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AFRICAN POLYGAMY: PAST AND PRESENT

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ABSTRACT. Motivated by a simple model, I use DHS data to test nine hypotheses about the prevalence and decline of African polygamy. First, greater female involvement in agriculture does not increase polygamy. Second, past inequality better predicts polygamy today than does current inequality. Third, the slave trade only predicts polygamy across broad regions. Fourth, modern female education does not reduce polygamy. Colonial schooling does. Fifth, economic growth has eroded polygamy. Sixth and seventh, rainfall shocks and war increase polygamy, though their effects are small. Eighth, polygamy varies smoothly over borders, national bans notwithstanding. Finally, falling child mortality has reduced polygamy.

1. INTRODUCTION

Polygamy remains common in much of Africa.[1] In the "polygamy belt" stretching from Senegal to Tanzania, it is common for more than one third of married women to be polygamous (Jacoby, 1995). Polygamy has been cited as a possible contributor to Africa's low savings rates (Tertilt, 2005), widespread incidence of HIV (Brahmbhatt et al., 2002), high levels of child mortality (Strassmann, 1997), and to female depression (Adewuya et al., 2007).[2] This is despite a striking decline in the prevalence of polygamy in Africa over the last half century. In Benin, more than 60% of women in the sample used for this study who were married in 1970 are polygamists, while the figure for those married in 2000 is under 40%.[3] This is also true of Burkina Faso, Guinea, and Senegal. Several other countries in the data have experienced similar erosions of polygamy. This is an

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[1]I deal only with polygyny in this paper, ignoring polyandry. The term "polygamy" is more familiar to most readers.
[2]In addition, a debate exists about whether, and in what direction, polygamy influences fertility (Dodoo, 1998; Pebley et al., 1988).
[3]These raw correlations do not account for age effects. I discuss these in section 4.

evolution of marriage markets as dramatic as the rise in divorce in the United States or the decline of arranged marriage in Japan over the same period.

I use data from the Demographic and Health Surveys (DHS) on women from 34 countries to test nine hypotheses about the prevalence and decline of polygamy in sub-Saharan Africa. These are motivated by a simple model, and by previous theories and findings from economics, anthropology, and African history. These hypotheses test whether polygamy responds to economic incentives, economic shocks, and the process of economic development. First, Jacoby (1995) has linked the demand for wives in the Ivory Coast to the productivity of women in agriculture. I find, by contrast, that polygamy is least common in those parts of Africa where women have historically been most important in agriculture. Second, economists since Becker (1974) have linked polygamy to inequality between men. I am not able to find any correlation between wealth inequality recorded in the DHS and the probability that a woman is polygamous. I find, however, that historical inequality predicts polygamy today. Similarly, geographic predictors of inequality that have been used in other studies also predict the existence of polygamy in the present. Third, I confirm the result of Dalton and Leung (2011); greater slave trade exposure does predict polygamy today. I show, however, that the result depends on a broad comparison of West Africa to the rest of the continent.[4]

Fourth, I exploit two natural experiments that have increased female education in Nigeria (Osili and Long, 2008) and Zimbabwe (Agüero and Ramachandran, 2010), and find no causal effect of women's schooling on polygamy. By contrast, I use colonial data from Huillery (2009) and Nunn (2011) to show that schooling investments decades ago predict lower polygamy rates today. Fifth, I find an impact of greater levels income per capita on the decline in polygamy. I follow Miguel et al. (2004), and use country-level rainfall as an instrumental variable. Sixth, I find that local economic shocks predict polygamy; women within a survey cluster who received unfavorable rainfall draws in their prime marriageable years are more likely to marry a polygamist. Seventh, war acts like a detrimental rainfall shock at the local level, increasing the prevalence of polygamy. Both of these effects, however, are small in magnitude. Eighth, I use a regression discontinuity design to test whether national bans and other country-level efforts have played any role in the decline of African polygamy. With a few notable exceptions, I find that they have not. Finally, I use national-level differences in differences and a natural experiment from Uganda to test for an effect of falling child mortality. The magnitudes I find are large enough to explain a meaningful decline in polygamy in several African countries.

I find, first, that existing theories of polygamy face challenges in explaining Africa. Inequality is related to polygamy, but acts over the very long term. The distribution of polygamy in Africa does not fit an explanation rooted in the gender division of labor.

[4]I became aware of their paper while working on this project. They were first, but replication is good for science.

Educating women in the present does not spur men to demand "higher quality" wives, as in Gould et al. (2008). Second, I find that history matters. Pre-colonial inequality, the slave trade, and colonial education matter in the present. Third, African marriage markets have responded to economic growth and fluctuations, but the largest elasticities that I find are in response to changes in child health. These patterns are consistent with other findings that, while norms and culture respond to economic pressures, they are persistent (Alesina and Fuchs-Schundeln, 2007; Becker et al., 2011; Fisman and Miguel, 2007). Mechanisms for this durability include intergenerational transmission of values (Tabellini, 2008), social stigma (Edlund and Ku, 2011), and symbolic practices in isolated communities (Voigtländer and Voth, 2012).

My results contribute to our knowledge of the determinants of ethnic institutions. Institutions such as pre-colonial states and land tenure matter for modern incomes (Goldstein and Udry, 2008; Michalopoulos and Papaioannou, 2012). Shared institutions facilitate collective action within ethnic groups, while ethnic inequality lowers incomes today (Alesina et al., 2012; Glennerster et al., 2012; Miguel and Gugerty, 2005). Although an empirical literature has explained national institutions as products of influences such as settler mortality, population, trade, or suitability for specific crops (Acemoglu et al., 2001, 2002, 2005; Engerman and Sokoloff, 1997), less is known about the origins of ethnic institutions. Like national institutions, these may have their basis in biogeographical endowments such as population pressure or ecologically-driven gains from trade (Fenske, 2012; Osafo-Kwaako and Robinson, 2012). I add to this literature by testing hypotheses about the origin of one specific ethnic institution, and by identifying variables that influence its persistence and evolution.

My results also add to our understanding of the working of marriage markets and family structures. These matter for several outcomes, including female schooling (Field and Ambrus, 2008), sex selection (Bhalotra and Cochrane, 2010), child health (Bharadwaj and Nelson, 2012), labor force participation (Alesina and Giuliano, 2010), and women's access to capital (Goyal et al., 2010). Several recent contributions have explained marriage patterns using the gender division of labor created by influences such as the plough (Alesina et al., 2011), animal husbandry (Voigtländer and Voth, 2011), natural resource wealth (Ross, 2008), or deep tillage (Carranza, 2012). Other views link marital rules to risk-sharing arrangements (Rosenzweig, 1993; Rosenzweig and Stark, 1989). Dowries and bride prices respond to population growth (Rao, 1993), the costs of contraception (Arunachalam and Naidu, 2010), pressures to maintain fidelity (Nunn, 2005), and exogenous legal changes (Ambrus et al., 2010). A handful of papers model polygamy, including Adshade and Kaiser (2008), Tertilt (2005) and Gould et al. (2008). In this paper, I reassess some of the most influential explanations of African polygamy, and propose new contributing factors. I uncover a dramatic transition in the continent's marriage markets, and assess some plausible explanations for this change.

I also touch on a variety of other literatures, including the importance of inequality for development (Easterly, 2007), the implications of the gender division of labor (Qian, 2008), the impacts of the slave trade (Nunn, 2008), the effects of war (Blattman and Miguel, 2010), the ability of poor households to cope with economic shocks (Townsend, 1994), and the capacity of African states (Gennaioli and Rainer, 2007).

In section 2, I outline the hypotheses that I test, presenting a simple model to motivate them. Because space and data availability force me to ignore some plausible explanations of polygamy and its decline, I discuss other possible determinants of polygamy in Appendix A. In section 3, I describe the tests that I apply to each of these hypotheses. I introduce the multiple data sources that I use in section 4, and I provide additional details on these sources in the Web Appendix. I report the results in section 5. Additional robustness checks and supporting results are listed in in Appendix A and are described in detail in the Web Appendix. In section 6, I conclude.

2. Hypotheses

2.1. **Model.** I begin with a simple model that motivates the hypotheses that I test. This builds on work by Bergstrom (1994), Lagerlöf (2010), and Tertilt (2005). This motivates the empirical tests within a unified framework. Not every outcome is novel. For example, the link between inequality and polygamy goes back to Becker (1974). This model cannot explain all stylized facts in the data. Increasing incomes predict greater polygamy in the model, but less polygamy in the data. The purpose of the model, then, is to demonstrate that the hypotheses I test are theoretically relevant. Further, I derive predictions that differ from existing models of polygamy; this establishes that there is theoretical ambiguity that must be resolved empirically.

2.1.1. *Setup.* A community consists of N men and their sisters. There are two periods. In the first period, men trade their endowments of wealth and sisters in return for wives. In the second period, they make decisions about consumption, fertility, and the human capital of their children. A fraction π of men is rich, and a fraction $1-\pi$ is poor. Rich men begin with wealth equal to $y_R = \left(1+\frac{\theta(1-\pi)}{\pi}\right)y$, while poor men begin with wealth $y_P = (1-\theta)\,y$. This formulation allows the parameter θ to measure inequality without affecting mean wealth y. Each man has s sisters, which captures the female-male ratio.

Women are homogenous, divisible, and make no decisions. Wives are valuable as farmers, for producing children, and for educating those children. In the first period, the price of a woman is b, which is determined endogenously. Each price-taking man receives income bs in return for the sisters that he sells, and pays bw for the wives that he buys. Men receive utility from consumption c, fertility n, and the human capital of their children h_i, such that:

$$U = (1-\beta)\ln(c) + \beta ln(h_i n). \tag{1}$$

Fathers choose either high human capital or low human capital for their children, such that $h_i \in \{h_L, h_H\}$. Rearing n children with human capital h_i and w wives costs $\gamma_i \frac{n^2}{w}$. γ_i is a cost parameter. Because it is costly to raise a higher-quality child, $\gamma_H > \gamma_L > 0$. The costs of an increasing number of births for any one wife are convex, for example through depletion of her health.

