AFRICAN POLYGAMY: PAST AND PRESENT

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ABSTRACT. 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, historical inequality better predicts polygamy today than does current inequality. Third, the slave trade predicts polygamy, but only 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.

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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 of 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 a similar erosion of polygamy. This is an 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.

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[1] I deal only with polygyny in this paper, ignoring polyandry. I use the term "polygamy" since it 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.

In this paper, 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. Each of these are motivated by previous theories and empirical findings from economics, anthropology, and African history. These hypotheses test whether the institution of polygamy responds to economic incentives, economic shocks, and the general 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. By contrast, I find that historical indicators of inequality on the eve of colonial rule taken from the *Ethnographic Atlas* predict 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. My approach differs from theirs in several ways – I take women as the unit of observation rather than men, I include Angola (a low-polygamy country that was the hardest hit by the Atlantic slave trade), and I take locations rather than ethnic groups as the unit of treatment. I show, however, that the result depends on a broad comparison of West Africa to the rest of the continent.[4]

Fourth, I replicate 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 (2009) 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 generally have not. Finally, I use national-level differences in differences to test for an effect of falling child mortality. The magnitudes I find are large enough to explain a large decline in polygamy in several African countries.

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

Taken as a whole, I find, first, that existing theories of polygamy face challenges in explaining Africa. Polygamy within Africa is, simply, hard to predict. 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. 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.

Because of this diversity of hypotheses, I contribute to a range of literatures. The two most general literatures concern the economics of institutions and the economics of marriage. Existing findings have confirmed the importance of institutions such as land rights (Goldstein and Udry, 2008), slavery (Sacerdote, 2005), pre-colonial states (Michalopoulos and Papaioannou, 2011), and colonial legal forms (La Porta et al., 1997) for modern development. Empirical studies have linked these institutions to biogeographical endowments such as settler mortality (Acemoglu et al., 2001), suitability for specific crops (Engerman and Sokoloff, 1997), ecological diversity (Fenske, 2010), and population density (Acemoglu et al., 2002). By testing whether geographic determinants of inequality and the gender division of labor continue to predict the institution of polygamy today, I add to our understanding of how geography shapes institutions. Further, it has been suggested that institutions adapt to the needs of the market (Burness and Quirk, 1979; Greif, 1993). I show the extent to which polygamy rates are responsive to economic shocks.

Economists since at least Becker (1973) have been interested in the operation of marriage markets. Much of this work has focused on marital institutions in the developing world. These contributions have focused on the implications of marital arrangements for outcomes such as income smoothing (Rosenzweig and Stark, 1989), female schooling (Field and Ambrus, 2008), sex selection (Sen, 1990), and child health (Bharadwaj and Nelson, 2010). I uncover a dramatic transition in African marriage markets, and assess some of the most plausible hypotheses for this change. I also touch on a variety of other literatures, including the importance of inequality for economic development (Easterly, 2007; Putterman and Weil, 2010), the economic implications of the gender division of labor (Alesina et al., 2011; Qian, 2008), the long run impacts of the slave trade (Nunn, 2008), the microeconomic effects of war (Annan and Blattman, 2010; Blattman and Miguel, 2010), the ability of poor households to cope with economic shocks (Townsend, 1994), and the weak capacity of African states (Collier and Gunning, 1999).

In section 2, I outline the hypotheses that I test. 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 of these tests in section 5. Additional robustness checks are reported in the Web Appendix. Section 6 concludes.[5]

2. HYPOTHESES

In this section I motivate and explain the nine hypotheses that I test.

2.1. **The gender division of labor.** That polygamy might be a consequence of greater relative female importance in different types of agriculture is a familiar hypothesis for economists. Jacoby (1995), for example, shows that the demand for wives is greatest in those parts of the Ivory Coast where female productivity in agriculture is highest. In particular, he finds positive effects of cluster-level cultivation of yams/sweet potatoes, rice, plantains/bananas, and peanuts on female labor productivity. He finds a negative effect for maize, and insignificant effects of coffee, cassava, cotton, vegetables, and "other." He finds that female labor productivity predicted by these crops increases the demand for wives. He takes inspiration from Boserup (1970), who links polygamy to the sexual division of labor in hoe agriculture; women in a bush fallow system play a greater role in agriculture than elsewhere. Unlike Jacoby (1995), I have a data-set that spans most of sub-Saharan Africa, and exogenous measures of geographic suitability for cultivating specific crops. I contrast the coefficients on these with his findings. In addition, I have a measure of the historic importance of women in agriculture.[6]

2.2. **Inequality.** The most familiar explanation of polygamy for economists is that it is due to inequality between men. An early proponent of this view is Becker (1974), who argues that differences in male productivity can make polygamy efficient. 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 of sisters that can be traded for wives. This effect is tempered, however, by the self-interest of the elite; Lagerlöf (2010) suggests that a self-interested ruler may impose monogamy to prevent his own overthrow by lesser men deprived of wives. In Europe, the early Church may have helped create

[5]Though I have tried to be as comprehensive as possible, testing the most influential theories in the literature about the determinants of polygamy, I am constrained by space and data availability to ignore some plausible explanations of polygamy and its decline. I do not address whether exogenous changes in fertility or sex ratios influence polygamy. I include religion as a control, but do not attempt to explain whether it has a causal impact except insofar as I address the long-run impacts of historical missions. Further, it would be impossible in these data to construct a synthesis in which I test all nine hypotheses simultaneously. Many of the variables I use are only available for non-overlapping sub-samples of the data. Further, the econometric specifications that I use to test for the impacts of time-invariant variables, time varying variables, border discontinuities, and natural experiments cannot be combined into a single equation. This also prevents me from decomposing variation in the sample into separate components explained by trends, shocks, and geography.

[6]An alternative view of the importance of subsistence technology, which I do not test, comes from Adshade and Kaiser (2008). They argue that polygamy is less common in societies that practice mixed farming, because livestock increase the presence of pair-bonding hormones.

these constraints. Grossbard (1976) was one of the first to provide empirical support for a link between male income differences and polygamy.

