Polygyny, Unmarried Men, and Civil War: Debunking the Popular Demographic Narrative

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Abstract

There is a widespread belief that polygyny squeezes many men permanently out of the marriage market. In turn, polygyny is thought to cause crime and civil war. In response, we examine contemporary census data from 30 countries in Africa and Asia and historical data from the 19th century United States. We find that men living in polygynous communities marry at higher rates than men in comparable monogamous ones. This can be partly explained by how demographic forces shape the sex ratios of polygynous communities, but our empirical finding is better explained by a sociological explanation. Polygynous populations have strong pro-marriage norms, and those norms seem to override polygyny's effect of skewing the sex ratios of marriage markets, such that more men marry overall. This challenges the political and evolutionary science literature that links mass violence to polygyny, as well as a similar set of beliefs in incel culture.

1. Introduction

"If one man marries two wives, then another man must go without a wife" is a phrase often seen in the literature on polygyny. The assumption is that polygyny must inevitably create large numbers of men who have no hope of finding a heterosexual marriage partner, because some men are monopolizing multiple women. This is an intuitive assumption, but it is not necessarily a correct one. Polygyny is only one factor that influences the sex ratio of marriage markets, and sex ratios are only one factor that influences whether or not men get married.

However, the assumption that polygyny must inevitably squeeze a large proportion of young men out of local marriage markets—"often a majority" (*1*, p. 12)—leads to another highly problematic but common assumption: that polygyny causes mass violence. This conclusion is drawn because it is thought that polygyny increases the proportion of unmarried men in a population and that men are prone to violence as a result of being unmarried. Based on the demographic argument that polygyny locks large numbers of men out of marriage, polygyny has been argued to increase overall crime rates (*2*) (*3*) and violence against women in particular (*2*) (*4*) (*5*). Some analyses have additionally claimed a link to high maternal mortality (*2*), as well as discrimination against women in property rights and access to education, low levels of democratic development, and the practice of capital punishment (*4*). Above all, the assumed effect of polygyny on men's marriage chances is thought to be a major cause of armed conflict and especially of civil war. This has been argued across a wide range of political and evolutionary science literature (*1*) (*6*) (*7*) (*8*) (*9*) (*10*) (*11*) (*12*) (*13*) (*14*) (*15*) (*16*), as well as in five recent articles in the popular publication *The Economist* alone (*17*) (*18*) (*19*) (*20*) (*21*). This logic also has strong parallels with the belief in incel culture that the social practices of casual sex and serial monogamy create a system of 'effective' polygyny and therefore result in large numbers of young men being locked out of sex and relationships (*22*) (*23*) (*24*) (*25*). This belief is especially notable because it is used to sanction incels' desires for structural violence, namely restricting women's sexual autonomy through "enforced monogamy" (*26*). It seems that this belief is also used to promote terrorism by incels (*24*) (*27*).

A few reasons already exist for being skeptical of the idea that polygyny permanently squeezes many men out of marriage markets and therefore causes armed conflict. However, in this paper, we work to explain the connections between polygyny and the prevalence of unmarried men more thoroughly than has been attempted before. In the three sections that follow, we provide a demographic model that explains why the "then another man must go without a wife" model of marriage markets is flawed; we test whether polygyny actually correlates with large numbers of unmarried men in a systematic sample of 30 contemporary countries that practice polygyny; and we answer the same question using data from the 19th century United States. Our modeling shows that there are many demographic regimes in which there are more women than men in a marriage market, meaning that polygyny can occur without any men necessarily going unmarried. Our empirical results show that, at the sub-national level, polygynous communities actually tend to have fewer unmarried men than comparable monogamous ones, not more. In the final section of this paper, we consider the demographic and sociological explanations that seem likely to explain this surprising pattern.

2. A model of polygynous marriage markets

The idea that polygyny necessarily means that some men are prevented from marrying assumes that the numbers of men and women in the marriage market are equal. However, there are many demographic forces that influence the sex ratio of a heterosexual marriage market. These include men's and women's ages at marriage, the population's sex ratio at birth, the population's age structure, the proportions of men and women who ever want to marry heterosexually, age- and sex-specific divorce and remarriage probabilities, and age-, sex-, and marital-status-specific mortality and net migration rates. As a result of these factors, individually or in combination, it will often be the case that there are more prospective brides than prospective grooms in a marriage market. Therefore, the average groom can marry more than one bride without any other men necessarily being locked out of marriage. Some theoretical and empirical analyses have already demonstrated this fact, but they are admittedly scattered across the fields of demography, economics, history, and anthropology (*28*) (*29*) (*30*) (*31*) (*32*) (*33*) (*34*) (*35*) (*36*) (*37*). They have also not been widely acknowledged in the political and evolutionary sciences, nor the literature that comments on the beliefs of incel culture. Therefore, we developed a demographic model to show how some of the many relevant demographic forces influence marriage market sex ratios.

To this end, we assume a population that is closed to migration, has a stable age structure, has a sex ratio at birth of 1.03 (*38*), and experiences sex-specific mortality rates in line with the UN's general model life tables (*39*). Then, we compare the number of women to men at specific ages at which marriages can form. In reality, men and women marry at a wide range of ages and with a wide range of age gaps, including the not-uncommon cases in which women marry younger men (*40*) (*41*) (*42*). However, comparing the number of men and women at single ages allows us to present a nuanced but still intelligible model. Moreover, by comparing the total number of men and women at different ages, we do not need to specify rates of marriage, divorce, widowhood, and remarriage. As long as roughly equal proportions of men and women want to marry heterosexually, remarriage norms do not differ starkly by sex, and remarriage happens only a negligible time after marriage dissolution, the ratio of women to men can be taken as the average number of women available for each man to be married to. This is because all of the women in question are already hypothetically married to men or they are able to marry men due to being single, divorced, or widowed.

Based on this premise, Figure 1 shows how the number of prospective brides will be greater than the number of prospective grooms across a wide range of demographic regimes. In a population with 0% annual growth, a life expectancy at birth (e_0) of 40 for men and of 44 for women, the average 25-year-old man can be matched with 1.03 women who are also 25 years old. Meanwhile, in a population with 2% annual growth, a male e_0 of 30, and a female e_0 of 38, the average 45-year-old man can be matched with 1.81 women who are 35 years old.

This model makes it clear that marriage market demography is much more complex than the "then another man must go without a wife" model that is often employed in the literature. When modest proportions of men have multiple wives, a population's demography will often mean that the number of prospective brides is still equal to or greater than the number of prospective grooms. This is especially true if there are the relatively large average age gaps at marriage that are common in polygynous communities. The point that older men have more potential wives available than younger men is also very important, although it has been neglected in the literature. This is important because, in polygynous contexts, men tend to enter into higher-order marriages as they get older rather than all at once at an early age (*28*) (*43*) (*44*) (*45*). The assumption that only modest proportions of men have multiple wives holds in most contemporary populations in which polygyny is practiced (see Figure 1), and is the case in most of the available ethnographic record for hunter-gathers, especially outside of Australia (*46*).

However, it is not clear from this model how the practice of polygyny correlates with the prevalence of unmarried men in the real world. The assumption of a stable age structure does not hold in almost all contemporary populations. Remarriage may be less socially acceptable for women than it is for men and it may not happen after only a negligible period of mourning—although neither of those circumstances is common across the Sub-Saharan contexts in which polygyny is most prevalent (*47*) (*48*) (*49*). It is also unclear whether polygyny is associated with other practices that make it more or less likely that people will marry in general. Interpreting the number of women in excess of men in Figure 1 as the number of brides available to each groom assumes that marriages are made randomly, except with respect to age and sex. In contrast, marriage markets in India and China—which have been made tight for men, due to sex-selective abortion against female fetuses (*50*) (*51*)—have been made significantly more tight for both men and women due to a preference for educational hypergamy (*52*) (*53*). Therefore, we turn to empirical analysis to test whether polygyny correlates with large numbers of unmarried men in contemporary and historical census data.

3. Contemporary analysis

3.1. Data and methods

Our central question is whether the practice of polygyny correlates with the proportion of men in a population who are married. We aim to test this systematically and at the sub-national level. The data source we use to do so is IPUMS International, a global repository of demographic microdata based at the University of Minnesota (*54*). The repository contains individual-level microdata from 80 censuses in which polygynous marriages are directly observed. It also contains 5 household surveys, all from Nigeria, that record polygyny. For the sake of simplicity, we collectively refer to these 85 data sources as enumerations.

