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The colonial struggle over polygamy: Consequences for educational expansion in sub-Saharan Africa

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ABSTRACT



Christian missions in colonial Africa have contributed significantly to the expansion of formal education and thereby shaped the continent's long-term economic and political development. This paper breaks new ground by showing that this process depended on local demand for education. It is argued that disagreements over norms, and in particular the struggle over polygamy, which resulted from missions' insistence on monogamy in traditionally polygamous areas, lowered African demand for education. Analyses of geocoded data from historical and contemporary sources, covering most of sub-Saharan Africa, show that the struggle is associated with worse educational outcomes today. Effects are not limited to formal attainments but carry over to informal outcomes, in particular literacy. The findings attest to considerable heterogeneity in missionary legacies and suggest that local conditions should be given greater consideration in future studies on the long-term consequences of colonial-era interventions.

KEYWORDS

Colonialism; education; missionaries; Africa and polygamy

Introduction

Christian missions have contributed greatly to the expansion of formal education around the world. A growing number of studies focuses on their legacies in sub-Saharan Africa, which was exposed to a massive influx of missions at the turn of the twentieth century (Frankema 2012; Jedwab, Meier zu Selhausen, and Moradi 2019; Wantchekon, Klačnja, and Novta 2015; Woodberry 2012). While missions operated schools to attract prospective converts and to overcome local norms they were opposed to, Africans valued formal education for the skills and prospects of social mobility it provided (Fourie, Ross, and Viljoen 2014, Njoku, 2005). The norm missions opposed most was polygamy, which they condemned as slavery in disguise and as destructive to Christianity. Mission schools promoted monogamy and it often served as a requirement for enrolment (Comaroff and Comaroff 1997; Pirie 1985; Turner 1966). At the same time, polygamy provided social and economic benefits to those who practised it, and polygamous individuals were

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reluctant to divorce partners and parents wary schooling would lead children to reject traditional ways of life (Boserup 1970; Kenyatta 1938).

The resulting struggle over polygamy, with Africans pleading for greater acceptance and missionaries stubbornly resisting such calls, not only occurred as isolated events but occupied international circles. Following heated debates, a report on the 1910 World Missionary Conference concludes: '[T]here can be no "question" of polygamy. It is simply one of the gross evils of heathen society which, like habitual murder or slavery, must at all costs be ended.'¹ Notwithstanding a plethora of historical and anthropological evidence attesting to the struggle, systematic analyses of its legacy are lacking.

The present paper fills this gap. It is argued that missions' insistence on monogamy lowered demand for education among ethnic groups that practised polygamy. The empirical analysis supports this argument and shows that effects carry forward until today, affecting both formal and informal educational outcomes. For this purpose, geo-referenced data from widely used historical sources is combined with contemporary surveys. Two historical atlases are used to determine the colonial-era locations of missions (1924) and pre-colonial ethnic homelands. On that basis, it is possible to determine how close survey respondents live to historical mission locations and whether polygamy traditionally assumed an important economic and social function in their area. Overall, the cross-sectional data includes over 300,000 respondents in 26 sub-Saharan countries.

The first part of the analysis uses a linear regression framework with country fixed effects that estimates how polygamy conditions the relationship between proximity to mission locations and educational outcomes. Whereas missions had a positive impact on long-run educational outcomes in traditionally non-polygamous localities as well as their polygamous counterparts, the differences between them are considerable. The regression analysis shows that primary school completion rates in the immediate proximity of historical mission locations are 97.3% in non-polygamous localities, exceeding polygamous localities by more than two percentage points. This disparity is not limited to formal education. Literacy rates differ by a similar margin.

The second part supports these results with a matching approach that compares outcomes between survey localities that differ in terms of missionary presence but are similar otherwise. It is shown that the presence of a mission in a locality where polygamy was less important increases contemporary primary school completion rates by 8.2 percentage points. This effect is only about half as large in polygamous localities. At the same time, reading skills spread well beyond the formal classroom setting. Therefore, the missionary contribution to literacy rates was even greater. However, with increases of 11.0 and 6.4 percentage points due to missionary presence, polygamous localities again benefitted considerably less. The findings are robust to various adaptations, including plausible alternative specifications of the main variables, sample, and estimation technique. Further analyses explore transmission mechanisms that might underlie the long-term effects.