Each wife farms, creating income ρ for her husband. ρ captures female agricultural productivity. In equilibrium, it will be the case that $b > \rho$. Thus, a man of type $j \in \{R, P\}$ with w wives and n children of quality h_i will consume $c = y_j + bs - (b-\rho)w - \gamma_i \frac{n^2}{w}$. Each man's problem can be written as:

$$V = \max_{\{w,n,h_i\}} \left\{ (1-\beta) \ln \left(y_j + bs - (b-\rho)w - \gamma_i \frac{n^2}{w} \right) + \beta ln(h_i n) \right\}. \tag{2}$$

2.1.2. *Optimization.* (2) can be solved from its first-order conditions. These yield each man's demand for wives and optimal number of children:

$$w_j^* = \frac{\beta(y_j + bs)}{2(b-\rho)}, \tag{3}$$

and

$$n_j^* = \frac{\beta(y_j + bs)}{2\sqrt{\gamma_i(b-\rho)}}. \tag{4}$$

Substituting (4) and (3) into (2) gives utility conditional on a choice of human capital. A man will choose to provide his children with human capital h_H if the relative cost is sufficiently low. That is:

$$h_i^* = h_H \text{ if } \left(\frac{h_H}{h_L} \right)^2 \geq \frac{\gamma_H}{\gamma_L}. \tag{5}$$

2.1.3. *Equilibrium.* Total demand for wives will be $N(\pi w_R^* + (1-\pi) w_P^*)$. Total supply of wives will be Ns. Using (3), this gives equilibrium bride price b:

$$b^{eqm} = \frac{2\rho s + \beta y}{(2-\beta)s}. \tag{6}$$

Define $\tilde{\pi} \equiv \frac{1-\pi}{\pi}$. Substituting (6) into (3), the equilibrium numbers of wives possessed by rich and poor men are:

$$w_R^{eqm} = \frac{\beta s}{2} \left(\frac{(2-\beta)(1+\tilde{\pi}\theta)y + \rho s}{\beta y + \rho s} + 1 \right), \tag{7}$$

and

$$w_P^{eqm} = \frac{\beta s}{2}\left(\frac{(2-\beta)(1-\theta)y + \rho s}{\beta y + \rho s} + 1\right). \tag{8}$$

Define R as the relative number of wives married by rich and poor men. This is:

$$R \equiv \frac{w_R^{eqm}}{w_P^{eqm}} = \frac{(2 + (2-\beta)\tilde{\pi}\theta)y + \rho s}{(2 - (2-\beta)\theta)y + \rho s}. \tag{9}$$

Because the model does not allow for non-marriage of women or marital age gaps, the mean number of wives per man is determined mechanically by the female-male ratio, s. It makes sense, then, to think of R as an index of relative polygamy. The fraction of women who are married to rich men is increasing in R. In the remainder of this section, I use this model to generate predictions that motivate the hypotheses I test.

2.2. **The gender division of labor.** Jacoby (1995), building on Boserup (1970), shows that the demand for wives is greatest in those parts of the Ivory Coast where female productivity in agriculture predicted by crop mixes is highest. Although women are more important in agriculture where they are more productive (Alesina et al., 2011), the model does not predict that this will increase polygamy. Though greater productivity ρ increases the demand for women in (3), supply is held constant. In (9), $\frac{\partial R}{\partial \rho} < 0$. Increasing the productivity of women in agriculture *reduces* polygamy. The increase in ρ raises the purchasing power of both rich men and poor men, since their endowments of sisters have both increased in value. This reduces the disparity in purchasing power, hence, polygamy. Apart from the prediction of the model, women's economic roles shape their relative bargaining power (e.g. Ross (2008)), potentially improving their marital outcomes.

2.3. **Inequality.** The model predicts that inequality increases polygamy. From (9), $\frac{\partial R}{\partial \theta} > 0$. This echoes Becker (1974), who argues that total output can be raised by giving a more productive man a second wife than by giving her to a "less able" man. Similarly, Bergstrom (1994) models polygamy as a consequence of inequality in male endowments of both wealth and sisters. This may not hold as a society develops; Lagerlöf (2010) suggests that a self-interested ruler may impose monogamy at later stages of development to prevent his own overthrow by lesser men deprived of wives.

2.4. **The slave trade.** The slave trade can be thought of in at least two ways in the model. The first is as an increase in the female-male ratio, s. This will increase the number of wives for rich and poor men, given in (7) and (8). However, $\frac{\partial R}{\partial s} < 0$. A larger endowment of sisters for both rich and poor men will reduce inequality in wives. I show in the Web Appendix that the female-male ratio helps explain polygamy today by showing that polygamy is is more common in areas closer to mines, where labor is generally provided by migrant men. A second approach to the slave trade gives the opposite result. Because those who profited from the slave trade did so at the expense of others, it increased inequality (θ). This would increase R.

That the slave trade may have increased polygamy is an old argument – see Thornton (1983). In addition to its effects on inequality and the female-male ratio, it created movable wealth that may have facilitated a transition from matrilocal to patrilocal marriage, allowing non-sororal polygamy to exist (Schneider, 1981). Whatley and Gillezeau (2011) and Edlund and Ku (2011) show correlations between slave exports and polygamy at the ethnicity and country levels, respectively. Dalton and Leung (2011) also use DHS data to test whether the slave trade predicts polygamy today. I confirm their result using different methods. I take women as the unit of observation, rather than men, and match women to slave exports by location in addition to matching by ethnicity. I show these results are robust to adding Angola, which exported more slaves than any other country, but has low polygamy rates today. I add the caveat that the slave trade can only predict polygamy across broad regions.

2.5. **Female education.** The expansion of female schooling from the late colonial period until the 1980s was dramatic across much of Africa (Schultz, 1999). Empowering women through education may encourage them to avoid polygamous marriage. Alternatively, Gould et al. (2008) suggest that a rich man intent on increasing child quality will prefer one educated wife to several uneducated ones. The model, however, gives different predictions. If educating women makes it easier for them to raise educated children, reducing γ^H, it will have no effect on polygamy, though it may induce a switch from low-quality to high-quality children, as in (5). This differs from the result in Gould et al. (2008), because women here are homogenous. This suggests that the effects of mass education programs like the ones I exploit as natural experiments will differ from those that have unequal impacts. By contrast, histories of missionary education exert persistent influence on attitudes towards democracy (Woodberry, 2012) and the position of women (Nunn, 2011); it is possible that these have had a similar effects on attitudes towards polygamy.

2.6. **Economic growth.** If polygamy is simply a condition of poverty, it should be disappearing most rapidly in the countries that have grown most. Further, rising incomes may induce a shift in parental efforts away from the quantity to the quality of children (Galor and Weil, 2000), lowering the demand for multiple wives (Gould et al., 2008). The model reveals that other mechanisms may counter this effect. Here, an increase in y will increase the fraction of wives held by the rich: $\frac{\partial R}{\partial y} > 0$. The increase in y raises the importance of monetary wealth relative to wealth in sisters, increasing the advantage of rich men in the marriage market. The distribution of income gains, then, will matter.

2.7. **Economic shocks.** I test whether rainfall shocks at the survey cluster level predict whether a woman will marry polygamously. Since many African societies pay bride price, an adverse shock may encourage a girl's parents to marry her to a worse man in order to smooth consumption. Even without bride price, this may allow her parents to remove a dependant or gain ties with another household able to offer support. Since polygamist men tend be wealthier, they are better able to buy a wife in depressed conditions. In the model, if poor men see their incomes fall more than richer men, this will act like an increase in θ, increasing R. If, instead, incomes fall generally, this decline in y will reduce the extent of polygamy.

2.8. **War.** Warfare might increase polygamy through several mechanisms. In the model, it would be expected to operate through the same channels as a local economic shock, as well as by increasing s, the female-male ratio. Becker (1974) cites a nineteenth-century war that killed much of the male population of Paraguay and was followed by a rise in polygamy. The BBC has suggested that polygamy is a coping strategy for war widows in Iraq,[5] while the OECD has made similar claims about Angola.[6] Historically, warfare has existed as a means for capturing women from neighboring ethnic groups (White and Burton, 1988).

2.9. **National policies.** Polygamy was banned by law in the Ivory Coast in 1964, but remains widespread there. Despite the apparent failure of similar bans in other countries, it is possible that other policies that vary at the national level may have affected polygamy. These could include democratization, the legal status of women, or the provision of health and education. The model suggests that only some policies will matter. For example, some countries might provide better education, lowering γ^H, but having no effect on polygamy. Alternatively, countries with national bans that increase the costs of polygamy could be seen as levying a fine on wives greater than s. This would have the effect of dampening demand for wives from richer men, reducing bride-price and relative polygamy R.

I use a regression discontinuity design to test whether polygamy rates break at the borders in my sample. Other studies of Africa have found that government investments such as education and health have effects that change discontinuously across national borders (Cogneau et al., 2010; Cogneau and Moradi, 2011). Imported institutions such as local government can have long-lasting effects, even after the border disappears (Berger, 2009). By contrast, indigenous institutions such as rights over land pass smoothly over national borders (Bubb, 2009).

2.10. **Child mortality.** In the model, child mortality could be seen as an increase in γ^L and γ^H, the costs of children. Under the assumptions above, child mortality will change fertility, but not the total number of wives. Other models of fertility preference might give other results. This is a result of the assumptions made about utility and the costs of fertility; I show in the Web Appendix that a simplified model with quasilinear utility

[5] http://www.bbc.co.uk/news/world-middle-east-12266986
[6] http://genderindex.org/country/angola

gives the result that greater levels of child mortality increase polygamy if the extent of inequality is not too great. This follows a simple intuition; if polygamy is a mechanism for men to increase their fertility (e.g. Iliffe (1995); Tertilt (2005)) a reduction in the probability that any one child will die reduces number of wives needed to achieve a target number of surviving children.

3. Tests

The econometric tests that I use to test these hypotheses vary according to whether the potential cause of polygamy is time-invariant, varies over time, can be tested with a regression discontinuity, or can be tested using a natural experiment.

3.1. **Time-invariant causes of polygamy.**

Several hypotheses suggest effects of time-invariant variables on polygamy. Historical inequality is one example. For hypotheses of this type, my basic specification is:

$$polygamous_i = z_i'\beta + x_i'\gamma + \delta_{CR} + \epsilon_i. \quad (10)$$

Here, $polygamous_i$ is an indicator for whether woman i is in a polygamous marriage. z_i is the vector of controls of interest – for example her ethnic group's gender division of labor, or her survey cluster's suitabilities for growing certain crops. x_i is a vector of individual and geographic controls. δ_{CR} is a country-round fixed effect. ϵ_i is error. Standard errors are clustered at the level at which the variables of interest (z_i) vary. I use ordinary least squares (OLS) to estimate (10). Where I have instruments for z_i, I use instrumental variables (IV).