Contemporary demographic microdata usually does not comprise all of the entries recorded in the given enumeration, primarily for the sake of privacy. For each of the 85 enumerations that record polygyny, IPUMS holds a random sample of the households recorded, ranging from 0.05% to 16.6% samples of households depending on the enumeration. A few enumerations were excluded from our analysis due to the small number of individuals included in the sample available, or due to there being a lack of geographic disaggregation in the records—as in the 2008 census of South Sudan, where respondents were only coded as living in one of 10 states.

Additionally, we only included individuals aged 20 or older for whom sex and marital status were recorded. Then, for each enumeration, we grouped individuals' records by sub-national administrative area (hereafter, locality), and then we excluded all localities with fewer than 100 men aged 20 or older recorded in the microdata. Localities were defined as the lowest level administrative area available, except in Nigeria, where the small sample size and the large number of local government districts resulted in there being few men represented in most districts. Therefore, states were used instead. Then, we excluded all enumerations with fewer than 25 localities represented. Across all enumerations used, no more than 0.3% of records (at any age) were missing the respondent's sex and no more than 2% of records (of any sex) were missing the respondent's age. No more than 12% of records with a known age of 20 or older were missing the respondent's marital status—except for in the 1980 census of Papua New Guinea, in which marital status is only available for urban areas, and in the 2007 census of Ethiopia, in which most people were given an abbreviated census form that did not ask for marital status.

These exclusion criteria left our primary sample with 84.1 million person-records grouped into 11,943 localities from 74 enumerations in 30 countries. 52 of these enumerations are from sub-Saharan African countries, 11 are from North Africa and the Middle East, and 7 are from South Asia. There are additionally 3 enumerations from Papua New Guinea and 1 from Myanmar. These enumerations range in time from the 1969 census of Kenya to the 2016 intercensal community survey of South Africa. There are a few countries with a high prevalence of polygyny—e.g. Chad, Niger, and the Democratic Republic of the Congo (*55*) (*56*)—that are not represented in our sample. We also recognise that the conceptualisation of polygyny and the consequent extent to which it is captured in standard demographic sources varies over time and place (*57*). However, we believe that our samples are representative of the majority of contemporary populations that practice polygyny.

Using these samples, we assessed the association between the prevalence of polygyny and the prevalence of unmarried men. To do so, we deployed a large number of model specifications. For each sample, we operationalised the prevalence of unmarried men as either the proportion of men who were single or the proportion of men who were single or divorced. We operationalised the prevalence of polygyny as either (i) the proportion of married men who were polygynously married, (ii) the proportion of all men who were polygynously married, (iii) the proportion of married women married to a polygynyous man, (iv) the proportion of all women married to a polygynyous man, (v) the proportion of married women who were a second or higher-order wife, or (vi) the proportion of all women who were a second or higher-order wife. We measured the prevalence of unmarried men and the prevalence of polygyny separately in 21 age bands: eight 5-year bands (20–24, 25–30, … 55–59), seven 10-year bands (20–29, 25–34, … 50–59), five 20-year bands (20–39, 25–44, … 40–59), and at all ages 20 or older.

We also assessed the significance of the correlations between polygyny and men marrying using several methods: ordinary least squares regression, least squares regression weighted by the size of the male population in the age range within which the prevalence of unmarried men was assessed, and three unweighted non-parametric tests (rank regression, Theil–Sen regression, and Siegel regression). Some IPUMS samples provide individual-level weights that are designed to improve the representativeness of aggregate calculations. We additionally tested the effect of applying these weights where available.

Allowing for all combinations of these different analytical decisions, we apply 52,920 model specifications to our contemporary samples. Given the several million regressions analyses conducted, we use the Benjamini–Hochberg method of controlling for multiple comparisons (*58*). The relationship between different measures of polygyny and unmarried men in the same locality means that within-census tests are not independent, but the fact that those measures overwhelmingly correlate with each other positively means that the Benjamini–Hochberg method is still warranted, as opposed to the Benjamini–Yekutieli method that allows for negative dependency (*59*). As a result of this method, the estimated false discovery rate will be below the level of statistical significance chosen, and so we use the standard $p < 0.05$ level for assessing significance.

2.2. Results

Figure 2 shows the results of applying our main model specification to our sample of contemporary enumerations. When operationalizing the prevalence of polygyny as the proportion of all married men over age 20 in a polygynous marriage and the prevalence of unmarried men as the proportion of men in their 20s who have never been married, there is a significant positive association between polygyny and men not marrying in only 6 out of 74 enumerations (8.1%). In contrast, there is a significant negative association in 35 enumerations, which is a large plurality of cases (47.3%). Therefore, within the contemporary countries that practice polygyny, the men living in more polygynous sub-national communities have a smaller chance of being unmarried than the men living in more monogamous sub-national communities. Panel B shows the strength of the linear associations found across all 74 contemporary enumerations, while panel A shows the underlying data in 18 enumerations that were systematically selected to represent the strengths of associations found and the different global regions contained in the sample. Figures S1–S2 show the underlying data for all 74 enumerations.

If one only examines the most recent enumeration for each of the 30 countries in our sample, 15 countries (50%) exhibit a negative association between the sub-national prevalence of polygyny and that of unmarried men. 13 countries (43.3%) show a non-significant association, and only Mozambique (in 2007) and South Africa (in 2016) show the classically expected positive association (6.7%). Burkina Faso had a significant positive association in 1996 (adjusted $p = 0.020$) but did not have one in 2006 ($p = 0.488$). Malawi had a positive association in 1987 ($p < 0.001$) but did not have one in 1998 ($p = 0.764$) nor in 2008 ($p = 0.733$). By comparison, the findings of a significant negative association are more stable within countries over time. Nigeria shows a significant negative association in all five of its available enumerations, Benin does so in all four enumerations, and Senegal and Egypt do so in all three of its enumerations each.

Moreover, Figure S3 reports that our main finding generalizes across all of our robustness checks. Across our contemporary national samples, significant negative sub-national correlations between polygyny and unmarried men are more common than significant positive ones in all but 31 of our 52,920 model specifications (99.94%).

Additionally, in all of those outlying 31 cases, null correlations predominate—being found in 68–90% of enumerations. For example, in the single specification in which there are the most significant positive associations found in excess of the number of significant negative associations, 75.3% of the associations found are null, 8.2% are negative, and only 16.4% are actually positive. Among all of the specifications tested, the maximum proportion of the enumerations for which there is a positive association is only 27.4%, while the maximum proportion of negative associations found is 89.2%. Across all specifications, the median proportion of enumerations with a positive association is only 6.8%, whereas the median proportion with a negative association is 45.9%.

3. Historical analysis

3.1. Data and methods

As a secondary sample, we examined IPUMS International's full-count (100%) sample of the 1880 census of the United States. This allowed us to examine the prevalence of unmarried men throughout this large and socially diverse country. Crucially, it allowed us to study the Mormon communities of the American West—which were polygynous at the time—in comparison to the rest of the country. Studying Mormon polygyny is also valuable because it has been the subject of studies reporting that polygyny increases the variance in the number of children that men have (*2*) (*60*) (*61*).

The full-count sample of the 1880 census covers all territory of the United States that existed at the time, except for Alaska, the lands that became present-day Oklahoma, and the Native American reservations throughout the rest of the country (*62*) (*63*). We use the 1880 census to examine the case of Mormon polygyny for several reasons. This was the last federal census before Mormons' practice of polygyny began to be systematically prosecuted by federal authorities in 1882. This is also the only set of national microdata that is appropriate for studying this question and is available at the moment. The 1870 and 1860 censuses are available through IPUMS International as 1% random samples, which leave the (small) Mormon communities very poorly represented in the data. Those censuses are also available through IPUMS USA as full-count samples but only as preliminary datasets that do not record respondents' marital status. Almost all of the returns of the 1890 census were destroyed in a fire or due to subsequent bureaucratic negligence (*64*). The full-count 1900 census is available with marital status recorded, but the population of Utah roughly doubled between 1882 and 1900 in a way that renders that census unhelpful. The population growth was mostly due to migration from out-of-state, i.e. from people who never lived in a polygynous community. After restricting the records of the 1880 census to only include individuals aged 20 or older with a known sex and marital status and to only include counties with 100 or more adult men, we were left with a sample of 26.0 million people grouped in 2,475 counties.

