed of a man, two women, and six children. In one case, the man is married to the two women; in the second case, the second woman is the man's daughter, who for instance joined the household after divorcing, or who has not married. For the rest, the composition and resources of the two households may well be identical. The two questions we ask are: first, do such cases exist where some households are comparable in terms of resources and differ only by the presence or not of a polygynous union? Second, if such households exist, is polygyny associated with different educational attainment of children? By contrast with tables 8 and 9, the goal is now to characterize household composition much more precisely as a $2 \times 2 \times T$ vector giving the number of household members in each of T age groups, for males and females, and distinguishing children of the household head from other children. When ages are defined

[5] At the 5% level, one can reject the hypothesis that one more sibling reduces the probability of completing 4 years of primary education by more than $1.7 + 1.96 \times 1.4 \approx 4.5$ percentage points (see estimates in column 3). This is not a large effect given the fact that the average number of brothers and sisters in the sample is less than 3 (within the 7-21 age range).

narrowly (T is large), the "curse of dimensionality" implies that we will not find, in our sample, two large households with the exact same composition. However, this curse of dimensionality can be handled using propensity score matching techniques. For a given vector of resources $R = r$ and a given household composition vector $C = c$, define

$$\Delta(r, c) = E(edu|poly = 1, R = r, C = c) - E(edu|poly = 0, R = r, C = c),$$

and assume that selection into polygamy can be modeled with a latent variable threshold crossing index (which is actually restrictive: see Heckman, 2010, and Vytlacil, 2002). Then the "index sufficiency" property implies

$$\Delta(r, c) = E(edu|poly = 1, p(R, C) = p(r, c)) - E(edu|poly = 0, p(R, C) = p(r, c)),$$

where $p(R, C)$ is the probability that a household head in a household with resources R and composition C is polygynous. Under a common support condition, this allows to estimate

$$\Delta = E(edu(1) - edu(0)|poly = 1),$$

where $E(edu(0)|poly = 1)$ simply denotes the expected education level of children of monogynous household heads conditional on the same household resources and composition as for children of polygynous household heads.[6]

Figure 1 displays the density of the propensity scores of having a polygynous fathers, among children of polygynous fathers (top part) vs. monogynous fathers (bottom part, reversed scales).[7] There are nine different graphs, corresponding to different sets of matching variables. The top row progressively adds resource variables; the middle row uses different measures of household composition; the third row combines the two types of variables. The contrast between the top graph to the left and the middle one to the right illustrates that father's age and social background (religion, ethnic group, place of residence) are relatively poor predictors of polygyny, whereas the detailed composition of the household (by gender, age, and distinguishing children of the household head from others) are much stronger predictors. But the two dimensions – household resources and composition – contribute to predict polygyny. As a result, and as shown by the bottom graph on the right, most polygynous household heads live in quite specific households; for those, comparison household heads will be a few household heads that, despite

[6] In other terms, $E(edu(1) - edu(0))$ does not have to be thought of as the causal effect that would be revealed from manipulating the marital status of the household head from monogynous to polygynous, everything else held constant. Such manipulation is indeed hard to think of. We do not however need to have this causal interpretation in mind here, as our goal is merely to describe whether there remain differences in educational attainments between polygynous and monogamous households that can be isolated from differences in compositions or resources. Clearly, polygyny and monogamy remain correlated with other unobserved differences in preferences and individual histories that cannot necessarily be thought of as a one-dimensional "treatment". Causality in that context cannot be well thought under the "no causation without manipulation" maxim (Holland, 1986), and identifying causal effects of polygyny under a broader model of marital choices is beyond the scope of this paper.

[7] The sample is restricted to children of the household head; polygynous fathers are most often household heads.

their high propensity score, turn out to be monogynous.[8] Thus, figure 1 gives a mixed answer to the first question: there are a few households that are comparable (in terms of resources and composition) to polygynous households, but they are rare, and are in no way representative of the average household. It is therefore possible to statistically describe the gap in educational attainment of children between these two types of households, but the specificity of the reference point must be kept in mind; it should also be borne in mind that polygyny is for the most part indistinguishable from differences in the composition of households.

These caveats in mind, table 12 displays estimates of Δ by propensity score matching, with various sets of matching variables and comparing kernel and nearest neighbor matching. The results confirm the negative effects associated with polygyny in the simpler linear probability model in tables 8 and 9. They are however less precise, as could be expected given the limited common support between the two groups of households. Interestingly, the difference between girls and boys is less apparent: in both cases, polygyny is associated with lower educational attainment.

2.2 Polygynous vs. monogamous households: difference in transmission

In order to have a first insight into the specific mechanisms of the transmission of education within polygynous households as compared to monogamous ones, we estimate the following model:

$$edu = \alpha_0 + \beta_p poly + x\gamma_0 + x\gamma_p \times poly + \epsilon_0. \tag{2}$$

Among the results of model 2, presented in columns (5) and (6) of tables 8 and 9 respectively for boys and girls, two findings stand out for girls: the positive role of the mother's education fully disappears in polygamous unions. Though still insignificant, the main effect on the *poly* variable flips when the interaction between the mother's education and *poly* is introduced, suggesting that the adverse effect of polygamy, for girls, is due to the inability of women to transmit their educational capital to their daughters if they enter polygynous unions.[9] Second, the permanent income (proxied by quintile of household consumption) is much less of a determinant of girls education in polygamous households.