The variables that are available to include in x_i differ across the 90 DHS data sets that I compile, and so I use only a limited set of individual-level controls. These are: year of birth, year of birth squared, age, age squared, dummies for religion, and urban. I am able to include both year of birth and age because the DHS surveys were conducted in multiple years, though the linear term disappears with country-round fixed effects.

I include geographic controls in x_i to capture other determinants of polygamy that may be correlated with z_i. These are: absolute latitude; suitability for rain-fed agriculture; malaria endemism; ruggedness; elevation; distance to the coast, and dummies for ecological zone (woodland, forest, mosaic, cropland, intensive cropland, wetland, desert, water/coastal fringe, or urban).

3.1.1. *The gender division of labor.*

I use two separate measures of the gender division of labor in z_i. The first is the historic degree of female participation in agriculture. The second is the suitability of the woman's survey cluster for growing specific crops. I then use these suitability measures as instruments for the historic importance of women in agriculture. The exclusion restriction is that the relative productivity of different crops influences polygamy only through the gender division of labor and is not correlated with unobserved determinants of polygamy. Note that agricultural productivity in general is included as a separate regressor, and is not excluded from the second stage. This is similar to the restriction in Jacoby (1995).

3.1.2. *Inequality.* When I test for the importance of contemporary inequality, I use the coefficient of variation of household wealth in z_i.[7] I compute this within both survey clusters and sub-national regions. Because the wealth measures come normalized for each country-round, these results are only interpretable when country-round fixed effects are included. I also use historic class stratification, a measure of historical inequality, in z_i.

I also use geographic variables in z_i that have been treated by other studies as predictors of inequality. These are the log ratio of wheat to sugar suitability and heterogeneity in land quality. The mechanism behind the log ratio of wheat to sugar suitability was proposed by Engerman and Sokoloff (1997). Sugar production in the Americas was dependent on slave labor, while wheat production was amenable to family farms. The long-run result was more inequality in regions that grew sugar. Easterly (2007) finds the log suitability ratio predicts inequality even outside the Americas, which suggests that suitability for sugarcane predicts inequality-increasing agricultural practices even where it is not grown. Heterogeneity in land quality is more intuitive; when there is inequality in the ability to produce income, outcomes should be unequal. Michalopoulos et al. (2010) use this measure in explaining the rise of Islam. First-stage F statistics are too weak to permit using these geographic variables as instruments for inequality. I can, then, only offer a guarded interpretation; historical inequality or unobservable variables that are correlated with ethnic institutions shape polygamy today.[8]

3.1.3. *The slave trade.* I use measures of ethnicity-level slave exports in z_i, clustering standard errors by ethnicity. I instrument for slave exports using distance of the survey cluster from the closest slave port in the Americas. When country-round fixed effects are included, this instrument loses predictive power. Thus, I follow Nunn and Wantchekon (2011) and use distance from the coast as an alternative instrument. To demonstrate that the results depend on a broad comparison of West Africa and the rest of the continent, I show that including longitude in x_i eliminates the effect, as does re-estimating this regression on the sub-sample of West African countries.[9] Because my main data source and that of Dalton and Leung (2011) both exclude Angola (the polygamy question was not asked), I assemble alternative data using the DHS “household recodes.” I code each household as polygamous if more than one woman is listed as a wife of the

[7] I show in the Web Appendix that the results are similar if a Gini coefficient is used.

[8] Other approaches to predicting inequality, such as unequal landholding (Dutt and Mitra, 2008), inequality in immigrants’ home countries (Putterman and Weil, 2010), or changes over time in relative prices of “plantation” and “smallholder” crops (Galor et al., 2009) cannot be applied to these data.

[9] Benin, Burkina Faso, Cameroon, Ghana, Guinea, Ivory Coast, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

household head. Individual controls are missing from these data, and so I only use geographic controls.

3.1.4. *(Colonial) female education.* First, I follow Huillery (2009) and include the average number of teachers per capita at the district (cercle) level in colonial French West Africa over the period 1910-1928 in z_i. I modify x_i so that it matches the controls used by Huillery (2009) as closely as possible. I always include the respondent's year of birth, year squared, age, age squared, dummies for religion and the urban dummy. In successive columns, I include measures of the attractiveness of the district to the French, conditions of its conquest, pre-colonial conditions, and geographic variables in x_i. Standard errors are clustered by 1925 district.

Second, I follow Nunn (2011) and include distance from a Catholic or Protestant mission in 1924 in z_i.[10] Since much colonial education was conducted through missions, this captures the combined effects of schooling and evangelism. Standard errors are clustered by survey cluster.

The data I use cover women, and so do not reveal how colonial education affected the relative education levels of women and men. Because I do not have instruments for these historical variables, it is not possible to interpret these estimates as strictly causal. Indeed, geographic controls do predict the location of colonial missions (not reported). Supporting a causal interpretation, ethnicities recorded in the *Ethnographic Atlas* that practiced polygamy received more missions per unit area, though this is not significant conditioning on geographic controls (not reported). The significant estimates I find are, however, consistent with the importance of history in explaining polygamy.

3.2. **Time-varying causes of polygamy.** The data come as cross-sections of women born in different years. This allows me to use variation in the ages at which women were exposed to shocks such as drought, war, or economic growth to test for time-varying causes of polygamy. For hypotheses of this type, my basic specification is:

$$polygamous_i = z_i'\beta + x_i'\gamma + \delta_j + \eta_t + \epsilon_i. \tag{11}$$

The variables $polygamous_i$, x_i, and ϵ_i are the same as above. z_i now measures a woman's exposure to a shock around the time she is most marriageable. I measure shocks at the woman's age of marriage and, because this is potentially endogenous, averaged over her early adolescence (ages 12 to 16). δ_j is a fixed effect for the woman's survey cluster. η_t is a fixed effect for time – t is the year of marriage when z_t is measured at the age of marriage, and t is the year of birth when z_t is measured over the ages 12 to 16. I am comparing women across cohorts in the same survey cluster in order to identify β.

[10]Results are similar if dummy variables for whether a colonial mission exists within 5, 10, 15 or 20 km are used in z_i, although the correlation between polygamy and distance from a Protestant mission becomes more robust (not reported).

Because δ_j is collinear with geographic controls and the urban dummy, these controls are dropped. η_t is collinear with year of birth and the combination of η_t and δ_j are collinear with age when the shock is averaged over a woman's adolescence. Thus, x_i only contains dummies for religion in that specification. I use OLS or IV to estimate (11). Because the data are at the individual level, I am not able to include lagged polygamy. Standard errors are clustered at the level at which z_i varies.

3.2.1. *Economic growth.* I include log GDP per capita in z_t. Standard errors are clustered by country $\times$ year of marriage (or year of birth). I instrument for country-level GDP per capita using the country-level rainfall estimates used by Miguel et al. (2004). Standard errors are clustered by country-round in the IV estimation.

3.2.2. *Economic shocks.* I include rainfall shocks in the woman's survey cluster in z_t. Standard errors are clustered by cluster $\times$ year of marriage or cluster $\times$ year of birth.

3.2.3. *War.* I include the number of battle deaths in a conflict whose radius includes a woman's survey cluster in z_t. I treat this as a proxy for conflict intensity. Standard errors are clustered by cluster $\times$ year of marriage or year of birth.

3.2.4. *Child mortality.* I include (separately) country-level and sub-national measures of under-5 mortality mortality in z_t. Standard errors are clustered by country $\times$ year of marriage or year of birth. It is possible that polygamy increases child mortality (Strassmann, 1997). Here, however, child mortality is measured at or before the time these women are married and so precedes their fertility decisions. Causal interpretation requires that no within-country time-variant unobservables are correlated with both child mortality and polygamy. I also exploit a natural experiment in malaria eradication, described below.[11]

3.3. **National policies: regression discontinuities.** For each neighboring set of countries in the data, I select all clusters that are within 100 km of the border and estimate:

$$polygamy_i = \beta_0 + \beta_1 Country_i + f(Distance_i) + Country_i \times f(Distance_i) + x_i'\gamma + \epsilon_i \tag{12}$$

I adopt the convention that $Country_c$ is a dummy for the alphabetically prior country. $f(Distance_i)$ is a cubic in distance from the border. Because of the small sample size and inclusion of a spatial polynomial, I exclude the geographic controls from x_i. I cluster standard errors by survey cluster.

3.4. **Female education and child mortality: natural experiments.**

[11] I have explored using measures of health-care supply such as physicians per capita and government health spending as instruments. I have not found any with predictive power once δ_j and η_i are included.

3.4.1. *School-building in Nigeria.* From 1976 to 1981, the Nigerian government engaged in a school-building program in certain states. Osili and Long (2008) use this to test whether female schooling reduces fertility. I follow their approach, and use OLS to estimate:

$$\begin{aligned} \textit{polygamy}_i &= \beta \textit{Born 1970-75 X Intensity}_i \\ &\quad + \alpha \textit{Intensity}_i + \lambda \textit{Born 1970-75} + x_i'\gamma + \epsilon_i \end{aligned}$$

$\textit{Intensity}_i$ will, in different specifications, measure either whether the respondent's state was treated by the program, or spending per capita in the state. The controls in x_i match Osili and Long (2008). These are year of birth, dummies for the three largest Nigerian ethnic groups (Yoruba, Hausa, Igbo), and dummies for the major religions (Muslim, Catholic, Protestant, other Christian, and traditional). The sample includes only women born between 1956-61 and 1970-75. This tests whether the school-building program had a differential effect on the women young enough to be exposed to it as children in the affected states. β is the treatment effect. Standard errors are clustered by the states that existed in 1976.

3.4.2. *The end of white rule in Zimbabwe.* The end of white rule in Zimbabwe increased access to education for students who were 14 or younger in 1980. Agüero and Ramachandran (2010) test for intergenerational effects of this education shock. Agüero and Bharadwaj (2011) examine the impacts on knowledge of HIV. Following these, I use OLS to estimate:

$$\begin{aligned} \textit{polygamy}_i &= \beta \textit{Age 14 or below in 1980}_i + \alpha \textit{Age in 1980}_i \\ &\quad + \lambda \textit{(14-Age in 1980) X (Age 14 or below in 1980)} + \epsilon_i \end{aligned}$$

Like Agüero and Ramachandran (2010), I do not include additional controls and I use robust standard errors. The "full" sample includes women aged 6 to 22 in 1980, and the "short" sample includes women aged 10 to 20 in that year. β measures the effect of the change.