Then, we treated the prevalence of polygyny as a binary variable in each county. The 1880 census was the first federal census in the United States to report individuals' relationship to the designated head of their household (*65*), and the prevalence of polygyny in these communities can, therefore, be estimated as the proportion of adult men with more than one wife of theirs living in their household. However, we did not opt for this approach, due to the practice of polygynous men's different wives often living in different households. A previous study advises that this is a major biasing factor (*66*). In one part of Utah, 39% of the polygynous men were found to have at least one wife who was not reported as living in the same household as them in the 1880 census (*67*), and in the same community, that

phenomenon and other data quality issues mean that reading the 1880 census in isolation led one researcher to undercount the proportion of polygynous households by threefold (*68*). Indeed, key attempts to use census data to estimate the prevalence of polygyny throughout 19th century Mormon communities have all involved linking census records to Mormon church records and genealogical sources (*45*) (*66*) (*67*) (*68*) (*69*) (*70*). Lacking the resources to do this, we coded polygyny as a binary variable based on the knowledge that polygyny in 1880 was strongly confined to the 21 counties of Utah and one county each in Idaho (Oneida), Arizona (Apache), and Nevada (Lincoln) (*45*) (*71*) (*72*) (*73*).

Like in our contemporary sample, we test whether polygynous counties have larger or smaller proportions of men never-married than monogamous counties under a range of model specifications. We test the effect on our results of operationalizing the prevalence of unmarried men as either the proportion of men who were single or the proportion of men who were single or divorced; measuring those proportions within the 21 age bands described above; and applying a standard t-test, a male population-weighted t-test, or a (non-parametric) Wilcoxon rank sum test. We also test the effects of including the three counties outside of Utah with large Mormon settlements in our sample of polygynous counties, as well as including the two counties of Utah with only 58 and 63 adult men enumerated, respectively. Finally, given the social and demographic heterogeneity of the United States (even at this point in history), we test the association between polygyny and unmarried men by separately comparing the polygynous counties with the monogamous counties in the West, Midwest, Northeast, and South regions of the country, as those regions are currently defined by the Census Bureau (*74*). In combination, these analytical options resulted in 2,016 model specifications.

3.2. Results

Like our contemporary sample, our historical American sample shows that polygynous communities do not have a disproportionate number of unmarried men. In the United States in 1880, there was a very high amount of variance in the proportion of men in their 20s who had never married—ranging from 98.1% in Morton County, North Dakota to only 19.6% in Winston County, Alabama. However, in our main model specification, the polygynous counties (n = 24) have fewer never-married young men than average (Figure 2). This is especially true when comparing the polygynous counties to the other counties of the Western United States ($p = 3 \times 10^{-10}$). This is admittedly not surprising, given that the other counties of the West included large numbers of mining and other frontier communities that were mostly composed of unmarried men by virtue of their founding (*80*) (*81*).

It is more notable that the polygynous counties had fewer never-married men in their 20s than the (monogamous) counties of the Midwest (p = 0.002) and the Northeast (p = 0.009). In our main model specification, there are more young unmarried men in the polygynous counties than in the (monogamous) counties of the South (p = 0.032), but this result only remains statistically significant in half of the alternative model specifications tested (Figure S4). Moreover, large proportions of 20- to 29-year-old men in the South may have been married only due to the South's anomalous demography in this period. Large proportions of the Southern men who would have been aged 30–49 in 1880 died in the 1861–65 Civil War (*82*) (*83*), and assuming that the South had the considerable amount of age hypogamy that other historical populations did (*41*) (*42*) (*84*) (*85*), there were probably many otherwise unmarried women in their 30s marrying men in their 20s in this period. Therefore, in 1880, the highly polygynous counties of Mormon America had surprisingly few unmarried young men in comparison to all major regions of the rest of the country.

4. Explaining our results

4.1 A demographic explanation

As shown in Figure 1, there are numerous demographic reasons why polygyny will not necessarily result in large numbers of unmarried men. High male mortality, high overall mortality, and large age gaps at marriage (especially when coupled with the presence of population growth) will result in many men, especially older men, being able to have multiple wives simultaneously while no other men go unmarried. In Figure 1, we do not consider migration patterns, but it is also worth mentioning that high male emigration would have the same pro-polygyny effect of high male mortality in this context (*86*) (*87*) (*88*) (*89*). Therefore, the fact that we fail to find large numbers of unmarried men in polygynous communities may be attributable to the demography of those communities.

However, there are two reasons why formal demography alone does not explain our results in Figures 2 and 3. The first reason is that polygyny should still tend to make heterosexual marriage markets more competitive for men. In any marriage market that is not perfectly efficient, polygyny should still make it more difficult for prospective grooms to find prospective brides, even if the prevailing demographic regime means that polygyny will not fully exclude any men from the market. For example, if sufficient microdata were available for a difference-in-differences or synthetic control analysis, we would expect to find that the eventual ban on polygyny resulted in even more young men in Utah getting married. At best—if a marriage market is highly efficient—there should be a null association between polygyny and the prevalence of unmarried men. Demographic forces will not induce a negative association between polygyny and unmarried men unless polygynous communities systematically have more women than men.

The second reason that demography alone cannot explain our results is that polygynous communities do not systematically have more women than men. In our data, polygynous communities tend to have below-average proportions of unmarried men even after conditioning on the population sex ratio. Figure 4 shows, in 19 out of 24 of the Mormon counties in our sample, the proportion of never-married men in their 20s was lower than the national average for the counties with the same ratio of men to women in their 20s; an additional two counties are almost exactly at the national average. Figure S5 shows similar results when comparing the Mormon counties to the monogamous counties of each of the four national regions separately. Controlling for local sex ratio, the Mormon counties even have typical proportions of men in their 20s compared to the South. Therefore, the difference between the polygynous West and the (monogamous) South in Figure 3 can be explained because the latter had more feminine age 20–29 sex ratios than the former, even if the post-war age hypogamous marriages proposed above did not happen. One study reports that Mormon polygyny was more prevalent in Utah communities that had more feminine sex ratios (*90*), but having feminine sex ratios is not what seems to have facilitated polygyny and high marriage chances for all men to co-occur in Utah in general.

Sex ratios also fail to explain away the negative association between polygyny and unmarried men in the contemporary African and Asian enumerations that we study. Controlling for the sex ratio among people in their 20s is able to explain away a few of the 35 significant, negative associations reported in Figure 1B. Most notably, doing so reduces the point estimate of the association between polygyny and unmarried men to roughly zero for three out of the four available censuses from Benin (in 1979, 1992, and 2002, but not in 2013). However, controlling for the age 20–29 sex ratio only weakens the 35 significant,

negative associations found by a median of 18% and a mean of 29%. Admittedly, one may think that the sex ratio at older ages will be a key determinant of the ability of grooms in their 20s to find brides, since it is primarily older men who marry polygynously. However, if one alternately controls for the sex ratios within each of the 21 age bands used in the previous analyses, one finds that controlling for the age 20–29 sex ratio actually results in the largest mean attenuation. That attenuation is notable but ultimately modest.

If mortality or migration patterns could systematically explain our finding that polygynous communities have few unmarried men, controlling for the local sex ratios would result in the classically expected positive association between polygyny and unmarried men being revealed. Even after controlling for local sex ratios, we observe far more censuses in which there is a negative association than the expected positive association.

4.2. A sociological explanation

An alternative explanation for our findings is that communities that practice polygyny have relatively strong pro-marriage norms. If the social norms in a polygynous community are much more conducive to high marriage rates than they are in a monogamous community, one might expect the former to have fewer unmarried men. Even though the presence of polygyny does put counterfactual pressure on men's ability to marry in the former, strong overall marriage norms could override that fact.

This dynamic plays out clearly at the cross-national level. For example, it is arguably the main reason why only 58% of 35- to 39-year-old men in England and Wales were married in 2019 (*91*) compared to 87% and 89% of 35- to 39-year-old men in the highly polygynous countries of Guinea (in 2014) and Burkina Faso (in 2006), respectively. Differences in marriage norms are also why it is projected that, in 2050, roughly 35% of 45- to 49-year-old men in Taiwan will have never been married compared to only 10% of the corresponding cohort in mainland China (*53*). If one ignores variation in the strength of marriage norms, this fact will be surprising because those men in Taiwan will not have experienced the same large squeeze in their marriage markets due to sex-selective abortion that the corresponding men in mainland China did (*92*). Even when sex ratios are very skewed, they often only have a small influence on the proportion of people who can, and do, get married.