The main contribution of the paper is theoretical, adding to a growing body of studies on the colonial legacy of economic and social development.² Using the struggle over polygamy as an example, it shows that normative disagreements between local and external actors can alter colonial-era interventions and their legacies. This further

¹Report of Commission II of the 1910 World Missionary Conference, as cited in Hastings (1994, 317).

²For recent reviews, see De Juan and Pierskalla 2017; Michalopoulos and Papaioannou 2018; and Nunn 2020.

emphasizes the need to study pre-colonial conditions, which are often sidelined in work on long-run consequences of colonialism (Haas and Frankema 2018; Meier zu Selhausen 2019; Michalopoulos and Papaioannou 2013). More specifically, the paper joins a growing number of studies that analyse consequences of missionary activity on a wide range of economic, political and social outcomes (Cagé and Rueda 2020; Nunn 2014; Okoye 2021; Ricart-Huguet 2021; Woodberry 2012). By exploring the long-term consequences of early polygamous practices, the paper directly complements several works on the origins of contemporary polygamy (André and Dupraz 2019; Fenske 2015; Kudo 2017). Finally, the paper also contributes to scholarship on social norms and family structures, in particular the social and economic consequences of polygamy (Ashraf et al. 2020; Edlund and Lagerlöf 2006; Koos and Neupert-Wentz 2020; Tertilt 2006). The findings caution against interpreting associations between polygamy and lower educational attainment as being the result of polygamy itself, and emphasize the intervening role of other factors, such as Christian missions.

The paper proceeds as follows. The next section reviews literature on educational activities and legacies of colonial-era Christian missions. It brings in early anthropological work and missionary testimonies to situate the paper's theoretical propositions. The third section introduces the historical and contemporary data sources. The fourth section then presents results from the various regression, matching, and robustness analyses. The fifth section discusses the results, and a final section concludes.

Literature

Missions and educational expansion in Africa

Since the sixteenth century, European governments have built colonial empires to expand their political and economic influence. However, European mortality rates in sub-Saharan Africa were initially very high and colonial powers only became more interested in the region after the discovery of anti-malarial medicine in the nineteenth century (Jedwab, Meier zu Selhausen, and Moradi 2019). The Church, and mission societies in particular, saw colonial empires as an opportunity to spread Christianity and dispatched missionaries all around the world. In fact, this practice had become common already earlier, when missionaries accompanied explorers and merchants, who due to decreased transportation costs were often the first to establish contact with people overseas. As such, missionary activity often preceded the formal establishment of colonies (Abernethy 2000; Etherington 2005).

Missionaries quickly learned that their gospel alone was not enough to appeal to prospective converts. Thus, they began offering services, most frequently education and health, that were of more immediate benefit (Fourie, Ross, and Viljoen 2014; Njoku 2005; Pirie 1985). These services were accompanied by religious practices, such as morning prayers, to promote Christian norms and ultimately convert Africans to Christianity. Education proved especially effective as it not only allowed for the subtle imposition of norms, e.g. reading was taught using Christian texts, but also promoted skills that introduced students to Christian and European customs, e.g. sewing of European-style clothes (Pirie 1985; Sheldon 2017). Protestants even set up printing presses to have a larger number of bibles at their avail (Cagé and Rueda 2016).

The activities of Christian missions were frequently supported by colonial administrations, who provided transportation, financial support, and protection. The spread of Christian norms was seen as conducive to colonialism as it engendered understanding and acceptance of the European colonizers. Similarly, it was hoped that the non-economic, largely voluntary interaction with missions would counterbalance the violent and exploitative encounters that otherwise defined the colonial project (Mwiria 1991). Furthermore, colonial administrations and firms were in need of translators and skilled labourers (Suret-Canale 1971). High skill premiums attest to this demand (Frankema and Van Waijenburg 2019). Through their provision of Western education, missions addressed this need, relieving administrations and firms from resource-intensive investments (Ansell and Lindvall 2013; Frankema 2012). Studies also show that the British made use of missions most effectively, while French administrations took a more restrictive stance (Cogneau and Moradi 2014; Dupraz, 2019). For example, instruction in French was often demanded, which made it hard for foreign missions to be established (Buell 1928; Suret-Canale 1971).