I show in the Web Appendix that a similar natural experiment from Sierra Leone (Cannonier and Mocan, 2012) did not reduce polygamy. As with the colonial schooling investments, the data I use cover women, and so cannot be used to evaluate whether these modern schooling interventions altered the relative levels of schooling across genders.

3.4.3. *The eradication of malaria in Kigezi.* In 1960, a joint program between the WHO and the Government of Uganda eradicated malaria in the country's Kigezi region. Following Barofsky et al. (2011), I estimate the effect of this program with the regression:

$$\textit{polygamy}_i = \beta \textit{Post}_i \times \textit{Kigezi}_i + x_i'\gamma + \delta_j + \eta_t + \epsilon_i$$

Here, $Post_i$ measures whether the respondent was born in 1960 or later, $Kigezi_i$ is a dummy for the treated region. δ_j is a district fixed effect, and η_t is a year-of-birth fixed effect. x_i includes dummies for religion, ethnicity and urban. Standard errors are clustered by district. I use this to test for an impact of child mortality on polygamy. There are two caveats. First, none of the women in the sample are old enough for treatment to be measured relative to their year of marriage, rather than their year of birth. Second, malaria eradication had several effects; Barofsky et al. (2011), for example, find educational impacts. My results can only provide indirect support for the importance of a reduction in child mortality. This is, however, the only anti-malaria campaign I am aware of that overlaps with data on polygamy. The Kenyan anti-malaria efforts studied by Pathania (2011) began in 2004, and so it is still too early to evaluate that program's effects on marriage outcomes.

4. Data

4.1. **Dependent variables and controls.** Data are taken from the "individual recode" sections of 90 DHS surveys conducted in 34 sub-Saharan countries between 1986 and 2009. These individual-level samples are nationally representative cross-sections of ever-married women of childbearing age. From these surveys, 494,157 observations are available in which a woman's polygamy status, year of birth, and urban residence are known. A woman is coded as polygamous if she reports that her husband has more than one wife. Latitude and longitude coordinates of the respondent's survey cluster are known for 301,183 of these observations.[12] Year of birth, year of birth squared, age, age squared, dummies for religion, and urban are taken from these surveys.

Geographic controls are collected from several sources. For each of these, I assign a survey cluster the value of the nearest raster point. I obtain suitability for rain-fed agriculture and ecological zone from the Food and Agriculture Organization's Global Agro-Ecological Zones (FAO-GAEZ) project. The ecological zones are dummy variables, while the suitability measure ranges from 0 to 7. Elevation is an index that ranges from 0 to 255, taken from the North American Cartographic Information Society. Malaria endemism is from the Malaria Atlas Project, and ranges from 0 to 1. Ruggedness is the Terrain Ruggedness Index used by Nunn and Puga (2012), which ranges from 0 to 1,368,318. Absolute latitude and distance from the coast are computed directly from the cluster's coordinates. The women for whom geographic coordinates are available differ from the full sample. They were generally born and married later, and are slightly more polygamous (see the Web Appendix). This will only influence the estimation results if there are heterogeneous treatment effects.

[12]Recent DHS surveys add noise to these coordinates. Because this displaces 99% of clusters less than 5 km and keeps them within national boundaries, this adds only measurement error to the geographic controls.

Other variables are specific to each hypothesis, and are described in greater detail in the Web Appendix. Summary statistics are in Table 1. Because these variables come from multiple sources, they are each available only for subsets of the data. Sample sizes, then, differ across columns in the regression tables.

4.1.1. *The gender division of labor.* The suitability measures for specific crops are scores between 0 and 7, published by the FAO. These vary by survey cluster. These are available for wheat, maize, cereals, roots/tubers, pulses, sugar, oil crops, and cotton. Though chosen for their availability, these crops are important in the countries in the data. For example, they accounted for 83% of the value of crop production in Zambia and 91% in Namibia in 2000 (faostat.fao.org).

Historic female participation in agriculture is taken from the Murdock (1967) *Ethnographic Atlas*. This source reports the ethnic institutions of 1,267 global societies, approximately at the time of European contact. I join these to the DHS data using respondents' ethnic groups. More than 40% of the sample could be assigned a level of "historic female agriculture" by this method. The polygyny rate for this sample is roughly 10 percentage points greater than for the unmatched sample. This sample differs along other observable dimensions, though these differences are small (see the Web Appendix). "Historic female agriculture" assigns each ethnic group a score between 1 and 5 indicating the degree to which women were important relative to men in agriculture.

4.1.2. *Inequality.* I use the wealth index from the DHS to measure inequality. This is a factor score computed separately for every survey round, based on household ownership of durable goods. I compute coefficients of variation and Gini coefficients from these data, measuring inequality across households within the survey cluster or subnational region.

I take "historic class stratification" from the *Ethnographic Atlas*. This is a score between 1 and 5 describing the extent of class differences before colonial rule. The sample for which this is non-missing is similar to the sample for which "historic female agriculture" is available.

The log ratio of wheat to sugar suitability is computed directly from the FAO data. Heterogeneity in land quality is the coefficient of variation of constraints on rain-fed agriculture for the survey clusters within each region. The constraints variable is an index between 1 and 7. It measures the combination of soil, climate, and terrain slope constraints. It also comes from the FAO.

4.1.3. *The slave trade.* I match women in the sample to slave trade estimates from Nunn and Wantchekon (2011) using self-declared ethnicity. The estimates are reported on a map, allowing me to use respondents' geographic coordinates to create an alternative spatial measure of slave trade intensity. Since it is easier to measure slave exports across ports than across ethnicities, this will reduce measurement error. Further, the long-run effects of the slave trade may have worked through institutions that vary by location, rather than by ethnicity. Following Dalton and Leung (2011), I use the log of (one plus) Atlantic slave trade exports normalized by area to measure slave trade exposure.

4.1.4. *Female education.* Years of schooling are reported in the DHS data. I use three measures of Nigeria's school building program from Osili and Long (2008): a dummy for a "high intensity" state, school-building funds in 1976 divided by the 1953 census population estimates, and school-building funds normalized by (unreliable) 1976 population projections. I match survey clusters to the old states using their coordinates. Since the 1999 Nigerian DHS do not report coordinates, I do not use this wave.

Teachers per capita and other controls from colonial French West Africa from Huillery (2009) are available on her website. Locations of colonial missions from Nunn (2011) (originally from Roome (1924)) are available on his website.

4.1.5. *Economic growth.* GDP per capita is from the World Development Indicators. Rainfall measures from the Miguel et al. (2004) data set average precipitation over geographic points in a country during a given year, measured by the Global Precipitation Climatology Project.

4.1.6. *Economic shocks.* Rainfall shocks taken from a University of Delaware series that reports annual rainfall on a latitude/longitude grid. Each cluster is joined to the nearest grid point. I measure shocks as the ratio of rainfall in year t to average rainfall for that cluster.

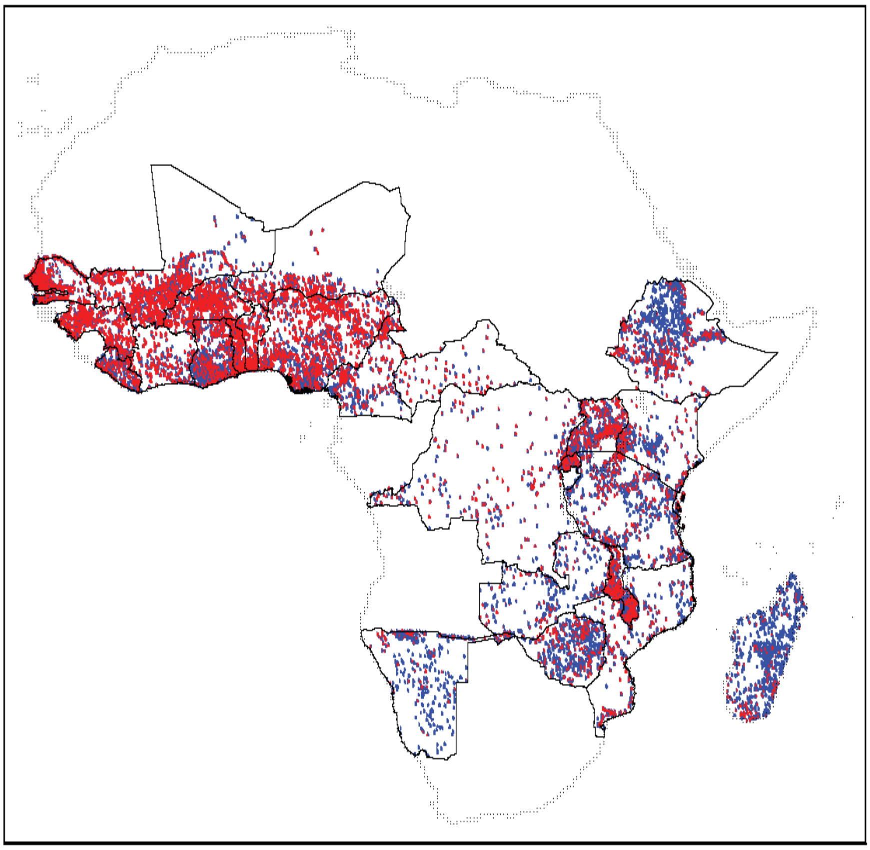
4.1.7. *War.* I take battle deaths from the Uppsala Conflict Data Program (UCDP) and International Peace Research Institute, Oslo (PRIO) Armed Conflict Dataset. Each conflict has a latitude/longitude coordinate, a radius, and a best estimate of the number of battle deaths during each year of fighting. If a war's radius overlaps a woman's survey cluster in her marriageable years, she is "treated" by these battle deaths.

4.1.8. *National policies.* Distance to each national border is computed by calculating the minimum distance between a survey cluster and a pixelated border map.

4.1.9. *Child mortaltiy.* Child mortality (under 5) is taken from the World Development Indicators. Because it is only reported every five years, it is interpolated linearly by country. In the Web Appendix, I show that alternative measures taken from the Institute for Health Metrics and Evaluation or computed directly from DHS birth histories give similar results.

For Uganda, "Kigezi" is a dummy for whether the respondent's survey cluster is in Kabale, Kanungu, Kisoro or Rukungiri. In addition to the DHS sample, I use the 1991 Ugandan census, available through IPUMS. Because polygamy is only reported for household heads in the census, I limit my sample to wives of household heads when using these data.