We perform a variety of robustness checks. First, as discussed above, we redefine polygamy as the fact of having several wives with children aged 7 to 21 at the time of the survey (table

[8] We compared monogynous households with low and high propensity scores. As could be expected from table 5, compared to other monogynous households, monogynous households with a high propensity score are larger, wealthier households whose head is less educated and older. We also ran balancing tests between monogynous and polygynous households, holding the propensity score constant. The balancing is not rejected when using the full set of matching variables.

[9] This result is reinforced by looking at the educational attainment of all members in the sample who give sufficient information on the marital status of their mother: though the sample is less consistent and the set of variables is smaller, the number of observations is much higher which increases the statistical power.

10). Given the large impact of this change of definition on who is polygamous (see table 1), the results on the transmission of education appear remarkably stable. Second, we consider the larger sample of all survey respondents older than 15 who reported the education of their parents and the marital status of their father (table 11). Though this means that the father may have become polygamous after the child had completed his education, thus introducing noise in the relationship, that sample is much larger and yields more precise estimates. The results confirm a significant, negative interaction effect of the polygamy and the mother's education (at both primary and secondary level).

In total, it appears that in polygamous union, educated mothers cannot transmit their education to their daughters in the same way as what they do in monogamous union. One mechanism might be that fathers do equalize outcomes for the children of all their wives, which prevents educated mothers to push their daughters as much as they could wish if the other mother in the household in not as educated. We'll look into this in the next section, by examining what happens within polygamous households.

2.3 Within polygynous households

The second step in our analysis is to check whether household features that are specific to the institution of polygamy impact the transmission of human capital. In particular, we examine the potential competition between co-wives to direct resources to the education of their own children. Indeed, one possible explanation for the absence of effect of the mother's education in polygynous households may be the fact that fathers with more and less educated wives have to treat their children equally, thus reducing the impact of the education of a given mother. Another hypothesis is that the education of the other mother matters as much as the education of the mother; by omitting this factor, model 2 would then suffer from an omitted variable bias. To analyze this question, we consider three alternative models of the transmission of education within households. For the sake of comparison with the next two specifications, the first model replicates model 1 on the sample of children of polygynous parents.

$$edu_{ij} = \alpha_0 + \beta_0 edufather_{ij} + \gamma_0 edumother_{ij} + x_{ij}\delta + \epsilon_{0ij} \tag{3}$$

The second model adds the effect of the education of the child's "other mothers":

$$edu_{ij} = \alpha_1 + \beta_1 edufather_{ij} + \gamma_1 edumother_{ij} + \zeta_1 eduothermother_{ij} + x_{ij}\delta + \epsilon_{1ij} \tag{4}$$

This allows us to test for the hypothesis of the omitted variable bias. Last, to directly take into account the possibility that what matters for the child is the relative education of his mother, we estimate a model with household fixed effect c_j. This has two consequences: unobserved heterogeneity at the household level is accounted for; the effect of the mother's education is

identified from her relative education, compared to the other mothers:[10]

$$edu_{ij} = \alpha_2 + \gamma_2 edumother_{ij} + x_{ij}\delta + c_j + \epsilon_{2ij} \quad (5)$$

Results are given in table 13. In this model, the striking result is that being the daughter of the most educated mother leads to a lower probability of reaching the 4 years of education threshold. Clearly, since the number of observations is now much smaller, this result should be taken with care, but it is very robust and perfectly consistent with what was obtained before. This effect is not significant for boys, although the point estimate is negative as well.

Additional results (not reported) show that the effect is not due to other characteristics of the mother (past marital history, size of the bride price, etc.)

The negative impact of one's own mother relative education is quite surprising. It suggests that what goes on in polygamous households is more that simple equalization of outcomes across children of different mothers, there seems to be a penalty for being the most educated mother in the household. One reading is that being more educated than other co-wives is a sign of a very weak bargaining power. It is unlikely that higher education causes lower bargaining power, but it is quite plausible that educated women who end up married in a polygamous union have other unmeasured characteristics that put them in an relatively unfavorable position in which they cannot transmit their education to their daughters. The following section tries to investigate possible selection mechanisms.

3 Selection

If the previous results are explained by a weak bargaining power, it could be expected that this weak position in the household also affects other outcomes. We take advantage of a particular feature of our data that measures consumption at the cell level. We therefore start by studying how education affects the consumption level of mothers' cells, according to the type of union.

Table 14 shows that if own education is associated with higher consumption for women in monogamous union, this is not the case for polygamous women. Estimation with a husband fixed-effect (table 15), also indicates that in a polygamous household, women cannot take advantage of their education in terms of consumption. This again would be consistent with equalization of resources within polygamous households, although other variables that differ between wives have an impact in both the monogamous and polygamous case, such as age at first marriage.