Therefore, our results in Figures 2 and 3 can be explained easily if the polygynous communities in question simply had much stronger pro-marriage norms than the corresponding monogamous communities did. This certainly seems plausible in the Mormon case, given the community's religious tenets and valorization of high fertility, especially in the 19th century (*93*). A sociological explanation also seems likely in the contemporary case. Polygynous communities are generally held to be pronatalist (*94*). Indeed, an analysis of the 1988–89 Demographic and Health Survey (DHS) in Kenya found that women living in communities with a higher prevalence of polygyny have larger desired numbers of children—whether the women in question are themselves in polygynous or monogamous unions, and after controlling for individual- and community-level characteristics (*95*). An analysis of DHS data from 1991–2019 from 29 Sub-Saharan African countries also found a robust positive association between the prevalence of polygyny and women's desired number of children (*96*). These findings are notable because pronatalist and pro-marriage norms often go hand-in-hand. The data from Kenya additionally showed that more polygynous communities also had lower divorce rates, higher proportions of reproductive-age women ever married, and lower ages at first marriage for women—both for women in polygynous marriages and for women in monogamous marriages (*95*). Using

survey data to test the actual differences in marriage-related norms in the different parts of the 30 contemporary countries we study would be a productive avenue for future research, but for now, it seems unlikely that another explanation accounts for the strong negative associations between polygyny and unmarried men that we find.

6. Discussion

Our results indicate that polygyny does not squeeze large proportions of men out of the marriage market in the way that is assumed by many researchers and members of the public. In fact, it seems that confounding social norms make it so that polygynous communities in a given country tend to have fewer unmarried men than monogamous communities in the same country do. These results challenge both the incel ideology that (effective) polygyny sharply reduces the proportion of heterosexual men who can find a partner or wife and the academic literature linking polygyny to armed conflict.

It is also worth noting the other challenges that those two branches of thinking already face in the literature. There are two key, pre-existing reasons to dispute the veracity of incels' claim—besides the many objections to the forms of violence that they use their claim to justify. They take the (flawed) conclusion that polygyny causes low rates of male marriage and then apply it to nominally monogamous populations in North America and Europe on the basis of the argument that those populations are effectively polygynous. A thorough analysis of the reasons for this claim seems to be absent from the literature, but there seem to be two reasons for it—both of which are contestable. Specifically, they seem to argue that the practice of serial monogamy and the practice of casual, non-exclusive sex result in conditions in which relatively few men have many female partners while women do not exhibit the converse behavior (*22*) (*23*) (*24*) (*25*). The first reason is contestable because serial monogamy has been argued to more resemble effective polyandry more than effective polygyny (*97*). The second reason is contestable because the vast majority of men and women in the United States, for example, have few simultaneous sexual partners, despite there now being less social sanctioning against casual sex. In particular, the rise in the 2010s in the proportion of American men who report having had no sexual partners in the last year was not mirrored by a rise in the proportion of men who had three or more partners (*98*). Therefore, there seems to be little clear evidence that a population like the contemporary United States is one of effective polygyny, and even if there were, polygyny would not clearly increase the proportion of men who are involuntarily celibate.

The political and evolutionary science research on polygyny and armed conflict has focused its analysis on truly polygynous populations, but it faces a different set of challenges in the pre-existing literature. The cross-sectional analyses used to test the association between polygyny and adverse social outcomes cannot rule out the possibility of reverse causality. Indeed, some researchers have conversely argued that war or despotism is the root of polygyny rather than vice versa (*29*) (*99*) (*100*). Some behavioral ecologists also dispute the idea that large numbers of unmarried young men will necessarily commit mass violence (*101*). Other analyses have objected to the statistical techniques by which an association between polygyny and conflict has been established (*102*) (*103*). Additionally, a recent study that is one of the first to attempt to robustly identify a relationship between marriage market squeezes against men and men joining armed conflicts (*9*) faces problems in its use of rainfall as an instrumental variable for marriage market conditions (*104*) and in its use of aggregated news reports to measure the prevalence of conflict (*105*).

The literature does feature one systematic test of the association between polygyny and the proportion of the men in a population who are married (*2*, pp. S11–13), and that test

does report the classically expected negative association between the two. However, there are few reasons that the results presented there and those presented here differ so greatly. The pre-existing study measures the prevalence of polygyny only as an ordinal variable. Additionally, by testing its hypothesis at the country-level, the significant within-country heterogeneity that we have found was understandably not observed. The study's preferred model also only supports the classical negative association at the $p < 0.10$ level (estimated $p = 0.095$) and without an apparent correction for multiple comparisons.

Also, the literature claiming that polygyny causes armed conflict because it squeezes many men out of marriage markets does not seem to have noted key demographic literature on men's fertility in polygynous communities. Polygyny can increase the variance in the number of children that men have (*60*) (*61*) (*106*), but it is also associated with very high average numbers of children ever-born to men. For example, the period total fertility rates for men circa 2011 ranged between 10 and 14 in the most polygynous countries in our sample (*107*). Similarly, an analysis of DHS data from across Sub-Saharan Africa shows that sub-national areas with a higher prevalence of polygyny have a lower proportion of men over age 40 who have never had a child (*108*).

Our results do not rule out the possibility that polygyny does contribute to the formation or persistence of armed conflicts via a mechanism besides the prevalence of unmarried men. Admittedly, one can imagine that any reported correlations between polygyny and violence emerge simply because the global forces that promote a transition from polygyny to monogamy are the least powerful in the places that are most prone to conflict; the global association between fertility rates and national wealth exists, at least in part, for similar reasons (*109*)—but we do not test that hypothesis here. Our results also do not speak to the reported associations between polygyny and other forms of violence, namely intimate partner violence (*110*) (*111*) (*112*). They additionally do not speak to the contested literature on the associations between polygyny and other adverse social outcomes, namely excess child mortality (*55*) (*113*) (*114*) (*115*). However, our results and the apparently weak pre-existing evidence in support of the idea that polygyny causes armed conflict suggest that such a causal link may not exist. At the very least, we are able to report that polygynous communities do not have the "excess" of men that has often been claimed in academic and popular publications.

Data availability statement

The data obtained from IPUMS International cannot be redistributed, even for the purposes of reproducibility, but it can be downloaded at no cost after registering on their website. To improve reproducibility, we have made the following materials available at https://osf.io/tgb3k/?view_only=48977e25e4c14c5dadc47b8f21dc89eb: the codebooks of the two IPUMS International extracts we use (which include summaries of the extracts), the R Markdown file used to analyze those extracts and produce all main and supplementary files in this paper, and the file of UN model life tables used by the R Markdown file to produce the demographic model in Figure 1.

Author contributions

Contributions are presented according to the Contributor Roles Taxonomy (CRediT; https://credit.niso.org/). Conceptualization: HG, LF, RS (equal). Formal analysis: HG. Methodology: HG (lead), LF (supporting). Visualization: HG. Writing – original draft: HG (lead), RS (supporting). Writing – review and editing: HG, LF, RS (equal).