FIGURE 1. Polygamy in Africa



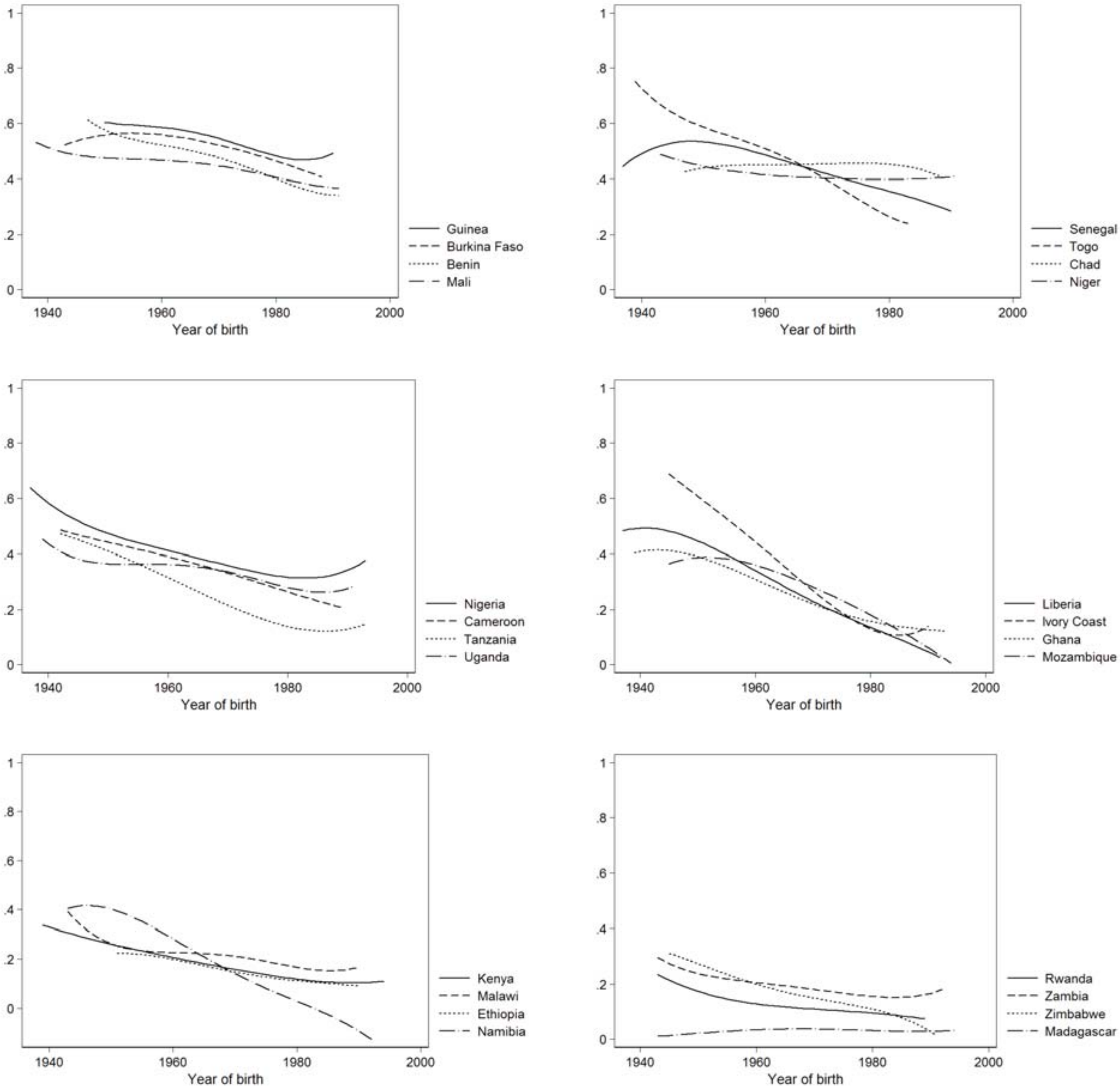
This figure plots polygamy for the women in the sample that have latitude and longitude coordinates. A red dot indicates polygamy, and a blue dot indicates monogamy.

4.2. **Polygamy across space and time.** I map polygamy in Figure 1. Each point is a married woman for whom coordinates are available. Red dots indicate polygamists; blue dots are monogamists. Polygamy is concentrated in West Africa, though a high-intensity belt stretches through to Tanzania. Polygamy in the data is largely bigamy: 72% of respondents report that they are the only wife, 19% report that their husband has two wives, 7% report that he has three wives, and fewer than 2% report that he has 4 wives or more.

I show the decline of polygamy over time in Figure 2. A raw correlation between year of birth and polygamy will confound time trends with age effects, since a young lone wife may later become a polygamist's senior wife. Thus, I estimate the time trend of polygamy for each country with more than one cross-section. I use the regression:

$$polygamous_i = f(age_i) + g(year\ of\ birth_i) + \epsilon_i.$$

FIGURE 2. Predicted polygamy over time for women aged 30, by year of birth



The functions f and g are quartic. I use the estimated coefficients and survey weights to calculate the predicted probability that a woman aged 30 is polygamous as a function of her year of birth. I present these in Figure 2. Though the speed of the decline has differed across countries, its presence has been almost universal. To my knowledge, this is not a trend that has been documented previously.[13]

[13]Because the data do not contain a representative sample of men, I am not able to conduct a similar exercise for men.

5. Results

5.1. **The gender division of labor.** I show in Table 2 that the distribution of polygamy within Africa is inconsistent with Jacoby's (1995) results. The variables that predict female productivity in his sample do not predict polygamy here. Roots and tubers (the equivalent of yams and sweet potatoes) have a negative impact on polygamy. His negative coefficient on maize is not found here.[14]

Polygamy and the historical importance of women in agriculture are negatively correlated. Polygamy is concentrated in the Sahel and Sudan regions where women have been less important in agriculture than in more tropical parts of Africa. Additional controls (in particular, religion), lead this result to become insignificant across countries, though it remains significant within countries. The correlations are moderate; a one standard deviation increase in historic female agriculture reduces polygamy by roughly 3 percentage points in the most conservative specification. To test whether the correlation varies by land scarcity, I include population density and its interaction with historic female agriculture. The interaction is not significant (not reported).

The IV results are larger than the OLS estimates. More severe measurement error in the historic division of labor than in contemporary geographic conditions is one explanation. It is also possible that crop suitability cannot be excluded from the second stage. Indeed, conventional over-identification tests fail on these data. Still, the hypothesis that the gender division of labor in agriculture determines polygamy cannot explain why polygamy is most prevalent in those parts of Africa where female labor in agriculture has historically been least important, even when this is predicted by fixed geographic factors.[15]

Why do my results differ from those of Jacoby (1995)? I show in the Web Appendix that my results hold even within the Ivory Coast. The hypothesis that a greater importance of women in agriculture leads to polygamy ignores general equilibrium effects captured by the model in section 2. In addition, a greater role for women may enhance their ability to negotiate improved marital outcomes.

5.2. **Inequality.** In Table 3, I show that there is no large positive relationship between present-day wealth inequality and polygamy. In the one specification where the correlation is statistically significant, the point estimate is very small. Historic class stratification, by contrast, predicts polygamy today. The geographic predictors of inequality also predict polygamy, further suggesting that the long-term determinants of inequality matter. The wheat-sugar ratio is significant across specifications. Greater intra-regional

[14]With no controls, wheat, roots and tubers, and oil crops positively predict female importance in agriculture, while cereals have a negative effect. With controls, roots and tubers become insignificant and cotton becomes positive. Adding country-round fixed effects makes all correlations insignificant, except oil crops (positive) and sugar (negative).

[15]The first-stage F-statistics are low because I treat all suitability measures as instruments. If I select only those with the most predictive power, the first-stage F-statistics improve without qualitatively changing the results.

differences in land quality predict higher levels of polygamy, though this is not robust to the inclusion of other controls unless country-round fixed-effects are also included.

The magnitudes of the effects vary. A one standard deviation reduction in historical class stratification would raise polygamy by a bit more than 2 percentage points. This is not negligible, but is not large enough to explain a substantial fraction of the variance in polygamy. A one standard deviation movement in the log wheat-sugar ratio is associated with a roughly 3 percentage point reduction in polygamy rates, while the comparable effect for unequal land quality is a bit larger than 2 percentage points without controls.

The data do not make it possible to identify the mechanisms that allow past inequality to better explain polygamy today than present-day inequality. I do not, for example, have data on hypergamy. There are at least two likely explanations. First, the basis of inequality in African societies has changed. Whereas inequality in the past was based largely on "wealth in people" (Guyer, 1993), inequality today depends more on factors such as human capital that are not complemented by polygamy. Supporting this interpretation, Lagerlöf (2010) argues that greater inequality leads to polygamy only in earlier stages of development. Second, institutions and culture are slow to evolve. Other results below confirm the importance of historical variables and the small elasticities of polygamy with respect to present-day shocks.

5.3. **The slave trade.** In Table 4, I find a positive correlation between the slave trade and current-day polygamy. This is true in both individual-level and household-level data. It is more robust when respondents are matched to treatment by location rather than by ethnic group. In the individual-level OLS, a one standard deviation increase in slave exports predicts a 2 percentage point increase in polygamy. The IV results are more than 10 times as large. This is consistent with more severe measurement error in slave exports than in geographic location.

This effect depends, however, on the comparison of West Africa with the rest of the continent. I use Table 4 to show that country fixed effects, controlling for longitude, and separately estimating the effects using only the West African sub-sample do not yield significant positive results. The hypothesis that the slave trade increased polygamy in Africa is supported, but the fineness of the variation that can be used to identify the effect should not be overstated.

5.4. **Female education.** I show in Table 5 that the educational expansions in Nigeria and Zimbabwe do not predict discontinuous drops in polygamy. In the Web Appendix, I show that these results are consistent with the small (though statistically robust) correlation between years of education and polygamy in observational data. I do find a negative effect of schooling in colonial French West Africa on polygamy today in Table 6. A one standard deviation increase in colonial education reduces polygamy by roughly 1 percentage point.[16] While I find that proximity to a historical Catholic mission reduces polygamy today, the similar effect of distance from a protestant mission disappears once country-round or region-round fixed effects are added. A one standard deviation increase in access to a Catholic mission reduces polygamy by roughly 3 percentage points with the tightest fixed effects. I find no evidence that Catholic missions better predict polygamy in colonies of Catholic countries, or where Protestant missions are more distant (not reported).