Christian missions were not always welcomed. While services, such as education and health, as well as food and refuge attracted Africans, activities that contradicted local norms and customs were met with scepticism and disinterest (Kenyatta 1938; Pirie 1985). In response, missions often developed a more careful approach, focusing on norms and customs they regarded as most incompatible with Christianity. Other less controversial local practices and rituals were occasionally integrated into activities of the missions (Sheldon 2017). As I discuss below, polygamy was a norm on which missionaries were rarely willing to compromise, very much to the discontent of many Africans. At later stages, Africans aspired to take control of missions, a demand that European missions opposed for fear that it would entail greater acceptance of local ways of life and thus inhibit 'proper' Christianization (Buell 1928; Turner 1966).

Several recent studies explore the long-term effects of Christian missions on educational outcomes. They show that individuals living in communities in which missions were active still receive more schooling today (e.g. Frankema 2012; Jedwab, Meier zu Selhausen, and Moradi 2019; Nunn 2014; Wantchekon, Klačnja, and Novta 2015). Cagé and Rueda (2016) also find positive effects, but caution that they are limited to missions that built schools and established printing presses. Another debate concerns the religious denomination of missions. Earlier studies have found Protestant missions to promote education more effectively than Catholic missions (Cogneau and Moradi 2014; Gallego and Woodberry 2010). Other studies point at geographic nuances regarding the long-term effects of Christian missions (Montgomery 2017).

Polygamy, missions, and demand for education

Polygamy has historically been widespread in Africa. Amongst other factors, this has been explained by agricultural practices and the transatlantic slave trade (Dalton and Leung 2014; Jacoby 1995). Polygamy in Africa concerns primarily marriages that include multiple wives.³ Ethnographic work evinces that most ethnic groups in Africa have been practising

³More accurately, polygamous marriages with one man and multiple women are instances of polygyny, and cases where one woman is married to multiple men constitute polyandry. However, the latter does not occur in the data used in empirical analysis.

polygamy in one form or another, be it to different degrees. The ethnographic atlas used in the later analyses shows that during the colonial era, polygamy was of central economic and social import in 425 out of 840 ethnic groups in Africa (Gray 1999; Murdock 1967). Despite its decline in the past century, polygamy remains more common in Africa than elsewhere in the world, with about a quarter of married women in polygamous unions (Fenske 2015). In the following, I draw mainly on missionary accounts and anthropological work to shed light on how missions and local populations in colonial Africa struggled over polygamy and how this affected the educational activities.

Among Christian missionaries polygamy was widely considered as incompatible with Christian norms. Missionaries were concerned about sexual promiscuity and often understood the practice as ownership of women, effectively equating it with slavery (Ekechi 1976; Pirie 1985; Turner 1966). Even when challenged, missionaries would not change their attitude:

Some, especially missionaries, have gone so far as to say that African women are regarded as mere chattels of the men. Well-informed anthropologists agree that this is erroneous and a misconception of the African's social custom. (Kenyatta 1938, 164–165)

Thus, missions opposed polygamy more actively than other norms and were unlikely to grant exceptions or to turn a blind eye. Before baptism would be practised, missions insisted on the resolution of polygamous unions. This also applied to local chiefs, whose conversion could result in a watershed moment to winning over whole communities. Missions insisted even if it meant that this moment was not realized (Hastings 1994). As one influential Methodist missionary put it, polygamy constituted 'the grand remaining barrier behind which the prince of darkness entrenches himself'.⁴

It should be noted that not all missionaries held as bleak a view of polygamy. Indeed, some practised greater tolerance in order to advance efforts to convert Africans (Dinnerstein 1976; Etherington 2005). The written record suggests that such a pragmatic attitude was more common among Protestant missionaries (Comaroff and Comaroff 1997). Nevertheless, such cases constituted exceptions rather than the rule (Hastings 1994).