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Figures

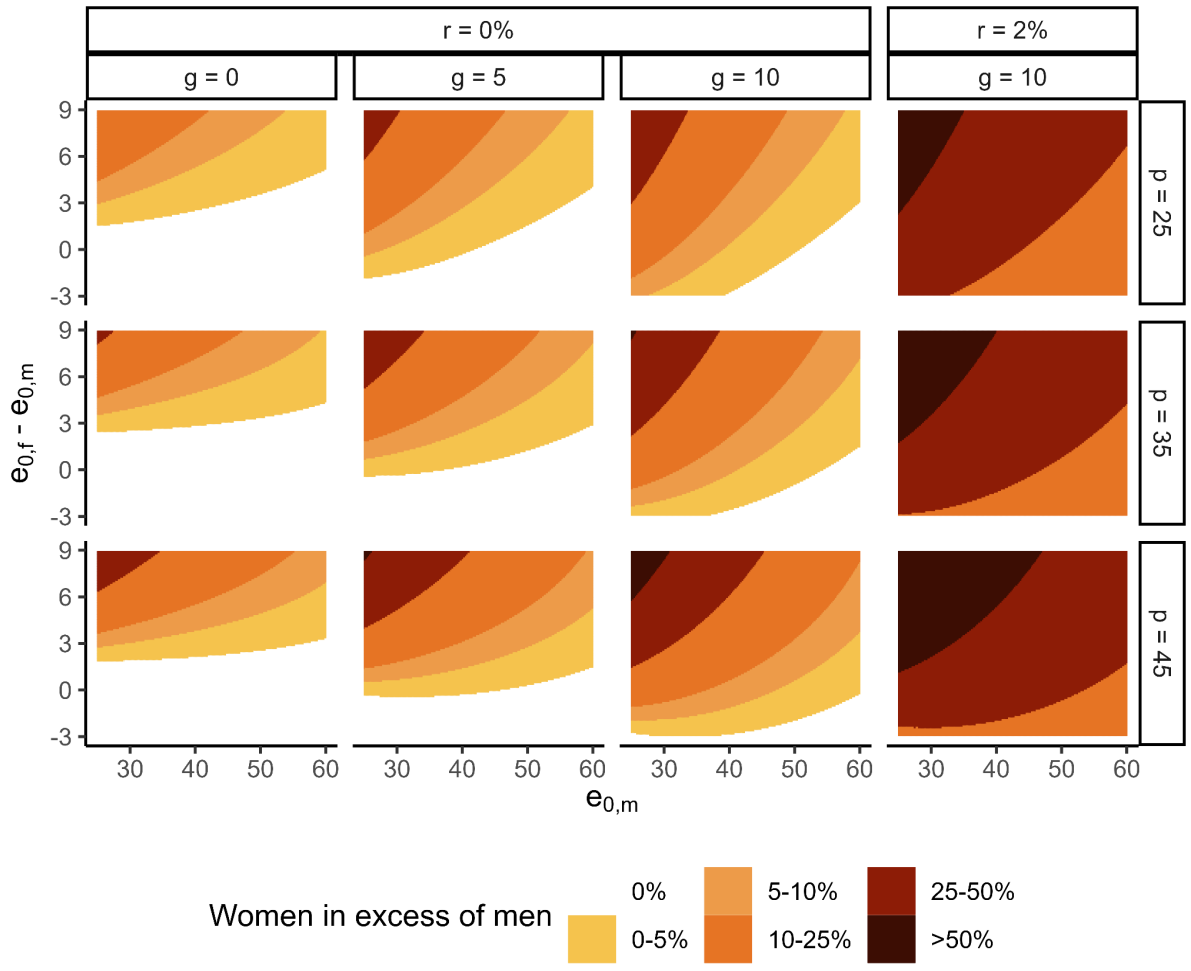

Figure 1. Modeled results of proportionally how many more women there are than men under a stable population regime that is closed to migration, as a function of male ($e_{0,m}$) and female life expectancy ($e_{0,f}$), the annual population growth rate (r), the age of the men (p), and the age gap (at prospective marriage) between the men and women (g).

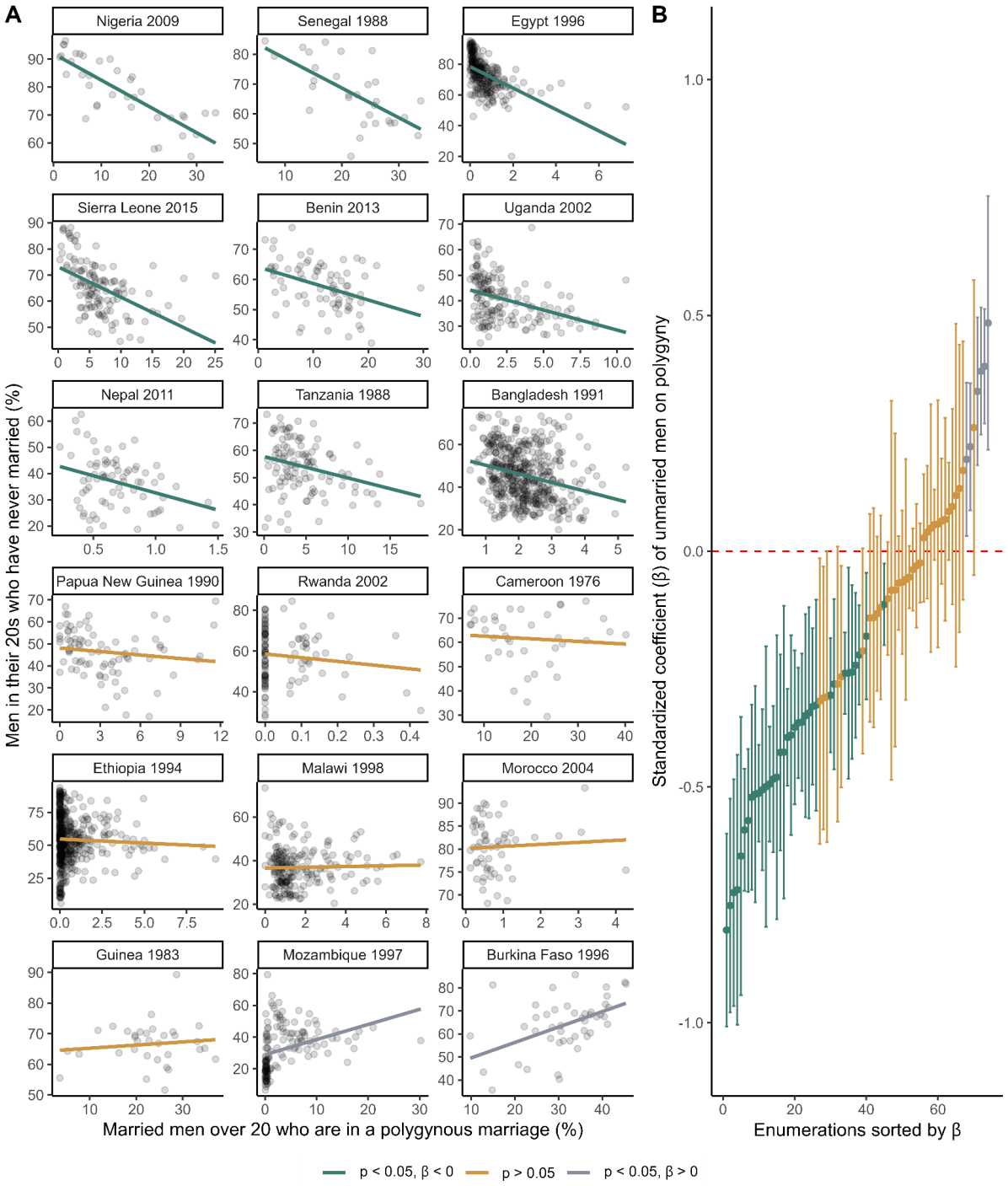

Figure 2. The sub-national associations between polygyny (operationalized as the proportion of married men over age 20 in a polygynous marriage) and unmarried men (operationalized as the proportion of men in their 20s who have never been married) in 18 enumerations that are representative of the associations found and countries examined (panel A); and the standardized (beta) coefficients of the relationship between polygyny and unmarried men in all 74 enumerations in our contemporary sample, with 95% confidence intervals (panel B). The statistical significance of the coefficients shown is adjusted for multiple comparisons within the entire family of tests shown in Figure S3; the confidence intervals shown are unadjusted.