2.3. **The slave trade.** That the slave trade may have increased polygamy in Africa is an old argument – see Thornton (1983). This may have operated through several mechanisms. First, the Atlantic slave trade removed more men than women from the affected areas of the continent. Second, the slave trade increased inequality between those who profited from the trade and those who suffered from it. Third, by creating movable wealth in the form of slaves and imported monies, the slave trade may have facilitated a transition from matrilocal to patrilocal marriage, allowing for non-sororal polygamy to exist (Schneider, 1981). Whatley and Gillezeau (2010) have shown that there is a correlation between slaves taken from points along the coast and the degree of polygamy among coastal groups recorded in the *Ethnographic Atlas*. Dalton and Leung (2011) have used DHS data to find a correlation that is robust to the instrumental variables strategy used by Nunn (2008) – predicting slave exports using distance from new world ports. I confirm their result using different methods. They use a man's number of wives as a dependent variable, while I take women as the unit of observation. They match DHS data to the ethnicity-level slave trade estimates in Nunn and Wantchekon (2011) using respondents' ethnic groups. I do this *and* use geographic coordinates to make an alternative matching to these slave estimates. I also show that their results are robust to adding Angola, which exported more slaves than any other African country, but has low polygamy rates today. I add the caveat, however, that the slave trade cannot predict differences in polygamy rates within West Africa.

2.4. **Female education.** It is intuitive that empowering women through education may encourage them to avoid polygamous marriage. Over and above this effect, Gould et al. (2008) suggest that parents' quantity-quality tradeoff in child-rearing links female education to polygamy. If child quality matters, a rich man may prefer to spend his money on purchasing one educated wife, rather than several uneducated ones. The expansion of female schooling from the late colonial period until the 1980s was dramatic across much of Africa (Schultz, 1999). Though the data do not make it possible to test whether a woman's parents' education reduces the probability she enters a polygamous marriage, I am able to test whether a woman's own exposure to schooling has played a role in the decline of polygamy in Africa.

2.5. **Economic growth.** The decline of polygamy in Africa has coincided with a period of fitful economic growth. If polygamy simply a condition of poverty, it should be disappearing most rapidly in the countries that have grown most robustly. Further, rising incomes may induce a shift in parental efforts away from the quantity to the quality of children (Galor and Weil, 2000). Following the logic of Gould et al. (2008), this would lower the demand for multiple wives.

2.6. **Economic shocks.** I test whether rainfall shocks at the survey cluster level predict whether a woman will marry polygamously. These shocks operate on both the supply and demand side of the marriage markets. Since many African societies pay bride price rather than dowry, an income-reducing rainfall shock may encourage a girl's parents to marry her to a worse man than they otherwise would, in order to smooth consumption. Even in the absence of bride price, this may allow her parents to remove a dependant from the household or to gain ties with another household able to offer income support. Further, since polygamist men tend be wealthier, they are better able to buy a wife in a year when the local economy is depressed.

2.7. **War.** Warfare might increase polygamy through several mechanisms. The most obvious is the sex ratio. Becker (1974) gives, as an example, a nineteenth-century war that killed most 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,[7] while the OECD has made similar claims about Angola.[8] In addition to war's effect on the gender ratio, conflict is expected to act like a negative rainfall shock, encouraging families to marry their daughters to polygamists for cash and protection. Historically, warfare has existed as a means for capturing women from neighboring ethnic groups (White and Burton, 1988). Has the changing incidence of war in Africa in the last five decades (e.g. Blattman and Miguel (2010)) contributed to the speed of polygamy's decline?

2.8. **National policies.** Polygamy was banned by law in the Ivory Coast in 1964, but polygamy has continued to be widespread in that country into the present. Despite the apparent failure of similar bans in other countries, it is possible that other policies and initiatives that vary at the national level may have affected polygamy on the ground. These could include democratization, the legal status of women, or the provision of health and education. I use a regression discontinuity design to test whether polygamy rates break at the borders in my sample. Other border studies for Africa (Cogneau et al., 2010; Cogneau and Moradi, 2011) have found that government investments such as education and health have effects that change discontinuously across national borders. Similarly, imported institutions such as local government can have long-lasting border effects, even after the border disappears (Berger, 2009). By contrast, indigenous institutions such as the sale and rental of land tend to vary continuously across national borders (Bubb, 2009).

2.9. **Child mortality.** Hypothetically, a man's completed fertility is limited only by his number of wives, each of whom can only give birth a certain number of times in her lifetime. 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 level of surviving children. Though this effect is offset

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

by the fact that each wife is now more effective at producing children, the net effect can be observed by testing responses to changes in the environment for child mortality.

3. Tests

In this section, I describe the econometric tests that I use to evaluate the above hypotheses. These 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 of the hypotheses I test concern the effects of time-invariant variables on whether or not women are polygamous. The degree of historical inequality, for example, does not change over time within my sample. For hypotheses of this type, my basic regression specification is:

$$polygamous_i = z_i' \quad + x_i' \quad + \quad {}_{CR} + \quad {}_i. \tag{1}$$

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 suitability for growing certain crops. x_i is a vector of individual and geographic controls. ${}_{CR}$ is a country-round fixed effect. ${}_i$ is error. Throughout, standard errors are clustered at the level at which the variables of interest (z_i) vary. I use ordinary least squares (OLS) to estimate (1). Where I have instruments for z_i, I also use instrumental variables (IV).

The variables that are available to include in x_i differ across the 90 DHS data sets that I compile together here, and so I use only a small set of individual-level controls. These are: year of birth, year of birth squared, age, age squared, dummies for religion, and a dummy for urban residence. I am able to include both year of birth and age because the various DHS surveys were conducted in several different years.

I include geographic controls in x_i, to capture other environmental determinants of polygamy that may be correlated with my variables of interest. 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.*

When I test for the importance of the historic gender division of labor in agriculture, I estimate (1) with two separate measures of z_i. The first is an ethnographic measure of the historic degree of female participation in agriculture. The second is a set of measures of 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 assumption justifying this exclusion restriction is that, over and above the suitability of an area for agriculture in general, the relative productivity of different crop types to each other influences polygamy only

through the gender division of labor in agriculture and is not correlated with other unobserved determinants of polygamy. 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.[9] I compute this within both survey clusters and sub-national regions. Because the wealth measures from the raw data are normalized for each country-round, these results are only interpretable when country-round fixed effects are included. In addition, I test for the importance of historic class stratification, a measure of historical inequality.

I also replace z_i with geographic variables that have been used in other studies as predictors of inequality. These are the log ratio of wheat to sugar suitability and heterogeneity in land quality. The log ratio of wheat to sugar suitability has been shown by Easterly (2007) to predict inequality across countries. The mechanism behind this was proposed by Engerman and Sokoloff (1997), who contrasted the sugar-growing regions of Latin America with the wheat-growing regions of North America. Sugar production was dependent slave labor, while wheat production was more amenable to family farms. The long-run result was more pronounced inequality in regions that grew sugar. Easterly (2007) finds that this measure predicts inequality even outside the Americas. Heterogeneity in land quality is a more intuitive predictor of inequality; when there is more heterogeneity within a region in the ability to produce income, then there should be more unequal outcomes within that region. Michalopoulos et al. (2010) have used this as a predictor of natural inequality in explaining the rise of Islam.