Questions about polygamy did not only concern missionaries in the field but were hotly debated back in the metropole. In 1888, at an international conference of the Anglican Church in England, a resolution that reaffirmed monogamy as a requirement for baptism was passed. This decision was quickly communicated into the field and thus encouraged missionaries to continue their strict stance on the issue. Later conferences, such as the 1910 World Missionary Conference, echoed this sentiment, as the passage cited in the introduction shows. At the same time, African elites were unsatisfied by the outcome of such conferences as they continued to call for greater tolerance of African customs (Ekechi 1976, 342–343).

Prospective converts were often surprised by missionaries' insistence on monogamy and other practices and norms which they perceived as impractical (Kenyatta 1938). As one missionary complained, 'they would, with little ceremony, pronounce our customs clumsy, awkward, and troublesome' (Moffat 1842, 248). At the same time, missionaries were fully aware of what their ask implied:

⁴J. Cameron, 1840, as cited in Comaroff and Comaroff (1997, 430).

Submission to [monogamy] is the severest test to which a savage can be subjected. When we see a man, for conscience' sake, parting with one or more favourite wives, can we deny him the credit of sincerity? (Moffat 1842, 574)

Where it was practised, polygamy generally had economic and social benefits for men and women (Boserup 1970; Ekechi 1976; Hastings 1994). Most notably, it entailed an improved division of labour and its practice was an important marker of social status. Nevertheless, the importance of polygamy also varied and was most pronounced where households were organized around polygamous unions, a constellation also known as independent polygamous family (Murdock 1949, 23ff).

Unconvinced by their insistence on monogamy, Africans frequently challenged missionaries. They pointed out monogamy's disadvantages and the newly literate questioned missionaries about Biblical figures, such as King Solomon, who had several wives (Comaroff and Comaroff 1997; Dinnerstein 1976). Later on, the establishment and popularity of independent African churches was also a response to the uncompromising attitude of European missionaries towards local customs (Kenyatta 1938). Although this development picked up before independence, its achievement greatly shifted the balance of power, also with regards to religion. As European missionaries were expelled, their positions were often filled by African priests more tolerant of local ways of life (Ekechi 1976; Hastings 1994; Subramaniam 1979). And independent churches, which were previously suppressed, began to flourish (Atieno-Odhiambo 1985; Njoku 2005; Turner 1966).

Most important for this paper, the insistence on monogamy crucially affected demand for education among Africans. In polygamous societies, parents faced a delicate dilemma. On the one hand, sending children to a mission school promised many economic and social opportunities. These opportunities included jobs in missions and increasingly the colonial economy and administrations (Frankema 2012; Meier zu Selhausen, Leeuwen, and Weisdorf 2018; Pirie 1985). Literacy was also highly valued as African populations considered it fundamental to manoeuvring and opposing the new political realities that colonialism brought about (Fourie, Ross, and Viljoen 2014; Njoku 2005). On the other, schooling risked that children turned away from polygamy, which could harm established family and community bonds, and more importantly, limit marriage prospects, as outsiders to the Christian community did not consider monogamy an attractive option (Orosz 2012; Yates 1971). This problem was particularly pertinent for boys, who usually composed the majority of pupils, and thus risked not finding a partner. Furthermore, missionaries occasionally denied enrolment to pressure parents to resolve polygamous marriages. The same applied to polygamous individuals themselves. However, it was rare that school access was considered worth a divorce (Atieno-Odhiambo 1985, 655; Kenya 1938, 272). As a consequence, the promotion of and insistence on monogamy decreased the demand for education in polygamous societies.

If demand for education, in particular mission schooling, was lower in polygamous societies, one would expect that this also affected the educational legacy of missions. Missions should have contributed to greater educational expansion in monogamous societies, leading to higher levels of educational attainment today. In this regard, it is also interesting to discern effects on formal and informal educational outcomes. While the attainment of formal degrees required actual enrolment, skills like reading could

easily spread beyond the classroom. As such, legacies in formal educational outcomes also rely more heavily on the persistence of institutional disparities, i.e. school access, whereas skills, and human capital more generally, can be transmitted directly from one generation to another. The empirical analysis below provides strong support for the proposition that the long-term effects of missions on formal and informal educational outcomes is affected by the struggle over polygamy and thus establishes it as a decisive determinant of educational expansion in Africa.