The lack of an impact for modern education is similar to the finding in Friedman et al. (2011) that educating women does not create "modern" attitudes. The historical results are consistent with the findings in Nunn (2011) that Catholic missions imparted both education and ideologies about the role of women. These results suggest that education only reduces polygamy rates over the long term and in conjunction with other interventions. While colonial schooling was largely performed by missionaries, for whom the sanctity of Christian marriage was an overarching concern (e.g. Chanock (1985)), this is not true of modern education. One limitation of these tests is that all of the interventions here affected both women and men. Whether a transfer of human capital to men will increase or reduce polygamy will depend on whether there is assortive matching and on the relative value men give to the quality versus the quantity of their children (Gould et al., 2008; Siow, 2006).

If historical schools proxy for parental education, it could explain these results. This information is not in the DHS data, and so I use other sources to test whether parental education predicts polygamy. I show in the Web Appendix that mother's education does not predict polygamy in World Bank surveys from Nigeria, Ghana, and the Ivory Coast. Daughters of more educated fathers are less likely to be polygamous in Nigeria and the Ivory Coast, and the negative correlations between own education and polygamy are significant only in the Ivory Coast.

5.5. **Economic growth.** I show in Table 7 that higher levels of GDP per capita during a woman's marriageable years predict that she is less likely to marry a polygamist. The estimated coefficients are, however, small. A 100% increase in GDP per capita would reduce polygamy by roughly 2 percentage points in the unconditional OLS specifications. This rises to roughly 20 points in the IV, which is consistent with the overall poor quality of African national income accounts (Jerven, 2010). If standard errors are clustered by country, the result remains significant at the 5% level in the IV specifications, but is no longer significant in the OLS (not reported). While economic growth has been uneven and halting, most countries in the sample have seen a steady decline in polygamy, even if this has been faster when growth has accelerated.

[16]There is a negative correlation between polygamy today and health workers in the past, but this is not robust to additional controls.

5.6. **Economic shocks.** In Table 7, a positive rainfall shock in a woman's marriageable years predicts that she is less likely to marry polygamously. These effects are small. Raising rainfall by 100% over its normal value would only have a roughly 3 percentage point effect on polygamy.[17] If standard errors are clustered by survey cluster, the result remains significant at the 1% level in both specifications (not reported).

5.7. **War.** In Table 7, war increases polygamy. This is marginally insignificant when measured at the year of marriage, though it is robust when averaged over early adolescence, and becomes larger and more significant if rainfall shocks are also included (see the Web Appendix). If standard errors are clustered by survey cluster, the result remains significant at the 1% level in the ages-12-to-16 specification (not reported). Although I take war as a random shock, I am unable to rule out the possibility that war operates through intermediate channels or that unobserved shocks cause both war and polygamy. The effects are again small. A war with one million battle deaths would, depending on the specification, raise a woman's probability of marrying polygamously by between 25 and 100 percentage points. On average, a woman receives a much smaller shock closer to 7,000 battle deaths in her year of marriage in the event she is affected by a war.

5.8. **National borders.** I report regression discontinuities in Table 8. Most borders do not bring significant discontinuous changes in polygamy rates. Of the seven exceptions, two can be immediately discarded; too few clusters were surveyed near the Benin-Burkina Faso and CAR-DRC borders for the polynomial to be estimated accurately. Similarly, the Cameroon-Nigeria and Niger-Nigeria discontinuities are driven by outliers near the border, and disappear with either a linear or quadratic distance polynomial.

The remaining three breaks are large. There is no obvious mechanism that explains the discontinuities at CAR-Cameroon, Ivory Coast-Liberia, and Malawi-Tanzania borders. While Bubb (2009) finds discontinuities indicating higher levels of education and numeracy in Ghana than in the Ivory Coast, education cannot explain the outcomes. I add years of schooling as a control; this has only a modest effect on the magnitudes (not reported).

5.9. **Child mortality.** The difference-in-difference estimates in Table 7 suggest that the effect of child mortality on polygamy is sizable. These results suggest an elasticity of at least 0.7. The magnitudes are similar if I use alternative estimates from the Institute for Health Metrics and Evaluation, and are roughly 40% as large if I use sub-national region-specific estimates computed from the raw DHS data (see the Web Appendix). Using these DHS-based estimates, the magnitudes are similar using the mortality of

[17]Because rainfall may be mean-reverting, I also allow rainfall to enter separately for each year between ages 12 and 16 (not reported). The coefficients are negative, but significant only at age 16. Interacting these shocks with the gender division of labor shows their effect to be largest where women are most important in agriculture (not reported).

boys or girls (not reported). In a country such as Nigeria, where under-5 mortality has fallen from more than 28% in the early 1960s to roughly 14% today, this is enough to explain a roughly 4 to 10 percentage point drop in polygamy rates over the period. I show in the Web Appendix that this is robust to including GDP per capita as a control. Similarly, this result survives controlling for country-level fertility rates (not reported). If standard errors are clustered by country, the result remains significant at the 5% level in the age-of-marriage specification and the 1% level in the ages-12-to-16 specification (not reported).

The results for Uganda provide suggestive evidence of causation. The DHS data show that women born after the malaria eradication program in the treatment area were roughly 7 percentage points less likely to marry polygamously. The IPUMS data give a smaller effect, equal to less than 1 percentage point, reflecting the lower polygamy rate for wives of household heads in the IPUMS data (11%) than all ever-married women in the DHS (31%).

Several other facts support the interpretation that polygamy is a strategy for men to increase their fertility, which would explain this result. Marriage of older women is rare; 95% of polygamists began their most recent marriage no later than age 27.[18] Interacting child mortality with the wealth index suggests the effect is largest for wealthier households (not reported). In the Web Appendix, I show that first wives whose first child dies are more likely to become polygamists, though I do not find an effect of child gender or twinning. Similarly, Milazzo (2012) has found that desired fertility leads Nigerian men to seek additional wives if their first wives do not have children; see also Wagner and Rieger (2011). I also show in the Web Appendix that controlling for pathogen stress in a sample of pre-industrial societies substantially reduces the unexplained gap between polygamy in Sub-Saharan Africa and the rest of the world.

6. Conclusion

I have tested several influential theories of polygamy, and none have passed cleanly. Polygamy rates in the present are more related to inequality and female education in the past than they are to these variables today. The relative distribution of polygamy in Africa cannot be explained by the traditional gender division of labor. The slave trade remains a plausible explanation. However, this is indistinguishable from the fact that polygamy rates are higher in West Africa. Similarly, national policies appear not to have mattered. While polygamy responds to rainfall shocks and war, the magnitude of these effects is too small to play an important role in polygamy's decline in Africa.

Because the tests I run cannot be synthesized into a single regression, the significant results that I do find are best compared using standardized coefficients. One standard deviation increases in historic inequality or its geographic predictors raise polygamy

[18]The duration of the respondent's current marriage is reported in bins such as "15-19 years." The maximum age at most recent marriage is current age minus the minimum value in this bin.

by 2 to 3 percentage points. Historical schools and missions have similar standardized effects between 1 and 3 percentage points. A one standard deviation reduction in child mortality has a larger effect, a bit over 5 percentage points. The effects of the slave trade and economic growth are less precisely measured; a one standard deviation decrease in slave exports or a 100% increase in economic growth is expected to reduce polygamy between 2 and 20 percentage points, depending on whether OLS or IV estimates are used. While I have uncovered some economically important determinants of polygamy, none of these can explain the bulk of polygamy's prevalence or disappearance.

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Appendix A. Robustness and additional hypotheses

The following robustness checks are detailed in the Web Appendix.

A.1. **Additional summary statistics and observable characteristics by sub-sample.** 1) Observable characteristics of the sample of polygamists differ from those of the sample of non- polygamists. 2) Observable characteristics of the sample for which the historic importance of women in agriculture is missing differ from those of the sample for which it is non-missing. I show similar comparisons for the sub-samples with non-missing historic class stratification and geographic coordinates. 3) I provide summary statistics on the distribution of respondents' husbands' total number of wives, and respondents' ranks as wives.

A.2. **The gender division of labor.** 1) Results are similar when the sample is restricted to societies that earn at least half their subsistence from agriculture. 2) Results are similar when dummies for ecological type are excluded. 3) Results are similar when estimated only on the Ivory Coast.

A.3. **Inequality.** 1) The correlation between country-level inequality in a woman's prime marriageable years and polygamy is small or nonexistent. 2) Results using cluster and region wealth Gini coefficients are similar to the baseline results. 3) A binary indicator of historical class stratification gives similar results to the baseline.

A.4. **Female education.** There is only a small (though robust) correlation between years of schooling and polygamy.

A.5. **Economic growth.** 1) Results are robust to including terms of trade as a control. 2) Results are similar when estimated on the sample of non-migrants.

A.6. **Economic shocks.** Results are similar when estimated on the sample of non-migrants.

A.7. **War.** 1) Results are stronger when rainfall shocks are included. 2) Results are similar when estimated on the sample of non-migrants.

A.8. **Child mortality.** 1) Results are similar when using an alternative measure of child mortality from the Institute for Health Metrics and Evaluation. 2) Results are similar when using an alternative measure of child mortality for sub-national regions computed using the birth histories section of the DHS. 3) Results are similar when estimated on the sample of non-migrants. 4) Results are robust to including log GDP per capita as a control.

A.9. **Other hypotheses not discussed in the text.** I include religion as a control, but do not attempt to explain whether it has a causal impact. I have tested whether additional time-invariant variables predict polygamy using (10). Polygamy and bride price recorded in the *Ethnographic Atlas* both predict polygamy. A quadratic function of historic population density gives an inverse-U pattern. This is consistent with many hypotheses. Baker et al. (2008), for example, argue that inequality is highest at intermediate population densities. The ratio of people to land may also reflect the cost of allocating farms across wives (Goody, 1976).

I have tested whether additional time-varying variables predict polygamy using (11). I have found no impact of urbanization or life expectancy. There is no significant correlation between the rate of population growth in a woman's year of marriage and the probability she is polygamous. Literacy rates are, surprisingly, positive predictors of polygamy. The Vanhanen (2000) index of democracy does not predict polygamy. Like GDP, the Human Development Index predicts less polygamy, though this recently-created index is missing for more than half the sample. The correlation between polygamy and women's labor force participation is negative, but not robust.

There is a negative correlation if population growth is measured over a woman's adolescence. Similarly, higher country-level fertility rates in a woman's year of marriage or averaged over her adolescence predict lower rates of polygamy. Although standard models (e.g. Tertilt (2005)) predict that population growth facilitates polygamy, these results are interpretable if wives and births per wife are substitutes in producing births. Further supporting this interpretation, both maternal mortality and adult female mortality predict greater rates of polygamy.