I have attempted to use these geographic measures as instruments for the contemporary and historical inequality measures, but the first stage F statistics are generally too weak to permit this. I can, then, only offer a guarded interpretation. I find that historical inequality or related unobservable variables that are also correlated with long-run differences in ethnic institutions predict polygamy today.[10]

3.1.3. *The slave trade.* When testing for the importance of historical exposure to the slave trade, I use measures of ethnicity-level slave exports in z_i. Standard errors are, then, clustered at the ethnic-group level. I also 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 instrument for slave exports using distance from the coast when country-round fixed effects are included.

To demonstrate that the significant results I find are dependent on a broad comparison of West Africa and the rest of the continent, I show that including longitude in x_i

[9]I show in the Web Appendix that the results are similar if a Gini coefficient is used.
[10]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.

eliminates the effect, as does re-estimating this regression on the sub-sample of West African countries.[11]

Because my main data source and that of Dalton and Leung (2011) both exclude Angola (since the polygamy question was not asked), I assemble an alternative data series using the "household recode" portion of the DHS survey. Here, the unit of observation is the household, and I code each household as polygamous if there is more than one woman listed in the household roster who is stated to be the wife of the household head. I discard households with no wives. These data do not include information on year of birth, urban status, or ethnicity, and so I am only able to estimate the main equation with geographic controls. Standard errors are again clustered at the ethnic group level.

3.1.4. *(Colonial) female education.* I investigate whether colonial investments in female education affect polygamy today. First, I adopt the historical approach of Huillery (2009) for French West Africa. I 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. Rather than the standard controls, I modify x_i so that it matches her methods 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. Following Huillery (2009), 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, but not all at once. Standard errors are clustered by 1925 district.

Second, I follow an exercise similar to Nunn (2010), and test whether the presence of a colonial mission lowers polygamy rates today. I include distance from a Catholic or Protestant mission in 1924 in z_i. Since most colonial education was conducted through missions, this will capture the combined effects of schooling and religious evangelism. Standard errors are clustered by survey cluster. Instruments are not available for either teachers in colonial French West Africa, or missions in Africa as a whole. It is not possible, then, to interpret these estimates as strictly causal; it may be that colonial-era schooling does not matter, but rather that the unobservable characteristics of certain places determined both outcomes. Despite this weakness, the significant estimates reported below are consistent with the importance of long-run factors in contemporary polygamy. That the results differ between Catholic and Protestant missions suggests that the effect does indeed operate through religious instruction. To test for an effect of modern schooling, I am able to exploit two different natural experiments, which I describe below.

3.2. **Time-varying causes of polygamy.** I am also concerned with whether polygamy is determined by variables that change over time. The data do not come as a panel, but are instead cross sections of women born in different years. For some countries,

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

multiple cross sections were collected 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. For hypotheses of this type, my basic regression specification is:

$$polygamous_i = z_i' \quad + x_i' \quad + \quad_j + \quad_t + \quad_i. \tag{2}$$

The variables $polygamous_i$, x_i, and $\ _i$ are the same as above. z_i now measures a woman's exposure to a shock around the time she is most marriageable. For all hypotheses, I measure the shock at the woman's age of marriage and, because this is potentially endogenous, averaged over her early adolescence (ages 12 to 16). $\ _j$ is a fixed effect for the woman's survey cluster. $\ _t$ is a fixed effect for the time the respondent became marriageable – 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. In these specifications, I am comparing women across cohorts in the same survey cluster in order to identify .

Because $\ _j$ is collinear with the geographic control variables and the urban dummy, these are no longer included in x_i. $\ _t$ is collinear with year of birth and the combination of $\ _t$ and $\ _j$ are collinear with age when the shock is averaged over a woman's adolescence. In that specification, these quadratics are not included in the controls. Thus, x_i only contains dummies for religion. I use ordinary least squares (OLS) to estimate (2). Where I have instruments for z_i, I also use instrumental variables (IV). Because the data are at the individual level and come as unbalanced repeated cross sections, I am not able to include lagged dependent variables. Standard errors are again clustered at the level at which z_i varies.

3.2.1. *Economic growth.* When testing for the importance of economic growth, I include the log of GDP per capita in z_t. Standard errors are clustered by country × year of marriage when this is measured at year of marriage, and country × year of birth when it is measured over her early adolescence. To test for a causal relationship, 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. These rainfall measures are taken by year, or averaged over early adolescence. Though I find a causal effect, I do not interpret it. GDP is too coarse an indicator to explain any underlying mechanism by which economic growth erodes polygamy.

3.2.2. *Economic shocks.* I include rainfall shocks in the woman's survey cluster in z_t. Standard errors are clustered by cluster × year of marriage when these shocks are measured at the year of marriage, and cluster × year of birth when they are averaged over her adolescence.

3.2.3. *War.* I test for the importance of war by including the number of battle-related deaths in a conflict whose spatial extent includes a woman's survey cluster in z_t. Though the data do not include civilian casualties, I take the number of combat deaths as a proxy

for the intensity of the conflict. I show that the result is robust to including local rainfall shocks in the Web Appendix. Standard errors are clustered by cluster × year of marriage when these shocks are measured at the year of marriage, and cluster × year of birth when they are averaged over her early adolescence.

3.2.4. *Child mortality.* In testing for a role of declining child mortality, include (separately) country-level and sub-national measures of child mortality in z_t. I use under-5 mortality to measure child mortality. Standard errors are clustered by country × year of marriage when this is measured at age of marriage, and country × year of birth when it is averaged over a woman's adolescence.

There exists, however, a literature suggesting that polygamy may cause greater child mortality (e.g. Strassmann (1997)). Similarly, if polygamy became more costly, men might respond by investing more in the survival of their children. The reverse causation that would explain the results that I find, however, must be more subtle than this, because child mortality is measured at the time these women are married. The declines in child mortality that I measure precede their fertility decisions. My causal identification, then, rests on the assumption that there are not other unobserved factors whose changes over time within a country are correlated with both child mortality and the decline in polygamy. I also exploit a natural experiment in malaria eradication, described below.[12]

3.3. **National policies: regression discontinuities.** To test whether national policies have had an effect on polygamy, I investigate whether polygamy breaks discontinuously over national borders. For each neighboring set of countries in the data, I select all clusters that are within 100 km of the border and estimate:

$$polygamy_i = {}_0 + {}_1 Country_i + f(Distance_i) + Country_i \times f(Distance_i) + x_i' \quad + {}_i \tag{3}$$

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 smooth spatial polynomial in each of these tests, I exclude the geographic controls from x_i. I cluster standard errors by survey cluster.