Overall, this paper makes two central contributions. First, it informs research on the colonial legacy of economic and social development (for recent reviews, see De Juan and Pierskalla 2017; Michalopoulos and Papaioannou 2018; Nunn 2020), in particular on the long-term effects of colonial-era missions on educational outcomes in Africa today. It highlights in particular the importance of pre-colonial conditions, which have not been a focus of most earlier work (Michalopoulos and Papaioannou 2013), and the role Africans played in shaping colonial-era developments and its long-term consequences. This paper argues that local demand determined where and how fast European-style education could expand in Africa. Such insights can help moving away from Western-centric interpretations that focus on the external imposition of institutions and norms through colonizers (Haas and Frankema 2018).

The paper makes a second contribution to academic debates on the social and economic consequences of marriage practices, in particular polygamy. It is often argued that polygamy has a variety of adverse effects, such as harming economic growth (Tertilt 2005, 2006), decreasing gender equality (Doepke, Tertilt, and Voena 2011; Edlund and Lagerlöf 2006), and nurturing intergroup conflict (Koos and Neupert-Wentz 2020). While this paper also shows that levels of educational attainment are generally lower in traditionally polygamous societies, it adds further nuance. As such, it demonstrates that the restrictive stance of missions on polygamy – rather than polygamy itself – is an important determinant of the educational gap between societies that were traditionally monogamous or polygamous.

Data

Sources and methods

To determine the effect of missionary activity on contemporary educational outcomes I use georeferenced data from a variety of sources, historical and contemporary. The main historical sources are maps of the African continent that indicate (1) the location of missions during the colonial period and (2) the distribution of ethnic groups and their local practices and norms. This information is merged with contemporary survey data. Variables from several other sources are added to facilitate the identification of causal effects.

Two estimation strategies are applied. First, I conduct a proximity analysis that measures how the educational attainments of survey respondents are affected by the geographic distance of their place of residence to historical locations of missions. The analysis controls for factors that are known to have influenced the location of Christian missions, such as geographic, economic, and social conditions. Second, I apply a matching analysis, which matches contemporary survey localities with a mission present during

colonial times to localities without missionary presence. This matching is done based on potential confounding factors. Localities for which no adequate match can be found are discarded, thus reducing inferential biases due to covariate imbalances.

Contemporary data

To assess contemporary educational outcomes and their geographical distribution, I use the most recent surveys from the Demographic and Health Surveys (DHS). Georeferenced DHS data from 26 African countries is used in the analysis.⁵ Joining up the most recent survey for each country results in a dataset with a total of 341,688 respondents.⁶

The individual level variables used in the analysis are drawn from the DHS data. Most importantly, *Primary* indicates whether a person has completed primary education. I focus on primary education as missions rarely provided education at a higher level. *Literacy* summarizes reading ability in a binary variable, which indicates whether respondents were able to read at least parts of a sentence.⁷ While these measures are chosen to specifically capture the educational legacy of missions, the results also hold when years of schooling, a more general measure of educational attainment, is used (see online Supplemental Material).

Three individual-level control variables are included to improve the estimation and to account for potential confounding effects. A binary gender variable, *Female*, takes into account differences in access to education. Another binary variable, which indicates whether respondents identify as *Christian* captures effects of conversion efforts, which themselves depended on the practice and treatment of polygamy. Finally, *Age* takes into account that some respondent are born closer to the colonial era than others and could thus be exposed more strongly to colonial legacies. In additional analyses, I split age into three cohorts to explore whether the intensity of mission legacies changes over time. Descriptive statistics for all variables used in the analysis are included in the online Supplemental Material.