Table 1. Summary statistics

	Mean	s.d.	Min.	Max.	N
Main controls					
Polygamous	0.28	0.45	0	1	494,157
Age	30.8	8.70	10	64	494,157
Urban	0.30	0.46	0	1	494,157
Year of birth	1,970	10.5	1,937	1,994	494,157
Religion: Animist	0.0071	0.084	0	1	494,157
Religion: Catholic	0.17	0.37	0	1	494,157
Religion: Christian (Other)	0.025	0.16	0	1	494,157
Religion: Missing	0.093	0.29	0	1	494,157
Religion: None	0.044	0.21	0	1	494,157
Religion: Orthodox	0.016	0.12	0	1	494,157
Religion: Other	0.096	0.29	0	1	494,157
Religion: Protestant	0.19	0.39	0	1	494,157
Religion: Spiritual	0.0036	0.060	0	1	494,157
Religion: Traditional	0.025	0.16	0	1	494,157
Religion: Muslim (excluded)	0.34	0.47	0	1	494,157
Ecological zones					
Woodland	0.22	0.42	0	1	301,183
Forest	0.061	0.24	0	1	301,183
Mosaics	0.15	0.35	0	1	301,183
Cropland	0.12	0.33	0	1	301,183
Intensive cropland	0.0011	0.033	0	1	301,183
Wetland	0.0084	0.091	0	1	301,183
Desert/Bare	0.034	0.18	0	1	301,183
Water/Coastal fringe	0.041	0.20	0	1	301,183
Urban	0.0070	0.083	0	1	301,183
Other GIS controls					
Malaria	0.38	0.19	0	0.75	301,183
Elevation	165	10.3	140	195	301,183
Ruggedness	64,300	102,512	0	1.37e+06	301,183
Distance to coast	463	358	0.013	1,771	301,183
Abs. latitude	10.7	5.18	0.0015	28.7	301,183
Crop suitability					
Wheat suit.	0.42	1.05	0	7	298,017
Maize suit.	2.02	1.74	0	7	301,183
Cereals suit.	3.26	1.73	0	7	299,111
Roots and tubers suit.	2.04	1.68	0	7	301,183
Pulses suit.	2.43	1.61	0	7	299,111
Sugar suit.	2.88	1.60	0	7	299,111
Oil suit.	0.83	1.14	0	7	299,111
Cotton suit.	1.64	1.70	0	7	299,127
Rainfed ag. suit.	4.08	2.06	0	7	299,111

	Mean	s.d.	Min.	Max.	N
The gender division of labor					
Historic female agriculture	2.91	0.89	1	5	207,757
Inequality					
Cluster c.v. of wealth index	2.95	39.2	0	3,721	241,709
Region c.v. of wealth index	15.1	148	0.22	3,199	240,656
Historic class stratification	3.20	1.39	1	5	219,474
Log wheat sugar ratio	-1.04	0.68	-2.08	1.61	297,936
Region c.v. of ag. constraints.	0.18	0.064	0	0.39	301,183
The slave trade					
ln(1+Atlantic slaves/Area), by name	0.62	0.99	0	3.66	259,012
Dist. Atlantic ST by name	5,818	1,531	3,694	9,258	259,012
ln(1+Atlantic slaves/Area), by location	0.45	0.84	0	3.77	301,183
Dist. Atlantic ST by location	6,143	1,719	3,702	9,534	301,183
Female education					
Resp. Education Years	3.27	4.06	0	26	493,829
High intensity	0.85	0.36	0	1	35,513
Funds/capita (1953 pop.)	92.3	53.0	1.40	220	35,513
Funds/capita (1976 pop.)	1.77	1.32	0.15	6.19	35,513
Teachers/cap (1925)	0.00046	0.0022	4.3e-06	0.024	103,432
Distance to Catholic Mission (000 km)	0.21	0.20	0.00015	1.17	301,183
Distance to Protestant Mission (000 km)	0.17	0.19	0.00010	1.22	301,183
Economic growth					
Ln GDP per capita: Age of marriage	5.73	0.70	-3.85	9.06	448,195
Ln GDP per capita: Ages 12-16	5.72	0.71	-3.84	8.79	422,763
GPCP Rain: Age of marriage	1,000	437	122	2,588	335,661
CPCP Rain: Ages 12-16	1,014	429	181	2,376	275,863
Economic shocks					
Rainfall shock: Age of marriage	0.95	0.19	0	8.06	252,079
Rainfall shock: Ages 12-16	0.95	0.11	0	2.97	268,381
War					
Battle deaths: Age of marriage (millions)	0.0011	0.0050	0	0.12	300,669
Battle deaths Ages 12-16 (millions)	0.0012	0.0037	0	0.033	300,390
Battle deaths: Age of marriage (nonzero)	0.0072	0.011	0.000020	0.12	47,572
Battle deaths Ages 12-16 (nonzero)	0.0044	0.0063	4.0e-06	0.033	78,118
Child mortality					
Child mortality: Ages of marriage	0.19	0.059	0.054	0.42	474,759
Child mortality: Ages 12-16	0.20	0.058	0.057	0.40	456,573

Table 2. The gender division of labor

	Dependent variable: Polygamous							
Historic female agriculture			-0.065***	-0.032***	-0.091***	-0.035***	-0.145***	-0.200**
			(0.021)	(0.011)	(0.017)	(0.012)	(0.031)	(0.086)
Wheat suit.	-0.070***	-0.003**	-0.064***	-0.005				
	(0.002)	(0.001)	(0.014)	(0.004)				
Maize suit.	0.005**	0.007***	0.019**	0.008**				
	(0.002)	(0.002)	(0.008)	(0.003)				
Cereals suit.	0.021***	-0.004**	-0.006	-0.005*				
	(0.002)	(0.002)	(0.009)	(0.003)				
Roots and tubers suit.	-0.003*	-0.005***	-0.013*	-0.005				
	(0.002)	(0.002)	(0.008)	(0.003)				
Pulses suit.	-0.009***	0.002	-0.002	0.004				
	(0.003)	(0.002)	(0.010)	(0.005)				
Sugar suit.	0.014***	0.009***	0.015*	0.009*				
	(0.002)	(0.002)	(0.008)	(0.004)				
Oil suit.	-0.030***	0.001	0.008	0.002				
	(0.002)	(0.002)	(0.012)	(0.005)				
Cotton suit.	0.004*	0.000	0.006	-0.002				
	(0.002)	(0.002)	(0.006)	(0.004)				
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	IV	IV
Observations	297,959	297,959	139,499	139,499	207,757	140,044	139,499	139,499
Other controls	None	Geo./Ind.	None	Geo./Ind.	None	Geo./Ind.	None	Geo./Ind.
F.E.	None	Cntry-rnd	None	Cntry-rnd	None	Cntry-rnd	None	Cntry-rnd
Clustering	Cluster	Cluster	E.A. Ethnic.	E.A. Ethnic.	E.A. Ethnic.	E.A. Ethnic.	E.A. Ethnic.	E.A. Ethnic.
F test							10.65	1.792
Excluded instrument(s)							Crop. Suit.	Crop. Suit.

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Geographic controls (Geo.) are absolute latitude, suitability for rain-fed agriculture, malaria endemism, ruggedness, elevation, distance to coast, and ecological zone. Individual controls (Ind.) are year of birth, year of birth squared, religious dummies, age, age squared, and urban.

Table 3. Inequality

	Dependent variable: Polygamous						
Cluster wealth c.v.	0.000***	0.000					
	(0.000)	(0.000)					
Region wealth c.v.			-0.000	-0.000			
			(0.000)	(0.000)			
Historic class stratification					0.031***	0.019***	0.012**
					(0.012)	(0.007)	(0.005)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Observations	241,709	168,348	240,656	168,363	219,474	148,789	148,789
Other controls	None	Geo./Ind.	None	Geo./Ind.	None	Geo./Ind.	Geo./Ind.
F.E.	Cntry-rnd	Cntry-rnd	Cntry-rnd	Cntry-rnd	None	None	Cntry-rnd
Clustering	Cluster	Cluster	Region	Region	E.A. Ethnic.	E.A. Ethnic.	E.A. Ethnic.

	Dependent variable: Polygamous					
Log wheat sugar ratio	-0.116***	-0.045***	-0.017***			
	(0.002)	(0.003)	(0.003)			
Region c.v. of ag. constraints.				0.373***	0.002	0.200***
				(0.107)	(0.067)	(0.064)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS
Observations	297,959	297,959	297,959	301,183	299,111	299,111
Other controls	None	Geo./Ind.	Geo./Ind.	None	Geo./Ind.	Geo./Ind.
F.E.	None	None	Cntry-rnd	None	None	Cntry-rnd
Clustering	Cluster	Cluster	Cluster	Region	Region	Region

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Geographic controls (Geo.) are absolute latitude, suitability for rain-fed agriculture, malaria endemism, ruggedness, elevation, distance to coast, and ecological zone. Individual controls (Ind.) are year of birth, year of birth squared, religious dummies, age, age squared, and urban.

Table 4. The slave trade

	Dependent variable: Polygamous										
	Individual recode								*Household recode*		
ln(1+Atl. slaves/Area), by location	0.043***	0.024**	-0.008	0.008	-0.005				0.028**	0.019*	-0.011*
	(0.014)	(0.011)	(0.007)	(0.011)	(0.017)				(0.012)	(0.011)	(0.005)
ln(1+Atl. slaves/Area), by name						0.025*	0.006	-0.001			
						(0.013)	(0.011)	(0.007)			
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Observations	301,183	299,111	299,111	299,111	170,674	259,012	169,262	169,262	291,060	288,871	288,871
Sample	Full	Full	Full	Full	W. Africa	Full	Full	Full	Full	Full	Full
Other controls	None	Geo./Ind.	Geo./Ind.	Longitude	None	None	Geo./Ind.	Geo./Ind.	None	Geo.	Geo.
F.E.	None	None	Cntry-rnd	None	None	None	None	Cntry-rnd	None	None	Cntry-rnd
Clustering	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)
	Dependent variable: Polygamous										
	Individual recode								*Household recode*		
ln(1+Atl. slaves/Area), by location	0.429***	0.360***	-0.068***	-0.107**	-0.075*				0.310***	0.415***	-0.041**
	(0.108)	(0.102)	(0.024)	(0.044)	(0.044)				(0.076)	(0.135)	(0.018)
ln(1+Atl. slaves/Area), by name						0.300***	0.373*	-0.035			
						(0.084)	(0.195)	(0.029)			
Estimator	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
Observations	301,183	299,111	299,111	301,183	170,674	259,012	169,262	169,262	291,060	288,871	288,871
Sample	Full	Full	Full	Full	W. Africa	Full	Full	Full	Full	Full	Full
Other controls	None	Geo./Ind.	Geo./Ind.	Longitude	None	None	Geo./Ind.	Geo./Ind.	None	Geo.	Geo.
F.E.	None	None	Cntry-rnd	None	None	None	None	Cntry-rnd	None	None	Cntry-rnd
Clustering	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)
F test	17.87	16.27	18.18	13.50	9.891	15.35	5.513	13.88	18.90	11.52	17.97
Excluded instrument(s)	ST distance	ST distance	Coast dist.	ST distance	ST distance	ST distance	ST distance	Coast dist.	ST distance	ST distance	Coast dist.