3.4. **Female education and child mortality: natural experiments.** I exploit two natural experiments to test for the importance of female education, one from Nigeria and the other from Zimbabwe. To test for the importance of child mortality, I make use of a third natural experiment from Uganda.

[12] I have explored a variety of instrumental variable strategies, using measures of health-care supply such as physicians per capita and government health spending as instruments. I have not found any that have 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 that only affected certain states. Osili and Long (2008) use this to test whether female schooling reduces fertility. I follow their approach, and use OLS to estimate:

$$\begin{aligned} polygamy_i = & \quad \textit{Born 1970-75 X Intensity}_i \\ & + \quad Intensity_i + \quad \textit{Born 1970-75} + x_i' \quad + \quad _i \end{aligned}$$

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 are chosen to 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. The treatment effect is the coefficient . Since the measures of program intensity that I use differ only at the level of states in 1976, standard errors are also clustered at this level.

3.4.2. *The end of white rule in Zimbabwe.* At the end of white rule, Zimbabwe dramatically increased access to secondary schooling. This created a discontinuous increase in educational attainment for students who were 14 years old in 1980. Agüero and Ramachandran (2010) use this break to test for intergenerational effects of this education shock, while Agüero and Bharadwaj (2011) examine the impacts on knowledge of HIV. Following their approach, I use OLS to estimate:

$$\begin{aligned} polygamy_i = & \quad \textit{Age 14 or below in 1980}_i + \quad \textit{Age in 1980}_i \\ & + \quad \textit{(14-Age in 1980) X (Age 14 or below in 1980)} + \quad _i \end{aligned}$$

Following 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. Here measures the program's discontinuous effect on women aged 14 in 1980.

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:

$$polygamy_i = \quad Post_i \times Kigezi_i + x_i' \quad + \quad _j + \quad _t + \quad _i$$

Here, *Post*$_i$ measures whether the respondent was born in 1960 or later, *Kigezi*$_i$ is a dummy for the treated region. $_j$ is a district fixed effect, and $_t$ 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 difficulties with this approach. 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 may have had other effects over and above a reduction in the mortality of a woman's potential children; Barofsky et al. (2011), for example, use the experiment to test for educational effects. The results, then, can only provide indirect support for the effect of a reduction in child mortality.

4. DATA

4.1. **Dependent variables and controls.** The principal dependent variable that I use is an indicator for polygamy. This is taken from the "individual recode" sections of 90 separate DHS surveys conducted between 1986 and 2009, collected from 34 sub-Saharan countries. These are cross-sections repeated at irregular intervals, collected from nationally representative samples of ever-married women of childbearing age. These data are at the individual level. For some of these surveys, data were also collected on the latitude and longitude coordinates of the woman's survey cluster. From these surveys, 494,157 observations are available in which an ever-married woman's polygamy status, year of birth, and urban residence are known. Latitude and longitude data are known for 301,183 of these observations. The standard individual controls that I use (year of birth, year of birth squared, age, age squared, dummies for religion, and a dummy for urban residence) are all taken directly from these DHS surveys.

The standard geographic controls that I include in most specifications are collected using raster data from several other 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. The measure of elevation is an index that ranges from 0 to 255, taken from the North American Cartographic Information Society. Malaria endemism is taken from the Malaria Atlas Project, and ranges from 0 to 1. Ruggedness is the Terrain Ruggedness Index used by Nunn and Puga (2011), which ranges from 0 to 1,368,318 in my sample. Absolute latitude is computed directly from the cluster's coordinates, as is distance from the coast.

Unfortunately, the women in the sub-sample of the data for which geographic coordinates are available differ from the full set of data. They were generally born and married later, and are slightly more polygamous (see the Web Appendix). Though this is not ideal, it will only influence the estimation results if there are substantially heterogeneous treatment effects of the variables of interest. The other variables that I use are specific to each hypothesis. I introduce these below. Summary statistics are given in

Table 1. Each of these data sources are described in detail in the Web Appendix. Because these variables come from multiple sources, sample sizes generally differ across columns in the regression tables. Geographic controls are only available for observations with geographic coordinates, while measures of the different variables of interest are each available only for certain subsets of the data.

4.1.1. *The gender division of labor.* The suitability measures that I use for specific crops are all scores between 0 and 7, published by the FAO-GAEZ project. 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 economically important in the countries in the data. These accounted in the year 2000 for 83% of the value of crop production in Zambia, 91% in Namibia, and 72% in Burkina Faso, for example (faostat.fao.org).

The measure I use of the historic degree of female participation in agriculture is from the *Ethnographic Atlas* of Murdock (1967). This database records institutions at the ethnicity level for 1,267 societies from around the world at the time of European contact. These are joined to the DHS data using the name of the respondent's ethnic group. Slightly 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 is statistically different along other observable dimensions, though the magnitudes of these differences are small (see the Web Appendix). The variable "historic female agriculture" assigns each ethnic group a score between 1 and 5 indicating the degree to which female labor was important relative to male labor in agriculture, roughly at the time of European contact.

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 ownership of durable goods. It varies at the level of the household. I compute both coefficients of variation and Gini coefficients from these data, measuring inequality across households within the survey cluster. I am compelled to use inter-household inequality, since individual-level wealth is not available. I also compute these within each sub-national region, a unit roughly equivalent to a province or state. The definitions of these regions are specific to each survey, and so they will differ across surveys from the same country.

To measure historic inequality, I take "historic class stratification" from the *Ethnographic Atlas.* This is a score between 1 and 5 describing the degree to which class differences were present before colonial rule. This varies by ethnic group. This sample is similar in its characteristics to the sample for which the historic gender division of labor in agriculture is available.

The log ratio of wheat to sugar suitability is computed directly from the FAO-GAEZ data, described above. Heterogeneity in land quality is measured as 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 on rain-fed agriculture. It is published by the FAO-GAEZ project.