A main advantage of the DHS data is the inclusion of geographic information on the location of surveyed households. To protect respondent privacy these locations are clustered and randomly offset by up to 2–5 km. I refer to these clusters as localities. Although the random offset increases the uncertainty of estimates, it does not induce any systematic bias. In the analysis robust standard errors are used to account for geographic clustering. Furthermore, DHS oversamples regions with low population densities. Individual surveys are administered to all female respondents but only to a subsample of all male respondents. In order to attain representative estimates it is thus necessary to weight respondents to account for the over/undersampling of their geographic and gender

⁵The following countries are included (with year of DHS survey): Angola (2015), Benin (2017), Burundi (2016), Cameroon (2011), Congo – Kinshasa (2013), Eswatini (2006), Gabon (2012), Ghana (2014), Guinea (2018), Ivory Coast (2012), Kenya (2014), Lesotho (2013), Madagascar (2008), Malawi (2015), Mali (2018), Mozambique (2015), Namibia (2013), Nigeria (2018), Rwanda (2014), Senegal (2016), Sierra Leone (2013), Togo (2013), Uganda (2016), Zambia (2013), and Zimbabwe (2015).

⁶This is all adult respondents up to the age of 49 (corresponds to age limit of women's interviews) who completed an individual survey and lived within 100 kilometres of a historical mission location. The latter sample restriction is applied to exclude respondents who live in localities in which Christian missions were very unlikely to settle. Doing so facilitates the identification of causal effects (Cagé and Rueda 2016). The results are robust to using an even narrower band of 50 kilometres (see online Supplemental Material).

⁷Note that the DHS assumes that all respondents who completed higher education are literate and does not test their reading skills directly.

group. The weights applied in the analysis below ascertain that the overall weight of each group in the sample corresponds to their population share. This also accounts for differential response rates across the groups. The results presented below are robust to omitting respondent weights from the analysis (see online Supplemental Material).

Historical data

A widely used map on pre-colonial conditions is part of the *Ethnographic Atlas* produced and later updated by Murdock (1967) and Gray (1999) respectively.⁸ The map divides the African continent, excluding all islands but Madagascar, into 840 ethnic homelands and the accompanying atlas provides information on a broad variety of economic, social, and political characteristics of each ethnic group. Based on the map, I identify the ethnic group that was historically present in each DHS locality and determine whether polygamous unions were the primary mode of household organization (*Polygamy*).

In operationalizing polygamy, the focus on household organization is chosen as it captures the economic importance of polygamy and the ease with which missionaries could discern marriage practices (see also Giuliano and Nunn 2018; Henderson and Whatley 2014; Murdock 1949). From the *Ethnographic Atlas*, different degrees in the frequency of polygamy can be identified. In the main analysis, I consider as polygamous those localities where it was practised at least occasionally. Again, the results are robust when only localities with a high incidence are considered polygamous (see the online Supplemental Material).

Historical maps that indicate the location of missions in colonial Africa have been used in several recent studies. I draw on William Roome's 1924 map, which contains information on 1,321 mission stations and was digitized by Nunn (2014).⁹ The locations of all missions are shown in Figure 1. Based on this information, I compute the distance between each locality in the DHS sample and the closest mission, *Mission distance (MD)*. In the matching analyses, I use a binary variable, *Mission*, to indicate whether a mission was present in the respective locality. Again following Nunn (2014) a locality is defined as the area within 25 km of a respondent's point coordinates. This radius takes into account daily walking distances as well as imprecision in the distance measures. However, as this choice remains somewhat arbitrary, the online Supplemental Material shows that the results are robust to various radii between 10 and 40 km.

Jedwab, Meier zu Selhausen, and Moradi (2019) offer an important methodological critique of scholarship on the long-term consequences of Christian missions. They show that the reliance on a few continent-wide maps, among them the one used here, has led to an overestimation of mission effects. Arguably, two factors underlie this bias. First, the map only shows a small proportion of all mission stations, ignoring most smaller ones, which were often run by African priests. As such, studies estimate only the effects of larger, more established stations that were overseen by Europeans. Second, this bias is exacerbated by the fact that mission stations were often set up in 'healthier, safer, more accessible, and richer areas' (Jedwab, Meier zu Selhausen, and Moradi 2019, 2). The authors show that

⁸The updated version, which fills many gaps in the original, is used for the analysis in this paper. The accompanying map was digitized by Nunn (2008). Although most observations in the atlas stem from the nineteenth or early twentieth century, it largely describes slow-changing features of societies, which warrants its use as a source of pre-colonial conditions (for a critical discussion, see Henderson and Whatley 2014).