Columns 1 to 8 in table 16 enumerate a number of characteristics of the marriage that could be correlated with education differently according to the polygamy status of the marriage, and might reflect quality of the match from the women's point of view. Interestingly, educated

[10] In this model, the effect of the father's education is not identified anymore.The effect of the education of the other mother neither, since, in this sample and in the within estimation it is perfectly negatively correlated with the education of the mother

women in a polygamous union didn't marry later than those in monogamous union. Hence, the anecdotal evidence that educated women who have a hard time finding a husband end up in a polygamous union does not seem to apply at the levels of education considered here (mainly primary education).We nevertheless cannot rule out that foreseeing difficulties in finding a "good" husband, women with potentially weak bargaining power rush into the marriage that is proposed, rather than taking the risk of remaining unmarried. Educated women in a polygamous union are less likely than their monogamous counterpart to marry a husband with a formal or public sector job. This could clearly be a major channel explaining differences in girls schooling attainment between household, but is not enough to account for difference within household. No difference is observed as to the age difference with the husband, his education or the marriage payments. Columns 9 to 11 try to understand the penalty for girls born to the most educated woman of the polygamous union, by trying to assess whether educated women who marry in a polygamous household despite the general tendency of educated women to be monogamous have health problems that might explain both their marriage and the lower education of their daughter (who might have to spend more time at domestic chores). Although a more flexible approach tends to signals that indeed they are slightly more likely to have a handicap or a long term illness, it is not apparent (significant) in the aggregated specification used here. The small sample size doesn't give us sufficient power to exhibit statistically significant results.

4 Conclusion

Even though an obvious caveat to the results is the lack of exogenous sources of variation for union choice, our results suggest that polygamy as such affects the transmission of education. In particular, more educated mothers living in polygynous unions seem to have great difficulty in transmitting their education, in particular to their daughters, when they are more educated than the other mother.

This counter-intuitive effect may still be partly due to unobserved characteristics of the mother. However, it is hardly reduced by controlling for a large set of possible confounding factors. This suggests that an alternative explanation deserves attention: the institution of polygamy may introduce a form of competition between children that makes the mothers' relative characteristics crucial for educational trajectories, in particular for girls.

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Figure 1: Common support analysis: monogamous and polygynous households