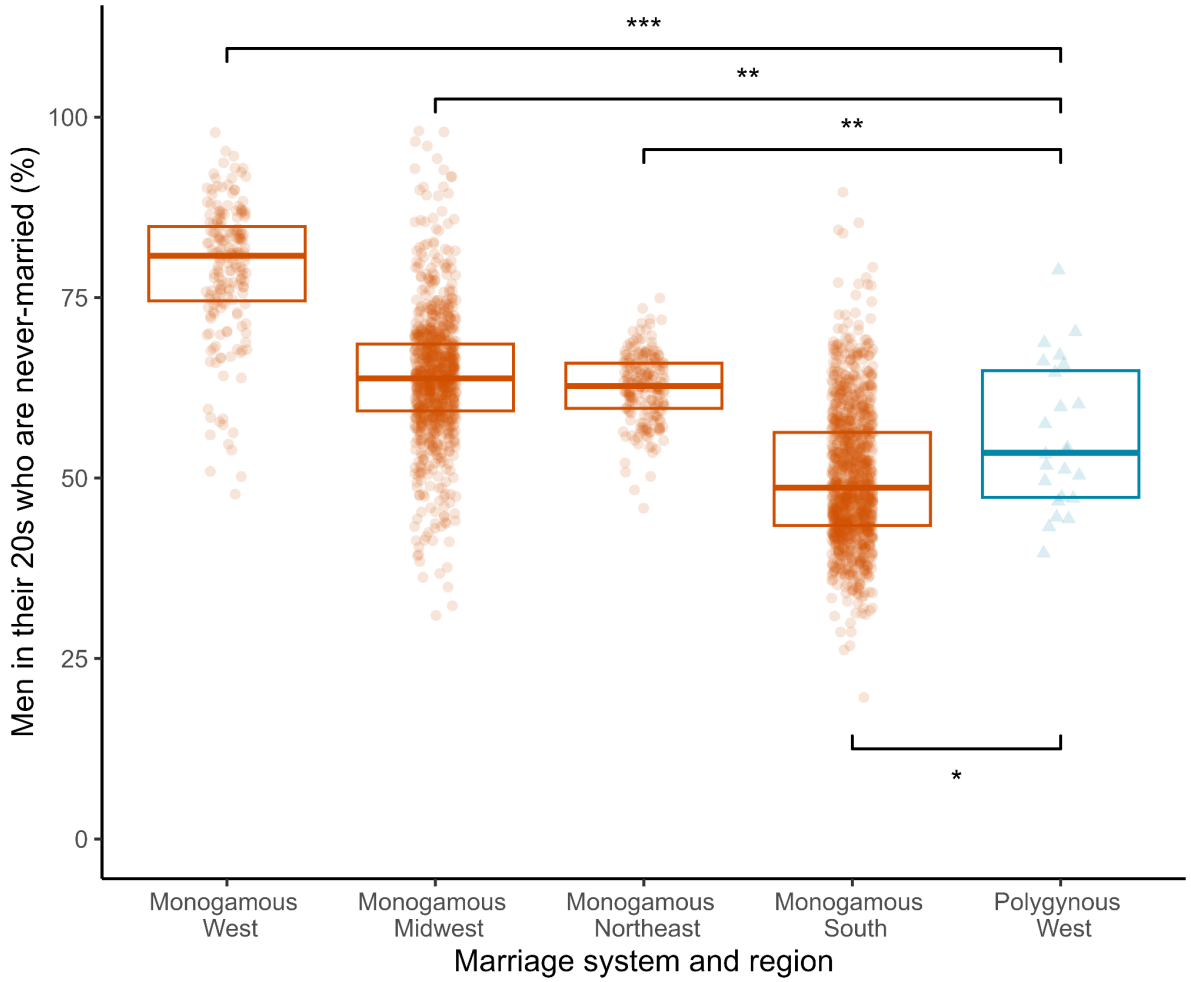

Figure 3. The proportion of men in their 20s who were never-married across United States counties in 1880 disaggregated by the prevailing marriage system and the current Census Bureau region. The counties shown contain at least 100 men over age 20 (n = 2,475). Full distributions, medians, and quartiles are shown. The p-values shown result from two-tailed unweighted t-tests adjusted for adjusted for multiple comparisons within the entire family of tests shown in Figure S4 (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

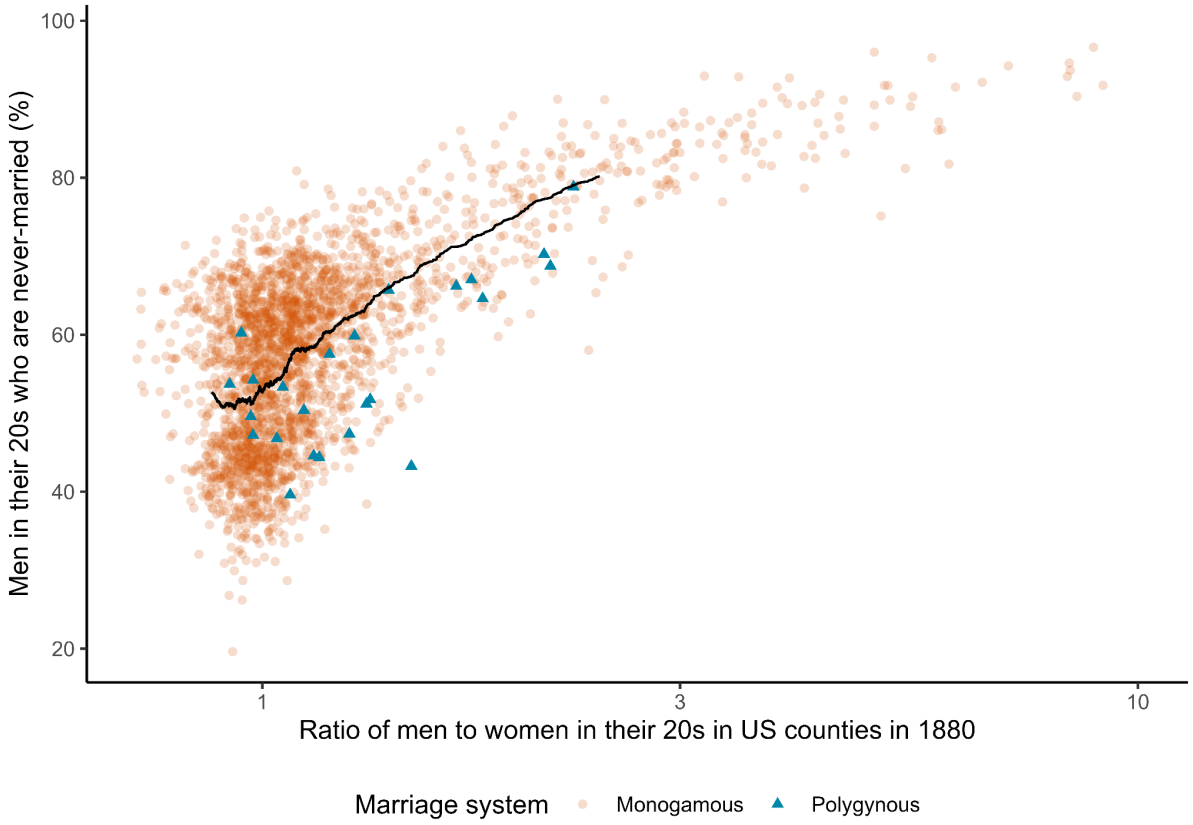

Figure 4. The proportion of men in their 20s who had never married across US counties in 1880 with more than 100 men over age 20 enumerated, disaggregated by the prevailing marriage system and the ratio of men in their 20s to women in their 20s. A moving average of male marriagelessness conditional on the population sex ratio with a period of 250 is shown. Nine counties with sex ratios greater than ten are omitted from the visualization; the full distribution is shown in Figure S5.