⁹For a critical perspective on the use of historical mission maps, see Jedwab, Meier zu Selhausen, and Moradi (2019).

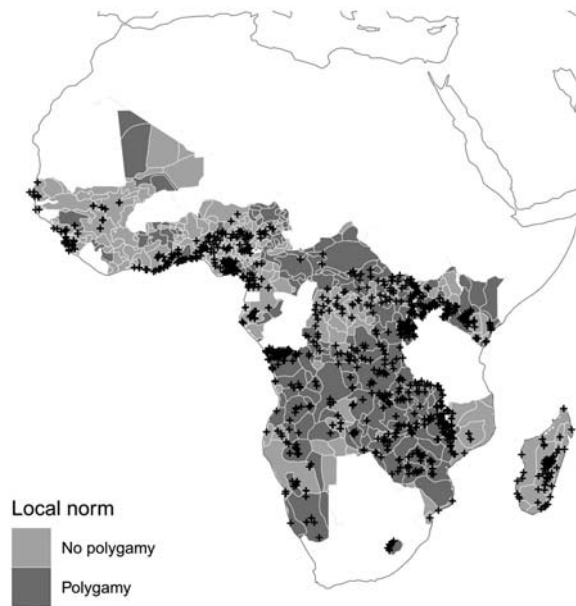


Figure 1. Pre-colonial polygamy and locations of colonial-era Christian missions.

when such endogeneity is accounted for by a wider set of control variables effect estimates are significantly reduced.

While their critique is important, it is relevant for the present study only to a limited extent. In fact, the empirical focus on European-run mission stations helps this study in that it was European missionaries that were most accustomed to monogamy and had a more immediate connection to church authorities in Europe (Turner 1966). As such, the struggle over polygamy should first and foremost materialize at European-run mission stations. However, these stations were less likely to be set up in rural areas, where polygamy was more prevalent, than African-run stations. While both of these differences could have cancelled each other out, leading to similarly intense struggles over polygamy at newer, African-run missions, it is not possible to draw any definite conclusions at this point.

Endogeneity resulting from locational choices of mission stations are an important concern. This paper follows the advice by Jedwab, Meier zu Selhausen, and Moradi (2019) and includes a broader range of control variables than earlier studies. It is important to note that the present paper deviates from earlier studies in an important way: It is not interested in the general effect of missions but how they were conditioned by local context. This implies that endogeneity primarily arises from factors that simultaneously determine missionary presence and the practice of polygamy. These factors are accounted for by the inclusion of adequate control variables.

Controls

Christian missions did not spread out randomly across Africa. Therefore, it is important for analyses of their legacies to account for factors affecting their distribution (Jedwab, Meier

zu Selhausen, and Moradi 2019). Arguably the most important factor was the accessibility of mission fields, which depended mainly on access to transportation by land and water but also geographic knowledge. Beyond that missionaries preferred areas that offered favourable living conditions, allowed for farming, and had few life-threatening diseases. Areas with a high incidence of Islam were frequently avoided as Muslim communities often openly opposed Christian missionaries and colonial administrations were eager to avoid potentially violent escalations. At the same time, missions often moved into areas heavily afflicted by slave trade in the hope to find more ready converts and to advance anti-slavery efforts.

Several contextual factors are particularly important to account for as they are also coinciding with the presence of polygamy. These include exposure to the transatlantic slave trade, which often led to a shortage of men and higher polygamy rates in the affected regions (Dalton and Leung 2014). Furthermore, Muslim communities not only resisted Christian missions, Islam also readily accommodated polygamous practices (Fenske 2015). Finally, polygamy was largely a rural phenomenon, and European missions often preferred more populated urban areas due to larger numbers of potential converts, higher living standards, and better access to transportation.