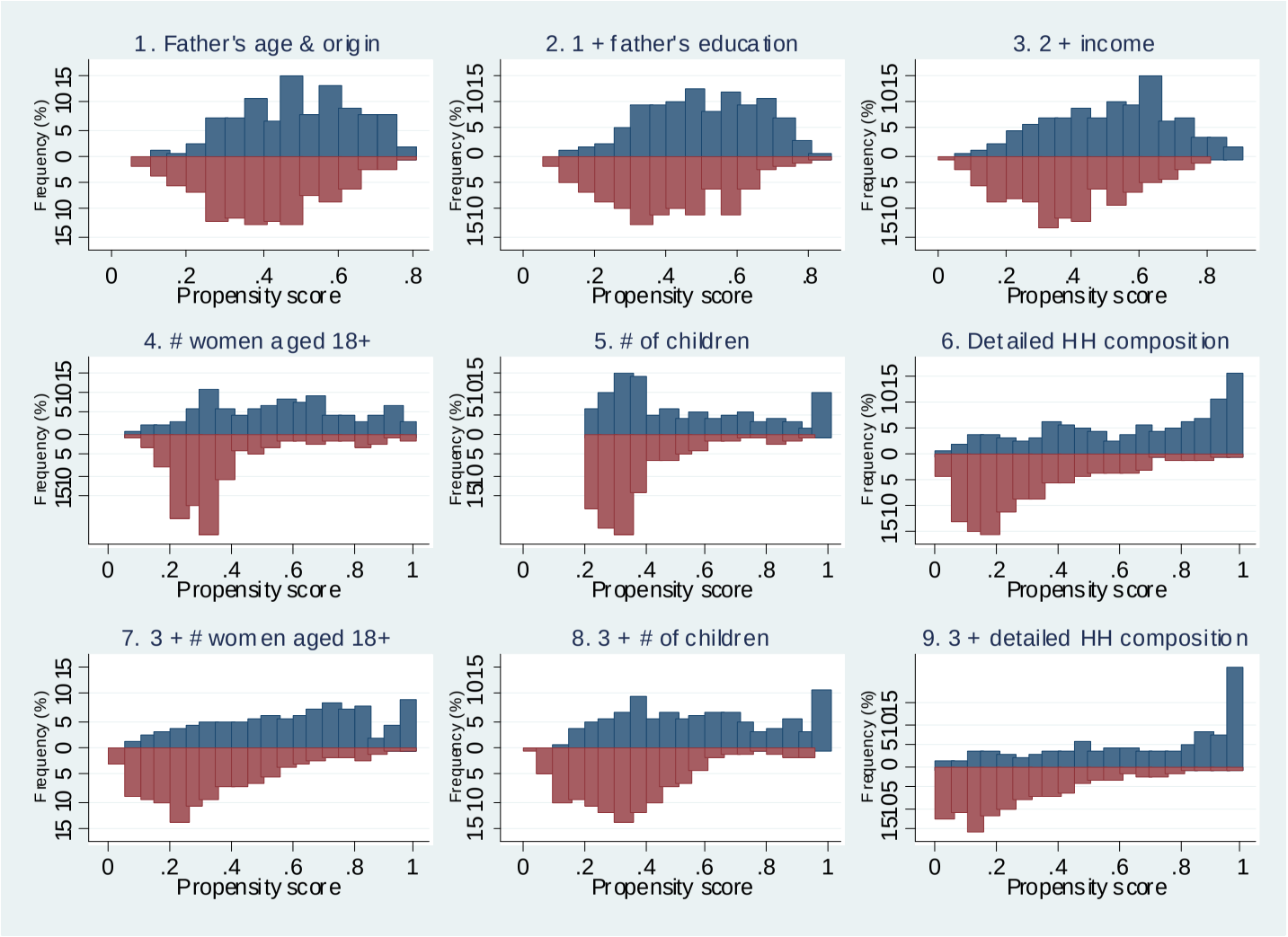

Table 1: Sample description

	Nb fathers (a)	Nb mothers (b)	Nb children aged 7-21 (c)	(c/a)	(c/b)
Number of wives					
A. By number of current wives					
1	453	474	1167	2.6	2.5
2	183	221	551	3	2.5
3	44	76	171	3.9	2.3
4	18	33	85	4.7	2.6
total	698	804	1974	2.8	2.5
B. By number of current wives with children aged 7 to 21					
1	627	649	1600	2.6	2.5
2	63	128	305	4.8	2.4
3	5	15	41	8.2	2.7
4	3	12	28	9.3	2.3
total	698	804	1974	2.8	2.5

Table 2: Education by polygamy status

	Polyamous Father	Monogamous Father	Diff.
Child completed at least 4 years of schooling			
Boys (N=1023)	0.26	0.35	0.09***
			(0.00)
Girls (N=951)	0.27	0.33	0.06***
			(0.00)
Mother has at least some formal schooling			
Mothers (N=804)	0.21	0.38	0.16***
			(0.00)

Table 3: Educational reproduction - Father/Child

Child completed at least 4 years of education - Odds ratio						
SAMPLE	(1) Boys mono	(2) Boys poly	test mono!=poly p-value	(3) Girls mono	(4) Girls poly	test mono!=poly p-value
Educated Father	3.177***	3.079***	0.9141	3.601***	2.099***	0.0736
	(0.570)	(0.710)		(0.671)	(0.498)	
Constant	0.315***	0.234***		0.265***	0.281***	
	(0.0406)	(0.0341)		(0.0361)	(0.0433)	
Observations	588	435		573	378	

seEform in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Educational reproduction - Mother/Child

Child completed at least 4 years of education - Odds ratio						
SAMPLE	(1) Boys mono	(2) Boys poly	test mono!=poly p-value	(3) Girls mono	(4) Girls poly	test mono!=poly p-value
Educated Mother	2.167***	2.396***	0.7413	4.523***	2.251***	0.0290
	(0.386)	(0.593)		(0.858)	(0.579)	
Constant	0.405***	0.278***		0.263***	0.302***	
	(0.0464)	(0.0366)		(0.0339)	(0.0421)	
Observations	587	435		573	378	

seEform in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Factors of polygyny: men

VARIABLES	(1)	(2)	(3)	(4)
	Dep. var.: Be polygamous (at least 2 wives)			
	(1)	(2)	(3)	(4)
coranic education	0.035	0.043	0.030	0.033
	(0.046)	(0.045)	(0.045)	(0.045)
some primary education	-0.030	0.014	-0.011	0.013
	(0.064)	(0.063)	(0.064)	(0.064)
completed primary education	-0.092	-0.063	-0.089	-0.053
	(0.063)	(0.061)	(0.062)	(0.063)
secondary education (and more)	-0.126**	-0.097*	-0.146**	-0.111*
	(0.055)	(0.054)	(0.058)	(0.059)
age 30-39		0.107	0.099	0.138
		(0.169)	(0.168)	(0.168)
age 40-49		0.178	0.175	0.233
		(0.167)	(0.166)	(0.166)
age 50-59		0.279*	0.282*	0.336**
		(0.167)	(0.167)	(0.166)
age 60+		0.425**	0.414**	0.466***
		(0.167)	(0.166)	(0.166)
HH exp. 2nd quintile			0.107**	0.138**
			(0.053)	(0.054)
HH exp. 3rd quintile			0.076	0.124**
			(0.055)	(0.057)
HH exp. 4th quintile			0.079	0.168***
			(0.057)	(0.062)
HH exp. 5th quintile			0.159***	0.255***
			(0.058)	(0.064)
dakar				-0.024
				(0.051)
rural				0.133**
				(0.052)
Constant	0.298***	0.024	-0.031	-0.205
	(0.112)	(0.197)	(0.199)	(0.207)
Observations	721	721	721	721
R-squared	0.034	0.095	0.105	0.121

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Additional controls: ethnic group, religion