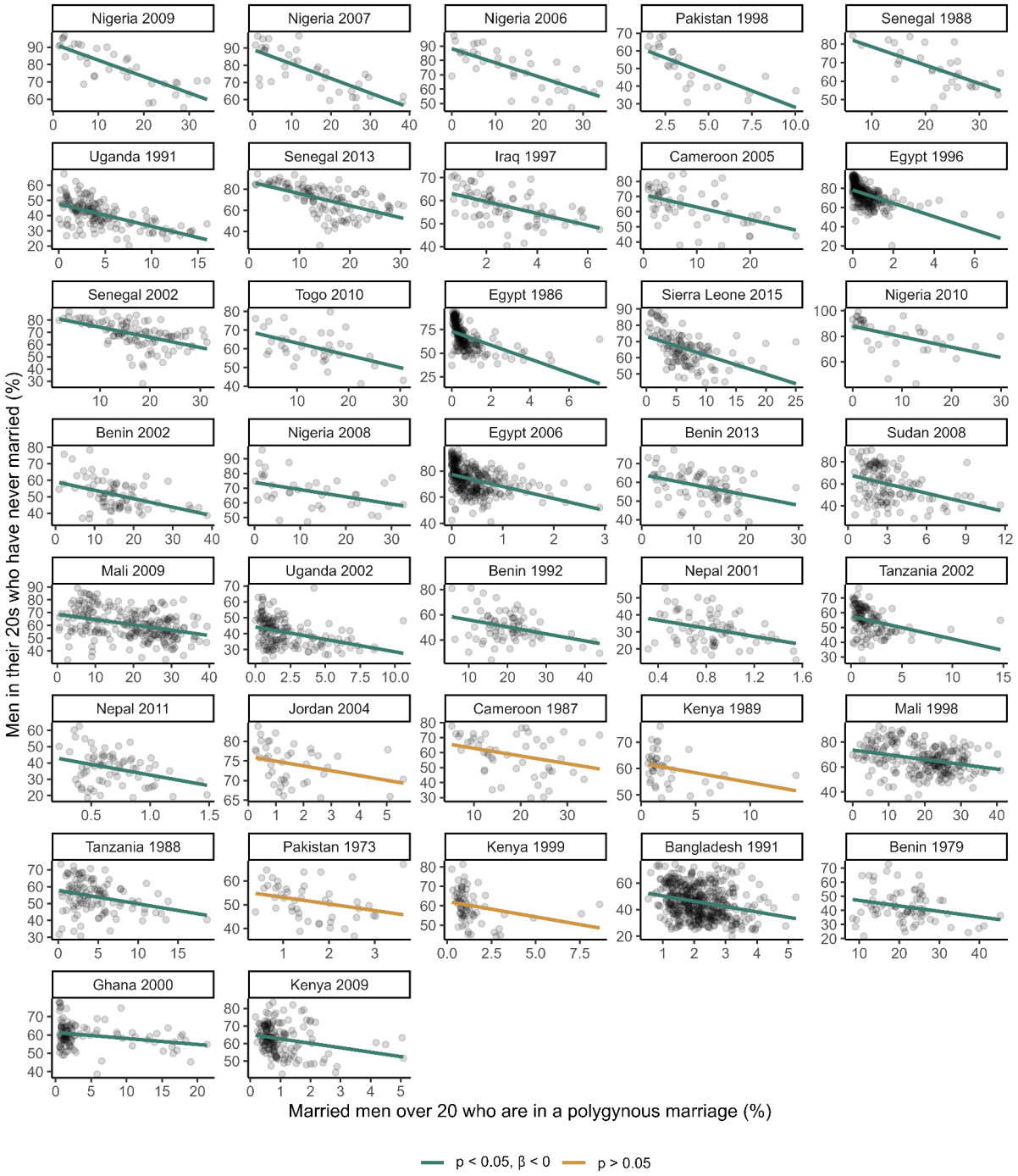

Figure S1. The sub-national associations between the incidence of polygyny and the incidence of unmarried men in the first 37 of the 74 enumerations in our contemporary sample, sorted by the standardized coefficient of the relationship and under the specification of polygyny and unmarried men used in Figure 1.

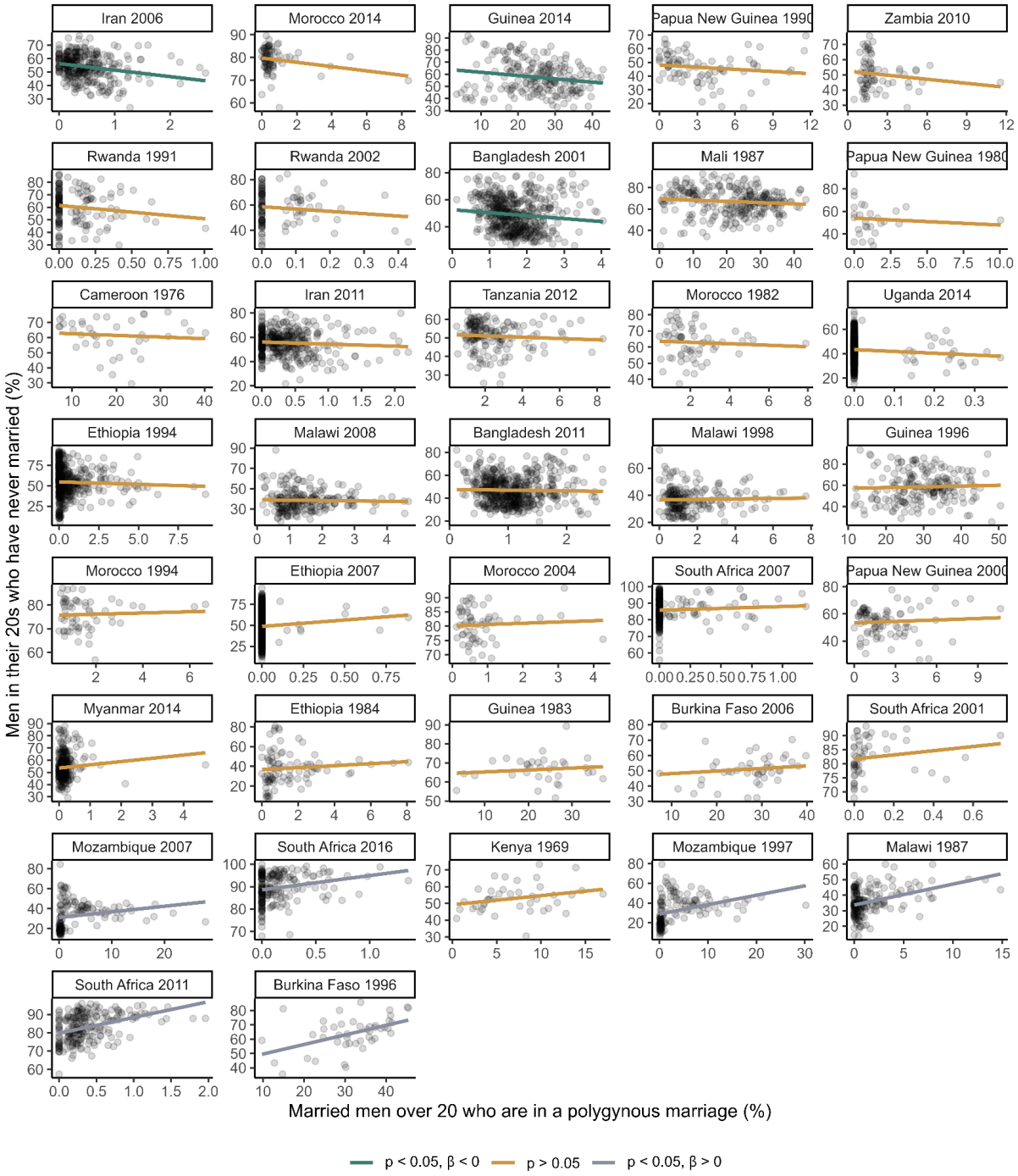

Figure S2. The sub-national associations between the incidence of polygyny and the incidence of unmarried men in the last 37 of the 74 enumerations in our contemporary sample, sorted by the standardized coefficient of the relationship and under the specification of polygyny and unmarried men used in Figure 1.

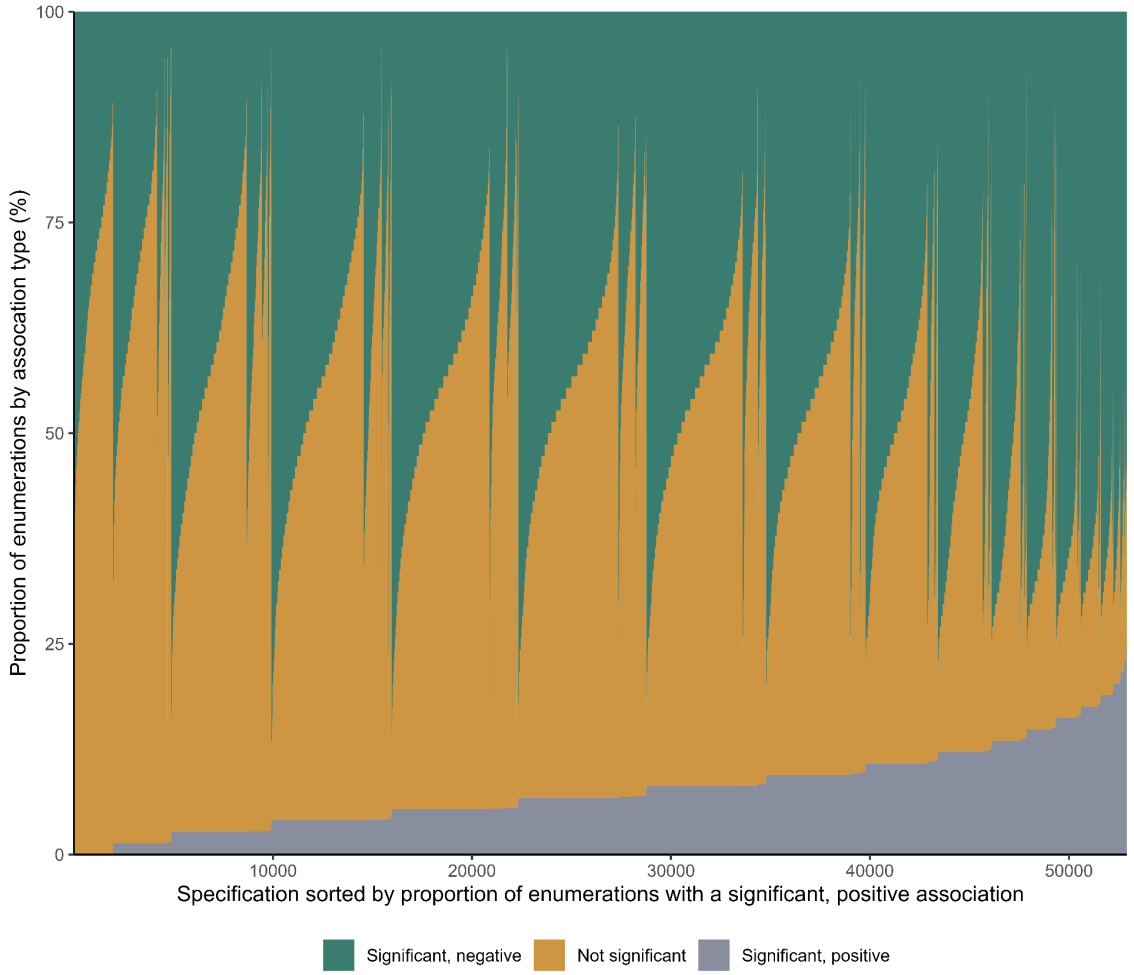

Figure S3. A summary of the associations between polygyny and unmarried men found for our contemporary sample of enumerations under our 52,920 model specifications; the sample size of enumerations is 74 in 80% of the specifications, and it is 61–73 for the remaining cases due to the lack of polygyny observed in certain enumerations under certain operationalisations.