4.1.3. *The slave trade.* I match the women in the sample to the ethnicity-level slave trade estimates from Nunn and Wantchekon (2011) using self-reported ethnicity. The estimates in Nunn and Wantchekon (2011) are reported in a map of ethnic groups, allowing me to use respondents' geographic coordinates to join them to these measures of slave trade intensity over space. I use this for two reasons. First, since it is easier to measure the slave trade across space than across ethnicities, this will reduce measurement error. Second, it is possible that the long-run effects of the slave trade have worked through its effects on institutions that vary by location, rather than on institutions that vary 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.* Each respondent's number of years of schooling is readily available in the raw DHS data. I take three measures of the intensity of Nigeria's school building program from the text of Osili and Long (2008). These are: a dummy variable for a "high intensity" state, school-building funds in 1976 divided by the 1953 census population estimates, and school-building funds normalized by 1976 population projections based on the (unreliable) 1963 census. I match survey clusters to the old states using their latitude and longitude coordinates. Since the 1999 DHS data for Nigeria do not have geographic data, I do not use this wave of the DHS in this test. The variables measuring age in 1980 that are needed to investigate the Zimbabwean education reform are easily computed from the raw DHS data.

Teachers per capita and other controls from colonial French West Africa were collected by Huillery (2009), and are available on her website. The only control for attractiveness of the district to the French is trade taxes per capita in 1914. Conditions of conquest are year of conquest, duration of resistance and its square, and indemnities charged. Pre-colonial controls are a dummy for a centralized political power, a European trade counter, and 1910 population density. Geographic controls are latitude, longitude, altitude, dummies for the river and coast, and average rainfall from 1915 to 1975. Because population is not available every year, the denominator for the per capita measures is always population in 1925. The data on colonial missions, collected by Nunn (2010), are available on his website. These were originally mapped in Roome (1924). Distance to these missions is measured directly from the respondent's survey cluster.

4.1.5. *Economic growth.* The log of GDP per capita is taken from the World Development Indicators. Rainfall data used to instrument national level GDP are taken from the

Miguel et al. (2004) data set. These capture average rainfall, recorded by the Global Precipitation Climatology Project, over the geographic points in the entire country during that year.

4.1.6. *Economic shocks.* Rainfall shocks are computed using data from the University of Delaware. These report annual rainfall on a latitude/longitude grid. Each cluster is joined to the nearest grid point. I measure shocks by taking rainfall in year t over average rainfall for that cluster, i.e. $Rainfall_{jt}/\overline{Rainfall_j}$.

4.1.7. *Civil war.* I take battle deaths from the Uppsala Conflict Data Program (UCDP) and International Peace Research Institute, Oslo (PRIO) Armed Conflict Dataset. Each conflict in the data contains a latitude/longitude coordinate, a radius, and a best estimate of the number of battle deaths in each year of fighting. If the spatial extent of a war overlaps a woman's survey cluster in her year of marriage (or early adolescence), she is "treated" by the number of battle deaths in that war. These are measured in millions of deaths.

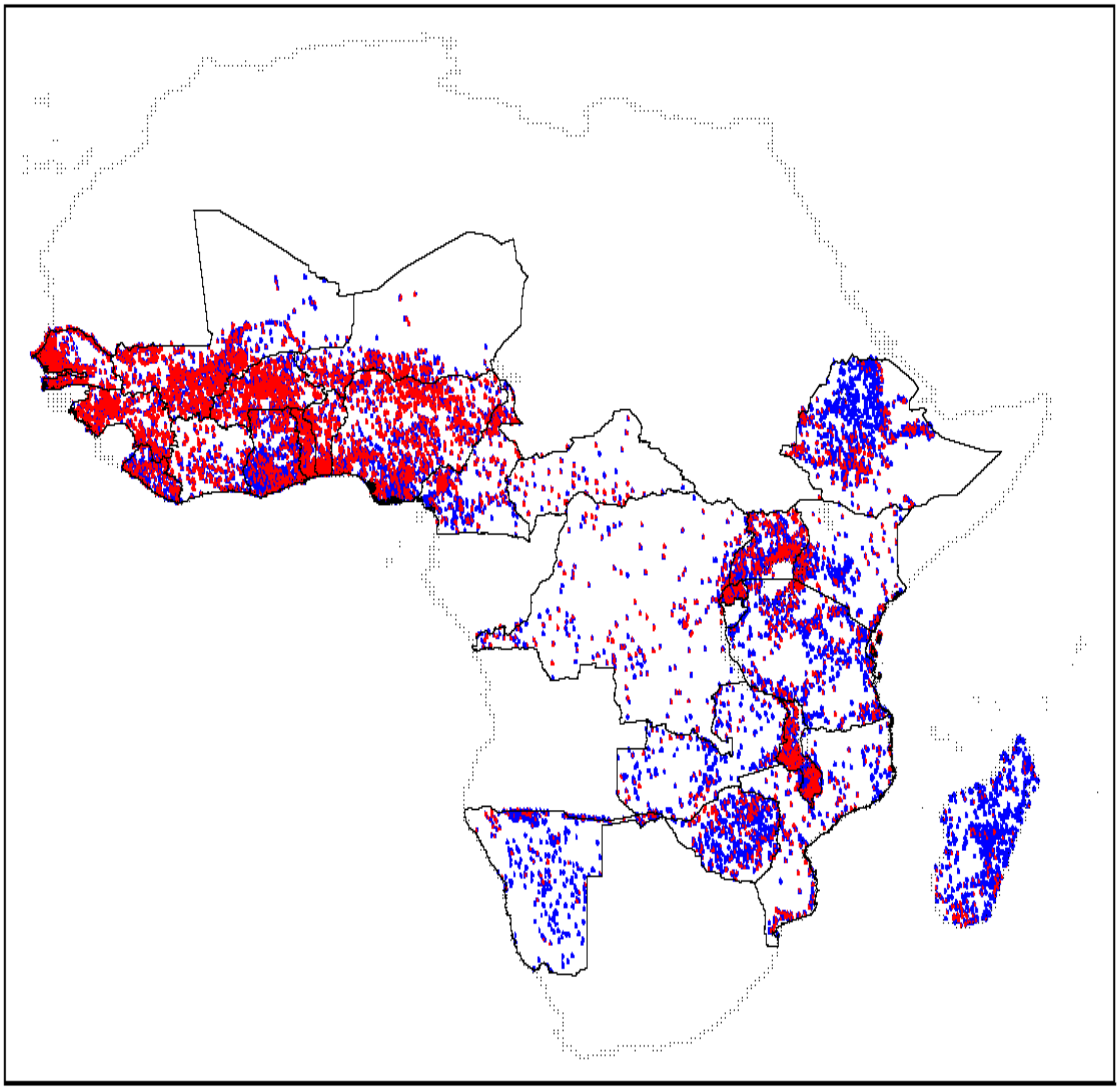
4.1.8. *National policies.* Distance from each survey cluster to each national border in the data is computed by calculating the minimum distance between the survey cluster and a pixelated border map.