Table 6: Factors of polygyny: women

VARIABLES	Dep. var.: Be married to a polygynous husband				
	(1)	(2)	(3)	(4)	(5)
coranic education	0.019	0.041	0.035	0.063	0.064
	(0.048)	(0.048)	(0.047)	(0.047)	(0.047)
some primary education	-0.114**	-0.077	-0.110*	-0.048	-0.047
	(0.056)	(0.056)	(0.057)	(0.058)	(0.057)
complete primary education	-0.192***	-0.176***	-0.231***	-0.158***	-0.154**
	(0.056)	(0.056)	(0.058)	(0.059)	(0.060)
secondary education (and more)	-0.235***	-0.251***	-0.330***	-0.250***	-0.243***
	(0.065)	(0.065)	(0.069)	(0.070)	(0.070)
age 30-39		0.123**	0.133**	0.174***	0.173***
		(0.052)	(0.052)	(0.052)	(0.052)
age 40-49		0.234***	0.233***	0.278***	0.271***
		(0.053)	(0.053)	(0.053)	(0.054)
age 50-59		0.265***	0.255***	0.289***	0.275***
		(0.061)	(0.061)	(0.060)	(0.061)
age 60+		0.323***	0.305***	0.321***	0.311***
		(0.113)	(0.113)	(0.111)	(0.111)
age unknow		-0.151	-0.195	-0.278	-0.207
		(0.242)	(0.243)	(0.240)	(0.246)
HH exp. 2nd quintile			0.121**	0.159***	0.161***
			(0.052)	(0.052)	(0.052)
HH exp. 3rd quintile			0.116**	0.173***	0.169***
			(0.054)	(0.054)	(0.054)
HH exp. 4th quintile			0.119**	0.223***	0.229***
			(0.056)	(0.060)	(0.060)
HH exp. 5th quintile			0.229***	0.349***	0.354***
			(0.057)	(0.062)	(0.062)
dakar				-0.022	-0.032
				(0.051)	(0.052)
rural				0.195***	0.201***
				(0.051)	(0.052)
first marriage					-0.014
					(0.073)
number of marriages missing					0.108*
					(0.061)
Children from a different father					0.110
					(0.072)
Constant	0.419***	0.415	0.367	0.220	0.148
	(0.107)	(0.273)	(0.274)	(0.276)	(0.289)
Observations	804	804	804	804	804
R-squared	0.053	0.089	0.107	0.134	0.143

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Additional controls: ethnic group and religion
First marriage = 1 is this union is the first one for this woman. Missing values are set to the median.

Table 7: Marriage rank, women in polygamous unions

VARIABLES	probability of being seniorwife
Coranic education	0.082
	(0.073)
Some primary education	-0.129
	(0.112)
Completed primary	-0.196*
	(0.115)
Secondary education (+)	-0.160
	(0.164)
dakar	0.050
	(0.092)
rural	-0.172**
	(0.086)
first marriage	0.303***
	(0.111)
firstmarriage missing	-0.224
	(0.169)
Children previous marriage	-0.152
	(0.116)
Constant	0.655
	(0.581)
Observations	285
R-squared	0.170

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Linear probability model; Additional controls: quintiles of expenditures, age (by decade), ethnic groups and religion.

Table 8: Transmission of education in monogamous and polygynous households - Boys

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Polygamy	-0.129***	-0.0981**	-0.0959**	-0.0876**	-0.121	-0.127
	(0.0483)	(0.0451)	(0.0440)	(0.0438)	(0.114)	(0.293)
Father ed. prim +		0.208***	0.193***	0.173***	0.168**	0.143**
		(0.0516)	(0.0526)	(0.0518)	(0.0661)	(0.0635)
Mother ed. prim +		0.128**	0.107*	0.111**	0.118*	0.143**
		(0.0533)	(0.0551)	(0.0537)	(0.0624)	(0.0612)
Nb siblings 7-21 same father & mother			-0.0144	-0.0140	-0.00839	-0.00512
			(0.0130)	(0.0134)	(0.0191)	(0.0191)
hh Cons., 2nd q			0.0767	0.0551	0.0668	0.0523
			(0.0719)	(0.0724)	(0.0965)	(0.0979)
hh Cons., 3rd q			0.131*	0.0940	0.142	0.0971
			(0.0740)	(0.0721)	(0.0921)	(0.0932)
hh Cons., 4th q			0.241***	0.221***	0.220**	0.184*
			(0.0794)	(0.0789)	(0.0936)	(0.0939)
hh Cons., 5th q			0.289***	0.251***	0.179*	0.112
			(0.0921)	(0.0916)	(0.104)	(0.104)
Age first marriage mother				0.0176***		0.0163**
				(0.00555)		(0.00639)
age_firstm_mis				-0.00402		-0.179*
				(0.0790)		(0.105)
First marriage mother				-0.114		-0.0849
				(0.102)		(0.124)
firstm_mis				0.0785		0.290***
				(0.0835)		(0.0975)
Children previous marriage				-0.170*		-0.186
				(0.0909)		(0.125)
Poly x Father ed					0.0756	0.0994
					(0.108)	(0.107)
Poly x Mother ed					-0.0301	-0.0538
					(0.112)	(0.110)
poly x nb siblings 7-21					-0.0104	-0.0149
					(0.0238)	(0.0236)
Poly x hh Cons., 2nd q					0.0201	-0.00588
					(0.135)	(0.139)
Poly x hh Cons., 3rd q					-0.0295	-0.0493
					(0.137)	(0.137)
Poly x hh Cons., 4th q					0.0455	0.0412
					(0.131)	(0.129)
Poly x hh Cons., 5th q					0.216	0.238*
					(0.140)	(0.141)
Poly x age 1st marriage						0.00486
						(0.0119)
Poly x age_firstm_mis						0.308**
						(0.147)
poly x children previous marriage						0.0156
						(0.177)
Poly x first marriage mother						-0.0579
						(0.192)
Polyx firstm_mis						-0.402***
						(0.152)
Constant	0.610***	0.474***	0.395***	0.214	0.406***	0.218
	(0.0280)	(0.0387)	(0.0746)	(0.152)	(0.0985)	(0.191)
Observations	618	618	618	618	618	618
R-squared	0.217	0.274	0.295	0.316	0.304	0.338