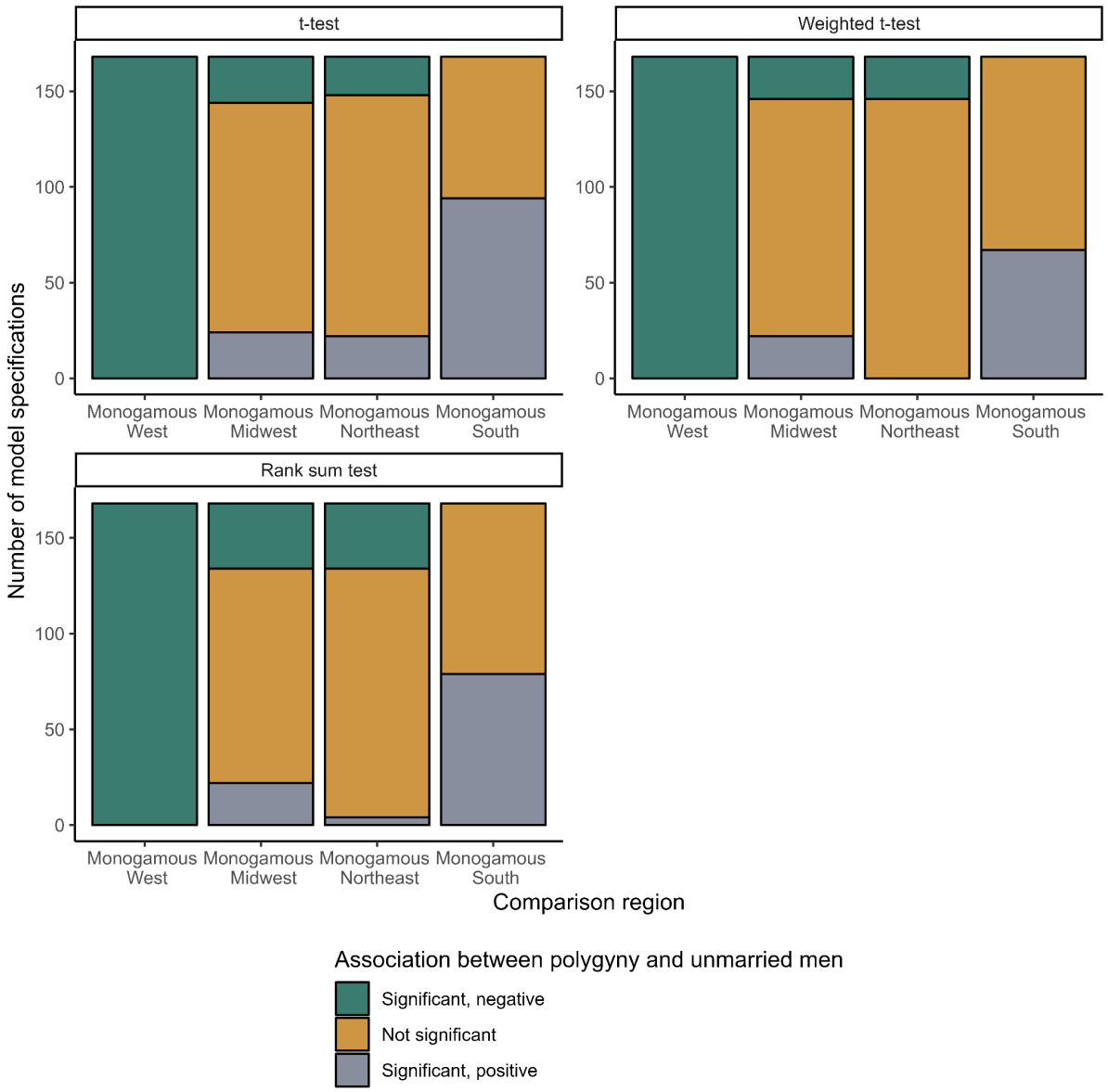

Figure S4. A summary of the associations between polygyny and unmarried men found when comparing the polygynous counties and the monogamous counties of specific regions within our historical sample (the 1880 census of the United States); the results of our 2,016 model specifications are summarized, disaggregated by the statistical test used and which region's counties were being compared to the polygynous counties.

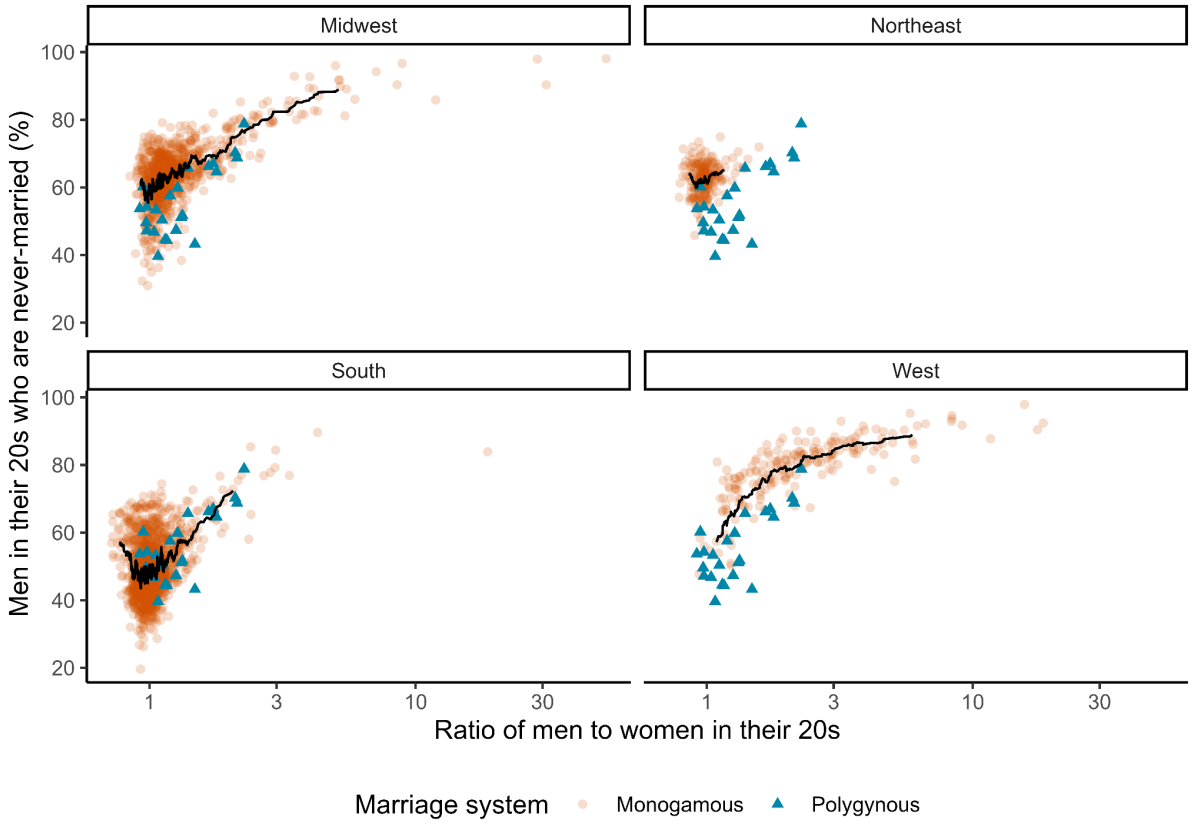

Figure S5. The proportion of men in their 20s who had never married across the full set of US counties in 1880 with more than 100 men over age 20 enumerated, disaggregated by region, the prevailing marriage system, and the ratio of men in their 20s to women in their 20s. A moving average of the proportion of unmarried men in the monogamous counties conditional on the population sex ratio with a period of 25 is shown. Here, the polygynous counties (of the West) are transposed on top of each of the four sets of monogamous counties for reference.

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