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 for each country during the missing years. In the Web Appendix, I show that alternative measures taken from the Institute for Health Metrics and Evaluation and computed directly from the DHS birth histories give similar results. For Uganda, "Kigezi" is a dummy for whether the respondent's survey cluster is in one of the present-day districts of 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, and record them as polygamous if the household head is listed as a polygamist.

4.2. **Polygamy across space and time.** I depict the distribution of polygamy over space in Figure 1. Each point in the figure is a married woman for whom latitude and longitude coordinates are available. Red dots indicate polygamists, while blue dots signify 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 depict the decline of polygamy over time in Figure 2. A raw correlation between year of birth and polygamy will confound time trends with possible age effects. Though a young woman may marry a single man, she may marry a man who will eventually take

FIGURE 1. Polygamy in Africa



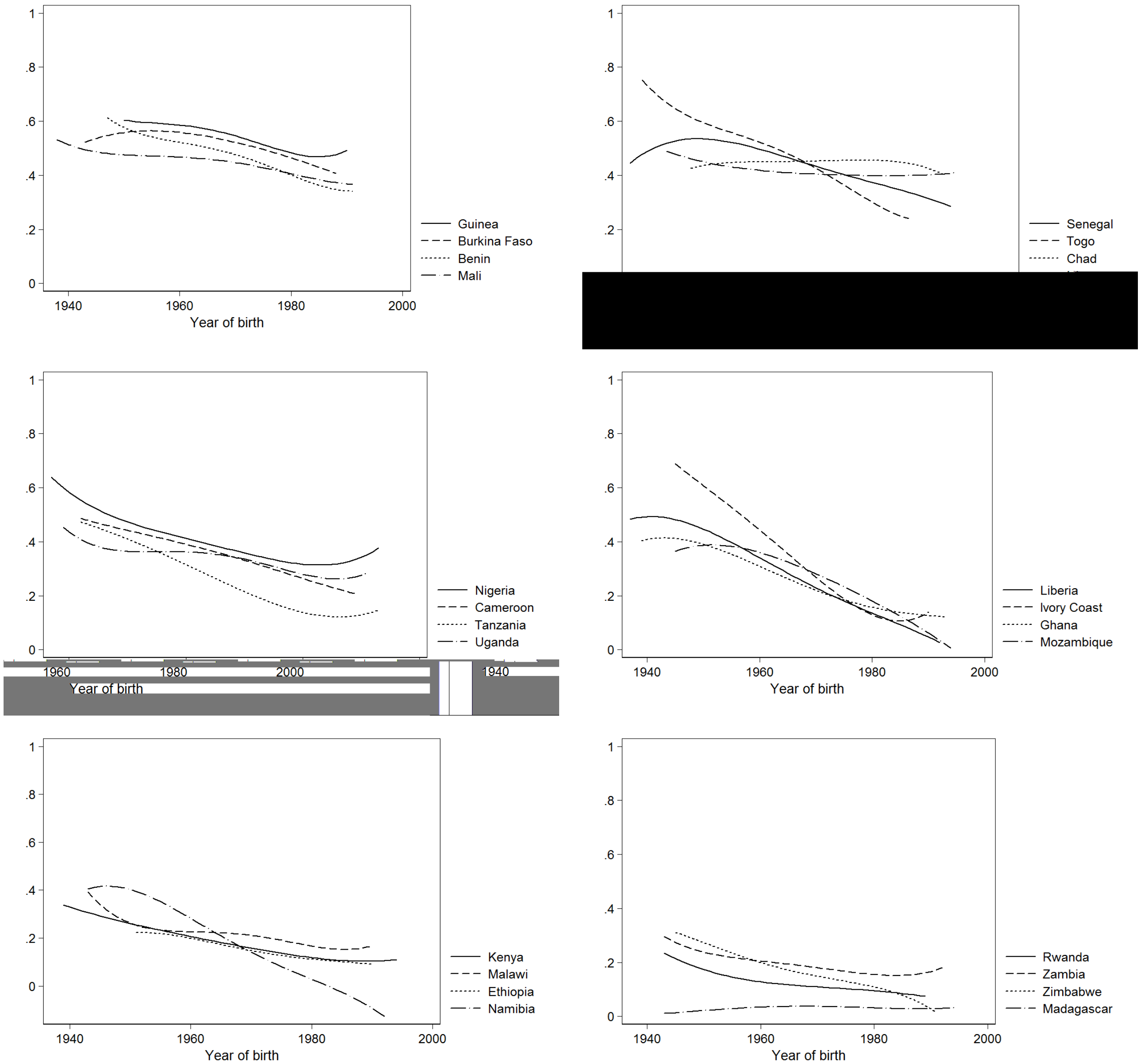
This figure plots polygamy for the women in the sample that have latitude and longitude coordinates. A red dot indicates polygamy, and a blue dot indicates monogamy.

another wife. Thus, I estimate the time trend of polygamy for each country in the data where there is more than one year of survey data available. I use the regression:

$$polygamous_i = f(age_i) + g(year\ of\ birth_i) + {}_i:$$

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 the results in Figure 2. The decline has not been confined to any one region of Africa, to high polygamy countries, to more urban countries, or

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



to those that have been more successful at achieving growth and stability. 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]

5. RESULTS

In this section I present my results, grouped by hypothesis.

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

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 for the Ivory Coast. 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 the probability that a woman is polygamous. His negative coefficient on maize is not found in these data.

The historical importance of women in agriculture and polygamy are negatively correlated. This is also evident from Figure 1. Polygamy is concentrated in the Sahel and Sudan regions where women have been less important in agriculture than in the more tropical parts of Africa. Additional controls (in particular, religion), lead this result to become insignificant across countries, though it is still negative. The effect remains significant when predicting differences within countries. The correlations are large; a one standard deviation increase in female importance in agriculture reduces the probability that a woman is polygamous by roughly 3 percentage points, even in the most conservative specification.

The IV results are larger than the OLS estimates. There are two possible explanations. First, more severe measurement error in the historic division of labor than in contemporary geographic conditions is plausible. Second, it is possible that the crop suitability measures cannot be excluded from the second stage of the estimation. Indeed, conventional tests of the over-identification restriction fail on these data. I am forced, then, to be cautious in interpreting the results. What *is* clear is that 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, nor where this importance is predicted by what crops can be grown.[14]

Why do my results differ from those of Jacoby (1995)? I show in the Web Appendix that this is not simply due to choice of sample – the results look similar when estimated only on the Ivory Coast. Although the hypothesis that a greater importance of women in agriculture leads to polygamy is influential among anthropologists, is it ignores general equilibrium effects. If women become more valuable, it is possible that this would increase the bride price paid to their parents without causing the distribution of wives across men to become more skewed.