Boys aged 12-21

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Additional controls: ethnic group, religion, age dummies, Dakar, rural, household size.

Table 9: Transmission of education in monogamous and polygynous households - Girls

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Polygamy	-0.0645	-0.0415	-0.0683	-0.0724	0.147	0.0886
	(0.0507)	(0.0496)	(0.0477)	(0.0485)	(0.131)	(0.301)
Father ed. prim +		0.123**	0.115**	0.119**	0.0890	0.0739
		(0.0584)	(0.0549)	(0.0572)	(0.0665)	(0.0708)
Mother ed. prim +		0.221***	0.161***	0.158**	0.268***	0.263***
		(0.0625)	(0.0611)	(0.0625)	(0.0687)	(0.0724)
Nb siblings 7-21 same father & mother			-0.0204**	-0.0198**	-0.00566	-0.00693
			(0.0103)	(0.0101)	(0.0187)	(0.0187)
hh Cons., 2nd q			-0.0136	-0.0118	0.105	0.119
			(0.0733)	(0.0741)	(0.0937)	(0.0957)
hh Cons., 3rd q			0.122	0.122	0.162*	0.166*
			(0.0788)	(0.0786)	(0.0984)	(0.0989)
hh Cons., 4th q			0.270***	0.270***	0.276***	0.294***
			(0.0830)	(0.0833)	(0.0933)	(0.0953)
hh Cons., 5th q			0.374***	0.375***	0.355***	0.357***
			(0.0938)	(0.0945)	(0.105)	(0.108)
Age first marriage mother				0.000415		0.00484
				(0.00614)		(0.00833)
age_firstm_mis				0.0394		0.00326
				(0.0817)		(0.113)
First marriage mother				0.0197		-0.0838
				(0.0930)		(0.106)
firstm_mis				-0.0171		-0.0494
				(0.0870)		(0.122)
Children previous marriage				0.0475		0.0572
				(0.0939)		(0.114)
Poly x Father ed					0.116	0.141
					(0.109)	(0.112)
Poly x Mother ed					-0.233*	-0.224*
					(0.119)	(0.126)
poly x nb siblings 7-21					-0.0225	-0.0195
					(0.0220)	(0.0218)
Poly x hh Cons., 2nd q					-0.294**	-0.310**
					(0.143)	(0.143)
Poly x hh Cons., 3rd q					-0.133	-0.142
					(0.155)	(0.153)
Poly x hh Cons., 4th q					-0.0616	-0.0950
					(0.143)	(0.148)
Poly x hh Cons., 5th q					-0.0194	-0.0173
					(0.151)	(0.152)
Poly x age 1st marriage						-0.00694
						(0.0120)
Poly x age_firstm_mis						0.0608
						(0.161)
poly x children previous marriage						0.176
						(0.161)
Poly x first marriage mother						0.0711
						(0.181)
Polyx firstm_mis						-0.0374
						(0.165)
Constant	0.544***	0.416***	0.381***	0.346**	0.272***	0.264
	(0.0328)	(0.0410)	(0.0722)	(0.150)	(0.0984)	(0.207)
Observations	561	561	561	561	561	561
R-squared	0.163	0.225	0.286	0.287	0.301	0.308

Girls aged 12-21

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Additional controls: ethnic group, religion, age dummies, Dakar, rural, household size.