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Geographic controls (Geo.) are absolute latitude, suitability for rain-fed agriculture, malaria endemism, ruggedness, elevation, distance to coast, and ecological zone. Individual controls (Ind.) are year of birth, year of birth squared, religious dummies, age, age squared, and urban.

Table 5. Modern education

	Dep. Var.: Polygamous				*Dep. Var.: Polygamous*	
Born 1970-75 X Intensity	0.048*	0.000	-0.012	14 or below in 1980	-0.008	-0.001
	(0.025)	(0.000)	(0.008)		(0.020)	(0.025)
Born 1970-75	-0.108***	-0.095**	-0.043	Age in 1980	0.002	0.003
	(0.036)	(0.035)	(0.037)		(0.003)	(0.005)
Intensity	-0.004	0.000	-0.019***	(14-Age in 1980)	-0.002	-0.004
	(0.054)	(0.000)	(0.006)	X Below 14 in 1980	(0.004)	(0.008)
Estimator	OLS	OLS	OLS	Estimator	OLS	OLS
Sample	Nigerians b. 1970-75 and 1956-61.			Sample	Zimb. "Full"	Zimb. "Short"
Measure of intensity	High / low	Dollars / 1953 pop.	Dollars / 1976 pop.	Ages in 1980	6 to 22	10 to 20
Observations	9,668	9,668	9,668	Observations	6,367	3,901
Other controls	Osili/Long	Osili/Long	Osili/Long	Other controls	No	No
F.E.	None	None	None	F.E.	None	None
Clustering	1976 State	1976 State	1976 State	Clustering	Robust	Robust

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Osili/Long controls are year of birth, and dummies for the three largest Nigerian ethnic groups (Yoruba, Hausa, Igbo), and the major religions (Muslim, Catholic, Protestant, other Christian, and traditional).

Table 6. Colonial education

	Dependent variable: Polygamous				
Teachers/capita, 1910-1928	-7.227***	-5.175***	-9.197***	-9.195***	-4.166**
	(1.314)	(1.834)	(2.245)	(3.255)	(1.974)
Estimator	OLS	OLS	OLS	OLS	OLS
Sample			French West Africa		
Observations	103,432	103,432	103,432	103,432	103,432
F.E.	None	None	None	None	None
Other controls	None	Attractiveness	Conquest	Precolonial	H-Geographic
Clustering	District 1925	District 1925	District 1925	District 1925	District 1925

	Dependent variable: Polygamous			
Distance to Catholic mission	0.191***	0.064***	0.052***	0.156***
	(0.010)	(0.009)	(0.014)	(0.025)
Estimator	OLS	OLS	OLS	OLS
Observations	301,183	299,111	299,111	299,111
Other controls	None	Geo./Ind.	Geo./Ind.	Ind.
F.E.	None	None	Cntry-rnd	Region
Clustering	Cluster	Cluster	Cluster	Cluster

	Dependent variable: Polygamous			
Distance to Protestant mission	0.233***	-0.003	-0.087***	0.015
	(0.011)	(0.010)	(0.012)	(0.025)
Estimator	OLS	OLS	OLS	OLS
Observations	301,183	299,111	299,111	299,111
Other controls	None	Geo./Ind.	Geo./Ind.	Ind.
F.E.	None	None	Cntry-rnd	Region
Clustering	Cluster	Cluster	Cluster	Cluster

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Geographic controls (Geo.) are absolute latitude, suitability for rain-fed agriculture, malaria endemism, ruggedness, elevation, distance to coast, and ecological zone. Individual controls (Ind.) are year of birth, year of birth squared, religious dummies, age, age squared, and urban. Attractiveness controls are trade taxes in 1914. Conquest controls are date of conquest, length of resistence and its square, and indemnities in 1910. Precolonial controls are the presence of an ancient state, the presence of a European trade counter, and 1925 population density. H-Geographic controls are latitude, longitude, altitude, dummies for the river and coast, and average rainfall from 1915 to 1975.

Table 7. Time-varying determinants of polygamy

	Dependent variable: Polygamous				
Shock	*Ln(GDP per capita)*		*Rainfall*	*Battle deaths*	*Child mort. (WDI)*
Shock at age of marriage	-0.015***	-0.201***	-0.025***	0.238	0.736***
	(0.004)	(0.074)	(0.004)	(0.153)	(0.074)
Estimator	OLS	IV	OLS	OLS	OLS
Observations	448,195	318,119	252,079	300,669	474,759
Other controls	Individual	Individual	Individual	Individual	Individual
FE	Y.O.M./Cluster	Y.O.M./Cluster	Y.O.M./Cluster	Y.O.M./Cluster	Y.O.M./Cluster
Clustering	Country x Y.O.M.	Country x Y.O.M.	Cluster x Y.O.M.	Cluster x Y.O.M.	Country x Y.O.M.
F test		8.855			
Excluded instrument(s)		GPCP Rainfall			
	Dependent variable: Polygamous				
Shock	*Ln(GDP per capita)*		*Rainfall*	*Battle deaths*	*Child mort. (WDI)*
Shock over ages 12-16	-0.014***	-0.257**	-0.040***	1.088***	0.987***
	(0.005)	(0.119)	(0.008)	(0.220)	(0.083)
Estimator	OLS	IV	OLS	OLS	OLS
Observations	422,763	253,662	268,381	300,390	456,573
Other controls	Religion	Religion	Religion	Religion	Religion
FE	Y.O.B./Cluster	Y.O.B./Cluster	Y.O.B./Cluster	Y.O.B./Cluster	Y.O.B./Cluster
Clustering	Country x Y.O.M.	Country x Y.O.M.	Cluster x Y.O.M.	Cluster x Y.O.M.	Country x Y.O.M.
F test		6.265			
Excluded instrument(s)		GPCP Rainfall			

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Geographic controls (Geo.) are absolute latitude, suitability for rain-fed agriculture, malaria endemism, ruggedness, elevation, distance to coast, and ecological zone. Individual controls (Ind.) are year of birth, year of birth squared, religious dummies, age, age squared, and urban.

Table 8. National borders

	Benin and Burkina Faso	*Benin and Niger*	*Benin and Nigeria*	*Benin and Togo*	*Burkina Faso and Ghana*	*Burkina Faso and Ivory Coast*	*Burkina Faso and Niger*	*Burkina Faso and Mali*	*Burkina Faso and Togo*	*CAR and Cameroon*	*CAR and DRC*	*Cameroon and Nigeria*	*DRC and Rwanda*
Border	0.867*	0.092	0.051	0.029	0.067	0.089	0.082	-0.023	0.048	0.189*	-0.726*	-0.201**	0.000
	(0.444)	(0.086)	(0.148)	(0.053)	(0.075)	(0.143)	(0.115)	(0.076)	(0.116)	(0.095)	(0.396)	(0.095)	(0.000)
Obs	1,605	1,375	9,217	14,855	5,503	1,803	3,857	11,148	2,603	1,255	1,924	7,198	5,359
	DRC and Tanzania	*DRC and Uganda*	*DRC and Zambia*	*Ethiopia and Kenya*	*Ghana and Ivory Coast*	*Ghana and Togo*	*Guinea and Ivory Coast*	*Guinea and Liberia*	*Guinea and Mali*	*Guinea and Senegal*	*Ivory Coast and Liberia*	*Ivory Coast and Mali*	*Kenya and Tanzania*
Border	-4.381	-0.134	-0.033	0.135	-0.049	-0.009	0.095	-0.006	0.144	-0.169	-0.130**	0.243	0.106
	(8.703)	(0.174)	(0.043)	(0.138)	(0.077)	(0.041)	(0.408)	(0.070)	(0.118)	(0.186)	(0.059)	(0.150)	(0.142)
Obs	887	3,210	1,665	470	3,957	11,518	2,145	4,458	4,628	2,126	4,000	3,380	4,639
	Kenya and Uganda	*Malawi and Mozambique*	*Malawi and Tanzania*	*Malawi and Zambia*	*Mali and Niger*	*Mali and Senegal*	*Mozambique and Tanzania*	*Mozambique and Zambia*	*Mozambique and Zimbabwe*	*Niger and Nigeria*	*Rwanda and Tanzania*	*Rwanda and Uganda*	*Zambia and Zimbabwe*
Border	-0.099	0.040	0.158***	-0.000	0.301	0.093	-4.497	0.000	-0.106	-0.125**	0.026	-0.043	0.049
	(0.085)	(0.061)	(0.060)	(0.064)	(0.213)	(0.096)	(2.932)	(0.000)	(0.210)	(0.061)	(0.066)	(0.043)	(0.110)
Obs	3,793	16,673	2,919	7,019	887	2,208	1,592	574	2,885	12,252	4,064	5,284	1,629

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. All regressions are OLS, with polygyny as the dependent variable and standard errors clustered at the survey cluster level. Other controls are a cubic in distance to the border, interacted with a country dummy, year of birth, year of birth squared, religious dummies, age, age squared, and urban. The coefficient reflects the jump from moving to the alphabetically prior country.

Table 9. Malaria eradication in Uganda

	Dependent variable: Polygamous	
	DHS	*IPUMS*
Kigezi X Post (birth)	-0.074**	-0.007**
	(0.035)	(0.003)
Estimator	OLS	OLS
Observations	8,740	182,553
Other controls	Rel/Urb/Eth	Rel/Urb/Eth
F.E.	Y.O.B./Dist.	Y.O.B./Dist.
Clustering	District	District

Notes: *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Sample only includes Uganda. Rel/Urb/Eth signifies controls for religion, urban, and ethnicity.