5.2. **Inequality.** In Table 3, I show that there is no large positive relationship between present-day wealth inequality and the probability that a woman is polygamous. In the one specification where the correlation is statistically significant, the point estimate is

[14]It is also clear from this table that the first-stage F-statistics are low. This is because I have chosen to treat all suitability measures as excluded instruments. If I select only those that have the most predictive power, I am able to improve the first-stage F-statistics without qualitatively changing the results.

very small. Historic class stratification, by contrast, predicts polygamy today. The geographic predictors of inequality also predict polygamy, suggesting that the very long-term determinants of inequality matter. The wheat-sugar ratio is significant across specifications. Greater intra-regional 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. The coefficient magnitudes imply that 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 variation in land quality is a bit larger than 2 percentage points without controls.

The data do not make it possible to tease out the mechanisms that allow past inequality to better explain polygamy today than present-day inequality. I do not, for example, have data on the rates at which women marry men from higher social classes. There are at least two likely explanations for the stronger link between current polygamy and past inequality. First, the basis of inequality in African societies has changed over the past century. 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 made more effective through polygamy. Second, institutions are slow to evolve. The suggestive results given below for the slave trade, for example, indicate that shocks to the gender ratio can persist long after gender balance is restored. Similarly, while I find below that polygamy is responsive to shocks such as drought and civil war, the magnitudes I find are low, suggesting a slow evolution.

5.3. **The slave trade.** In Table 4, I find a positive correlation between exposure to the slave trade and current-day polygamy rates in both the OLS and IV estimates. 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 an approximate 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 result depends, however, on the broad comparison of West Africa with the rest of the continent. I also 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. Parts of West Africa that were less affected by the slave trade do not display less polygamy today. The hypothesis that the slave trade permanently increased polygamy rates in Africa is supported by the data, but the fineness of the variation that can be used to identify the effect should not be overstated.

5.4. **Female education.** The two modern natural experiments that I use do not suggest any link between polygamy and education in the present day. I show in Table 5 that, while I am able to find program effects on female schooling that were uncovered by Osili and Long (2008) and Agüero and Ramachandran (2010), neither of these predict a discontinuous drop in polygamy rates. In Nigeria, the coefficient estimate is positive, while in Zimbabwe it is both small and insignificant. In the Web Appendix, I show that these results are consistent with the small (though statistically robust) correlation that exists between years of education and polygamy in observational data.

Contrary to this, I do find in Table 6 that there is a negative effect of schooling in colonial French West Africa on polygamy today. The magnitude suggests that a one standard deviation increase in colonial education reduces polygamy by roughly 1 percentage point. 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 in the specification with the tightest fixed effects. I have found no evidence that distance from Catholic missions better predicts polygamy in colonies of Catholic countries, or where Protestant missions are more distant in comparison.

The lack of an impact for modern education is similar to the finding in Friedman et al. (2011) that educating women does not lead unequivocally to more "modern" attitudes. The historical results are consistent with the findings in Nunn (2010) that Catholic missions imparted not only education, but also ideological views about the appropriate role for women in African society. Together, these results suggest that education of women 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 has been less true of educational efforts in the present. Another possible confounding effect is that all of the predictors of education used here – colonial or modern – are interventions that affected both women and men. Whether a (possibly unequal) transfer of human capital to men will increase or reduce the incidence of polygamy will depend on whether there is assortive matching by spousal ability, and on the relative value men give to the quality versus the quantity of their children (Gould et al., 2008; Siow, 2006).

5.5. **Economic growth.** I show in Table 7 that higher levels of GDP per capita in the year a woman is married predicts a lower probability that she marries a polygamist, and that this is also true when GDP per capita is averaged over her early adolescence. This is also true when rainfall is used to instrument for GDP. 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. While polygamy has declined more rapidly in the parts of Africa that are growing fastest, economic growth over the past few decades has been cyclical and

uneven across the continent. Most countries in the sample, by contrast, have seen a steady, uninterrupted decline in polygamy.

5.6. **Economic shocks.** In Table 7, a positive rainfall shock in a woman's prime marriageable years predicts that she is less likely to marry polygamously. Though statistically robust, these effects are small. Raising rainfall by, for example, 100% over its normal value would only have a roughly 3 percentage point effect on the probability a woman marries polygamously. Local economic shocks matter, but they cannot explain the decline in overall polygamy.[15]

5.7. **War.** The results for battle deaths in Table 7 mirror those for rainfall shocks: war increases the probability that a woman marries polygamously. 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). Although I take war as a random shock, I am unable to rule out the alternative interpretation that war operates through intermediate channels such as environmental degradation, or indeed that these cause both war and polygamy. A war that kills one million people would, depending on the specification, raise a woman's probability of marrying polygamously by roughly 25-100 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. These suggest, as with rainfall shocks, a more modest effect that cannot explain the overall decline in polygamy.

5.8. **National borders.** I report the results of the regression discontinuity exercise in Table 8. Most of the borders do not bring with them 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 precisely. 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. Polygamy nearly doubles at the border between Malawi and Tanzania. 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 in the regression equation. Controlling for it does not do away with the discontinuity in polygamy in any of the three cases, and has only a modest effect on the magnitudes (not reported).

[15]Because rainfall may be mean-reverting, I have also allowed rainfall to enter separately for each year between ages 12 and 16. The coefficients are each negative, but significant only for age 16.

5.9. **Child mortality.** The difference-in-difference estimates in Table 7 suggest that the elasticity of polygamy with respect to child mortality is sizable. The decline in child mortality in Africa since the 1960s has been large in magnitude. Critically, the addition of year and country fixed effects shows that polygamy is declining most rapidly where child mortality is falling fastest. 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). 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.

The results for Uganda provide suggestive evidence that this is a causal effect. The DHS data show that women born after the malaria eradication program were roughly 7 percentage points less likely to marry polygamously than those born in other parts of Uganda, relative to women born in these areas before the treatment. The IPUMS data give a smaller effect, equal to less than 1 percentage point.

6. CONCLUSION

I have tested three influential theories about the existence of polygamy in Africa, 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 of the high prevalence of slavery in West Africa, and this result survives the inclusion of Angola. However, the slave trade cannot explain the relative distribution of polygamy within West Africa, and is indistinguishable from the simple fact that polygamy rates are higher in West Africa.