Table 10: Transmission of education in monogamous and polygynous households - polygynous fathers with children aged 7-21

VARIABLES	Dep.var.: Receive 4 years of education									
	Panel A: Boys					Panel B: Girls				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
polygamous father	-0.129**	-0.126**	-0.129**	-0.134**	-0.0736	-0.0803	-0.0965	-0.0788	-0.0830	0.180
	(0.0647)	(0.0620)	(0.0636)	(0.0641)	(0.160)	(0.0625)	(0.0670)	(0.0737)	(0.0735)	(0.160)
educated father		0.199***	0.186***	0.188***	0.179***		0.121**	0.117**	0.102*	0.102*
		(0.0502)	(0.0508)	(0.0506)	(0.0556)		(0.0577)	(0.0550)	(0.0557)	(0.0603)
educated mother		0.134**	0.106**	0.107**	0.141**		0.226***	0.172***	0.164***	0.201***
		(0.0528)	(0.0537)	(0.0531)	(0.0555)		(0.0621)	(0.0597)	(0.0590)	(0.0630)
number of siblings			-0.00334	-0.0104	0.000699			-0.0148	0.0162	0.0380*
			(0.0149)	(0.0187)	(0.0211)			(0.0144)	(0.0187)	(0.0224)
HH income			0.182***	0.187***	0.149**			0.274***	0.277***	0.272***
			(0.0560)	(0.0554)	(0.0596)			(0.0570)	(0.0563)	(0.0616)
nb siblings same sex				0.0176	0.0142				-0.0539**	-0.0624**
				(0.0225)	(0.0261)				(0.0253)	(0.0307)
poly × edu father					0.0913					0.102
					(0.128)					(0.158)
poly × edu mother					-0.141					-0.190
					(0.130)					(0.155)
poly × nb of siblings					-0.0317					-0.0631
					(0.0351)					(0.0403)
poly × HH income					0.202*					0.00424
					(0.122)					(0.116)
poly × nb same sex					0.00194					0.0399
					(0.0478)					(0.0549)
Constant	0.587***	0.465***	0.397***	0.395***	0.373***	0.531***	0.417***	0.354***	0.320***	0.243***
	(0.0246)	(0.0352)	(0.0696)	(0.0680)	(0.0748)	(0.0277)	(0.0369)	(0.0700)	(0.0646)	(0.0721)
Observations	612	612	612	612	612	563	563	563	563	563
R-squared	0.225	0.280	0.298	0.299	0.307	0.157	0.221	0.271	0.280	0.290

Children aged 12-21
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Transmission of education in monogamous and polygynous households - broader sample

VARIABLES	4 years of primary education	
	(1)	(2)
	Boys	Girls
Polygamous father	-0.008	-0.002
	(0.023)	(0.020)
Father coranic education	-0.026	0.030
	(0.026)	(0.024)
Father some primary education	0.119***	0.179***
	(0.039)	(0.049)
Father complete primary education	0.110***	0.207***
	(0.040)	(0.038)
Father secondary education	0.092**	0.095**
	(0.042)	(0.046)
Mother coranic education	-0.001	0.016
	(0.028)	(0.025)
Mother some primary education	0.121***	0.178***
	(0.039)	(0.042)
Mother complete primary education	0.057	0.182***
	(0.039)	(0.038)
Mother secondary education	0.069	0.200***
	(0.046)	(0.041)
Polygamy × Father primary education	0.024	0.008
	(0.040)	(0.046)
Polygamy × Father secondary education	-0.013	0.146***
	(0.055)	(0.052)
Polygamy × Mother primary education	-0.055	-0.130**
	(0.049)	(0.054)
Polygamy × Mother secondary education	0.072	-0.116*
	(0.061)	(0.064)
Constant	0.706***	0.013
	(0.201)	(0.360)
Observations	2,574	2,869
R-squared	0.482	0.477

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Transmission of education in monogamous and polygynous households - Propensity score matching estimates

	mod 1	mod 2	mod 3	mod 6	mod 9	mod 1	mod 2	mod 3	mod 6	mod 9
					Kernel matching					
Polygynous father	-0.100	-0.104	-0.100	-0.108	-0.160	-0.064	-0.070	-0.137	-0.262	-0.207
	(0.049)	(0.048)	(0.049)	(0.106)	(0.064)	(0.057)	(0.059)	(0.060)	(0.080)	(0.081)
					3-nearest neighbor matching					
Polygynous	-0.151	-0.092	-0.063	-0.225	-0.172	-0.073	-0.050	-0.171	-0.320	-0.109
	(0.055)	(0.056)	(0.057)	(0.130)	(0.148)	(0.063)	(0.064)	(0.067)	(0.124)	(0.144)

Each entry gives the estimated "average treatment effect" and its standard error.
Dependent variable: receive 4 years of education.
Sample: children of household heads, aged 12 to 21.
All models include a set of dummies for the child's age.
The model numbers correspond to the same sets of covariates as in figure 1
Model 1: Father's age (by 10-year intervals), ethnicity and residence.
Model 2: 1 + education (5 groups).
Model 3: 2 + cubic in household consumption.
Model 6: Detailed household compositions (number of members in 32 categories, see text).
Model 9: 3+ detailed household compositions (number of members in 32 categories).
*** p<0.01, ** p<0.05, * p<0.1

Table 13: Transmission of education within polygynous households

VARIABLES	Dep.var.: receive 4 years of primary education					
	Panel A: Boys			Panel B: Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
Father with primary education (and more)	0.288***	0.155		0.176	0.144	
	(0.0921)	(0.107)		(0.115)	(0.121)	
Mother with primary education (and more)	-0.170*	-0.153*	-0.178	-0.240*	-0.241*	-0.284*
	(0.0902)	(0.0885)	(0.136)	(0.129)	(0.121)	(0.143)
"Other mother" with primary education (and more)		0.236**			0.0962	
		(0.115)			(0.107)	
Constant	0.329***	0.317***	0.452***	0.417***	0.403***	0.468***
	(0.0518)	(0.0514)	(0.0410)	(0.0385)	(0.0446)	(0.0414)
Observations	125	125	125	119	119	119
R-squared	0.591	0.610	0.025	0.639	0.643	0.054
Number of fixidpere			58			49

children age 12-21
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14: Mother's cell per capita consumption (log)