The widespread decline in African polygamy since independence has continued unhindered by the fits and starts of economic growth. Still, it has fallen furthest where growth has been strongest. Economic shocks and violence in a woman's prime years of marriage increase the probability she will marry polygamously, but the magnitudes of these effects are small. The decline has passed smoothly over national laws and most national borders. The education of women in Africa has also advanced in recent decades, often independent of economic growth. I do not find any evidence, however, that post-independence natural experiments in schooling have had any measurable effect on polygamy. Countries that have lagged in female schooling, such Mozambique, have seen remarkable declines in polygamy. By contrast, schooling in the past appears to have had a noticeable effect. Polygamy has fallen within both rural and urban areas, for women who self-declare as "Muslim" or as "Traditional", and among those who cannot read. Declining child mortality appears to have played a substantial role, but

still leaves the majority of the decline unexplained. Existing theories cannot explain the bulk of the decline of African polygamy, nor can most of the causal links uncovered here.

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APPENDIX A. ROBUSTNESS AND ADDITIONAL HYPOTHESES

Here, I briefly list the robustness checks that are detailed in the Web Appendix.

A.1. **Observable characteristics by sub-sample.**

(1) I show that the observable characteristics of the sample of polygamists differ from those of the sample of non- polygamists.
(2) I show that the 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. This is also the case if I divide the sample according to whether historic class stratification is missing or whether geographic coordinates are missing.
(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) I show that the results are similar when the sample is restricted to societies that earn at least half their subsistence from agriculture.
(2) I show that the results are similar when the dummies for ecological type are excluded.
(3) I show that the results are similar when estimated only on the Ivory Coast.

A.3. **Inequality.**

(1) I show that there is either no correlation or a small correlation (depending on the measure) between country-level inequality in a woman's prime marriageable years and the probability that she is polygamous.
(2) I show that there results using cluster and region wealth Gini coefficients are similar to the baseline results that use coefficients of variation to measure inequality.
(3) I show that a binary indicator of historical class stratification gives similar results to the ordered measure.

A.4. **Female education.**

(1) I show that there is only a small (though statistically robust) correlation between years of schooling and polygamy in observational data.

A.5. **Economic growth.**

(1) I show that the results are robust to including terms of trade as an additional control.
(2) I show that the results are similar when estimated on the sample of non-migrants.

A.6. **Economic shocks.**

(1) I show that the results are similar when estimated on the sample of non-migrants.

A.7. **War.**

(1) I show that the results are similar when rainfall shocks are included.
(2) I show that the results are similar when estimated on the sample of non-migrants.

A.8. **Child mortality.**

(1) I show that the results are similar when using an alternative measure of child mortality from the Institute for Health Metrics and Evaluation.
(2) I show that the 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) I show that the results are similar when estimated on the sample of non-migrants.
(4) I show that the results are robust to including log GDP per capita as a control.

A.9. **Other hypotheses not discussed in the text.** In addition to the cross-sectional hypotheses I test using (1), I have tested whether a quadratic function of historic population density matters. There does appear to be a statistically significant inverse-U pattern. I do not report this result in the main text, because it is descriptive. It is also impossible to attribute any effect of population to a particular hypothesis. Baker et al. (2008), for example, argue that inequality is highest at intermediate population densities. It is equally possible that the ratio of people to land reflects the cost of allocating farms across wives. This is also consistent with the anthropological view that allocating land to an additional wife will be less costly where land is more readily available.

In addition to the main hypotheses that I test using (2), I have also implemented similar pseudo-difference-in-difference specifications to test for the importance of rising life expectancy and urbanization. I have found no impact of either variable. Polygamy is less prevalent in more urban countries and those with long life expectancy, but it is not falling faster in countries that are urbanizing more rapidly, or in which life expectancy is rising more quickly.

Table 1. Summary statistics

	Mean	s.d.	Min.	Max.	N
Main controls					
HH Polygynous	0.28	0.45	0	1	494,157
Resp. 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	0.059	0.24	0	1	301,183
Mosaics	0.15	0.36	0	1	301,183
Cropland	0.12	0.33	0	1	301,183
Intensive cropland	0.0011	0.033	0	1	301,183
Wetland	0.0088	0.094	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	0.0061	0.078	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	299,058
Roots and tubers suit.	2.04	1.68	0	7	301,183
Pulses suit.	2.43	1.61	0	7	299,058
Sugar suit.	2.88	1.60	0	7	299,058
Oil suit.	0.83	1.14	0	7	299,058
Cotton suit.	1.64	1.70	0	7	299,074
Rainfed ag. suit.	4.08	2.06	0	7	299,108

	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***	-0.031***	-0.091***	-0.035***	-0.145***	-0.201**
			(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.	0.004*	0.007***	0.019**	0.007**				
	(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.	-0.008***	0.002	-0.002	0.004				
	(0.003)	(0.002)	(0.010)	(0.005)				
Sugar suit.	0.015***	0.009***	0.015*	0.009*				
	(0.002)	(0.002)	(0.008)	(0.004)				
Oil suit.	-0.030***	0.001	0.008	0.001				
	(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	297,936	297,936	139,499	139,499	207,757	140,023	207,757	140,023
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							10.66	1.812
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	168,363	240,656	168,378	219,474	148,768	148,768
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***	-0.046***	-0.018***			
	(0.002)	(0.003)	(0.003)			
Region c.v. of ag. constraints.				0.370***	0.004	0.205***
				(0.107)	(0.067)	(0.064)
Estimator	OLS	OLS	OLS	OLS	OLS	OLS
Observations	0.030	0.129	0.155	301,183	299,108	299,108
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*	-0.010*
	(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	299,108	299,108	299,108	170,674	259,012	169,241	169,241	291,060	288,882	288,882
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***	0.363***	-0.068***	-0.107**	-0.075*				0.310***	0.420***	-0.042**
	(0.108)	(0.104)	(0.024)	(0.044)	(0.044)				(0.076)	(0.138)	(0.018)
ln(1+Atl. slaves/Area), by name						0.300***	0.381*	-0.034			
						(0.084)	(0.199)	(0.029)			
Estimator	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
Observations	301,183	299,108	299,108	301,183	170,674	259,012	169,241	169,241	291,060	288,882	288,882
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 name)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by name)	Ethnicity (by loc.)	Ethnicity (by loc.)	Ethnicity (by loc.)
F test	17.87	15.91	18.00	13.50	9.891	15.35	5.411	13.93	18.90	11.26	17.84
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***	0.051***	0.155***
	(0.010)	(0.009)	(0.014)	(0.026)
Estimator	OLS	OLS	OLS	OLS
Observations	301,183	299,039	299,039	299,039
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***	0.014
	(0.011)	(0.010)	(0.012)	(0.025)
Estimator	OLS	OLS	OLS	OLS
Observations	301,183	299,039	299,039	299,039
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.