VARIABLES	(1)	(2)
Polygamous union	-0.451**	-0.734
	(0.209)	(0.561)
Father with education	-0.121	-0.222*
	(0.106)	(0.125)
Mother with education	0.285***	0.264**
	(0.106)	(0.115)
nb of children 7-21	-0.0990***	-0.112***
	(0.0272)	(0.0307)
hh exp 2nd quintile	0.625***	0.693***
	(0.132)	(0.141)
hh exp 3rd quintile	1.180***	1.240***
	(0.130)	(0.136)
hh exp 4th quintile	1.765***	1.822***
	(0.151)	(0.161)
hh exp 5th quintile	2.596***	2.640***
	(0.196)	(0.218)
poly x Father educ	0.178	0.217
	(0.178)	(0.201)
poly x Mother educ	-0.298	-0.356
	(0.196)	(0.225)
poly x children 7-21	0.0921***	0.114**
	(0.0352)	(0.0450)
poly x exp. 2nd quintile	0.0549	0.00430
	(0.208)	(0.235)
poly x exp. 3rd quintile	0.105	0.0954
	(0.217)	(0.249)
poly x exp. 4th quintile	-0.0768	-0.150
	(0.217)	(0.241)
poly x exp. 5th quintile	0.174	0.133
	(0.288)	(0.358)
age first marriage		0.0101
		(0.0103)
poly x age first marriage		0.00734
		(0.0194)
first marriage		-0.166
		(0.295)
poly x first marriage		0.0869
		(0.555)
children previous marriage		-0.00429
		(0.267)
poly x children prev.		0.0260
		(0.456)
Constant	10.15***	10.17***
	(0.154)	(0.370)
Observations	381	333
R-squared	0.762	0.772

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Mothers of children 12-21

Table 15: Mother's cell per capita consumption (log), within household

VARIABLES	(1)	(2)	(3)
Father with prim . educ +	0.201	0.108	
	(0.208)	(0.220)	
Mother with prim . educ +	0.362*	0.394**	-0.0187
	(0.188)	(0.191)	(0.259)
Other mother with prim . educ +		0.358**	
		(0.162)	
dakar	1.465***	1.410***	
	(0.488)	(0.481)	
rural	-0.558*	-0.471	
	(0.321)	(0.333)	
hhsize	-0.0311**	-0.0337**	
	(0.0146)	(0.0150)	
Constant	10.44***	10.39***	10.57***
	(0.117)	(0.123)	(0.0728)
Observations	135	135	135
R-squared	0.563	0.573	0.000
Number of fixidpere			68

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Additional controls: ethnic groups, religion, age, dakar, rural.

Table 16: Marriage characteristics and mother's health

VARIABLES	(1) age first marriage	(2) spousal age gap	(3) first f marriage	(4) Husband in formal sector	(5) Husband educated	(6) husb. sec. education	(7) Gift bride (dummy)	(8) Bride price (dummy)	(9) Good health	(10) handicap	(11) Cannot work
education	0.998***	0.452***	-0.000732	0.0426***	0.597***	0.100***	0.0173	-0.0395***	0.00466	0.00512	0.00133
	(0.106)	(0.173)	(0.00184)	(0.00834)	(0.0363)	(0.00980)	(0.0110)	(0.00985)	(0.00906)	(0.00519)	(0.00228)
polygamy	0.0200	-4.561***	0.00164	0.00859	-0.208**	-0.0647***	-0.0371	-0.0671**	-0.0105	0.0215	0.0106
	(0.347)	(0.688)	(0.00437)	(0.0237)	(0.100)	(0.0248)	(0.0392)	(0.0334)	(0.0310)	(0.0178)	(0.00836)
edu x poly	-0.0855	0.454	0.00192	-0.0331*	-0.108	-0.0145	0.0344	0.0504**	-0.0147	0.00341	0.00963
	(0.261)	(0.434)	(0.00219)	(0.0177)	(0.0811)	(0.0202)	(0.0235)	(0.0209)	(0.0198)	(0.0131)	(0.00834)
Constant	18.17***	-11.50***	0.995***	0.0857***	1.037***	0.134***	0.525***	0.794***	0.776***	0.0545***	0.00900**
	(0.201)	(0.375)	(0.00316)	(0.0127)	(0.0664)	(0.0166)	(0.0233)	(0.0189)	(0.0190)	(0.00975)	(0.00410)
Observations	1,274	1,084	1,349	1,405	1,081	1,405	1,405	1,405	1,405	1,405	1,405
R-squared	0.089	0.081	0.001	0.028	0.310	0.131	0.007	0.013	0.001	0.003	0.007

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Married women, aged 20 to 50.