To capture colonial-era accessibility, I compute the distance of each DHS locality from the coast (*ocean distance*)¹⁰ and from the nearest urban centre with more than 10,000 inhabitants in 1900 (*city distance*).¹¹ This is complemented by information on whether *colonial railways* or *early explorer routes* crossed through the locality.¹² The geographic conditions I account for are *water access*,¹³ *altitude*, *agricultural suitability*,¹⁴ and *terrain ruggedness*.¹⁵ The disease environment is captured by the historical *malaria burden*, which indicates how likely malaria-carrying mosquitoes were present in 1900.¹⁶ To account for the spread of Islam, I calculate the shortest distance to a major Muslim *pilgrimage route*.¹⁷ Data from Nunn (2008) which includes a variable on the number of *slaves* taken during the transatlantic slave trade from each ethnic group in the *Ethnographic Atlas* is also added.

Furthermore, I include *population density* (in 1800)¹⁸ to capture patterns of pre-colonial development.¹⁹ This is complemented by information on the dominant economic activity, i.e. whether the ethnic group in a given locality was agrarian (*agrarian society*).²⁰ Finally, colonial powers imposed different restrictions on Christian missions. Britain was most permissive and supportive of the establishment of missions (Cogneau and Moradi 2014). Therefore, I determine for each locality whether it is situated within the territory of a former *British colony*.

¹⁰Based on data from www.naturalearth.com (retrieved through the R package *rnaturalearth*).

¹¹I use the locations included in Jedwab and Moradi (2016). Information for Madagascar and South Africa is added manually from primary sources.

¹²Digitized historical maps are available from Nunn and Wantchekon (2011).

¹³combine information on rivers and lakes in Africa and determine whether they intersect with the respective locality.

¹⁴Based on data from www.naturalearth.com (retrieved through the R package *rnaturalearth*).

¹⁵Based on raster data from FAO/IIASA (2011) with a 5 arc-minute resolution.

¹⁶Terrain ruggedness has important implications for accessibility and the ability of local groups to resist colonization. I use a coarsened version of the raster data provided by Shaver, Carter, and Shawa (2016).

¹⁷Based on data from the Malaria Atlas Project (www.malariaatlas.org).

¹⁸Major Muslim pilgrimage routes are derived from Al-Naqar (1972), geocoded by Ciolek (2012).

¹⁹Average density based on Klein Goldewijk, Beusen, and Janssen (2010) using a 5 arc-minute resolution.

²⁰See e.g. Acemoglu, Johnson, and Robinson (2002) and Bruhn and Gallego (2011).

²¹The latter variable is derived from the Ethnographic Atlas.

Table 1. Determinants of mission location.

	Mission	No mission	Difference
Polygamy	0.591	0.577	0.015
Location determinants			
Water access	0.477	0.357	0.119*
Agrarian society	0.936	0.93	0.007
Altitude	891.608	847.958	43.65*
Terrain ruggedness	85.834	75.735	10.099*
Agricultural suitability	3463.995	3679.475	-215.48*
Malaria burden	0.838	0.877	-0.039*
Population density (1800)	44.108	15.144	28.964*
City distance [km]	408.148	432.043	-23.895*
Railway access	0.175	0.087	0.087*
Explorer routes	0.196	0.165	0.031*
Pilgrimage routes [km]	1676.685	1634.564	42.121
Slaves [1000s]	80.309	78.149	2.16
Ocean distance [km]	453.255	477.65	-24.395*
British colony	0.621	0.607	0.014
French colony	0.162	0.184	-0.022*

Note: Sample corresponds to all unique DHS localities within 100 km of a historical mission station ($n = 10,651$), split by presence of mission within radius of 25 km. Other local variables computed, as described in text, based on same radius. Differences assessed with two-sided t -tests. (* $p \leq .05$).

Missions and polygamy in colonial Africa

To better grasp where polygamy was the dominant form of household organization, [Figure 1](#) summarizes the data used in this paper. Due to data constraints, dark shaded countries could not be included in the analysis. That being said, the data covers most of sub-Saharan Africa. Another important insight from the map is that missions were widely spread out, with no obvious differences between territories where polygamy was, or was not, practised.

Nevertheless, mission locations were not selected randomly. To determine how different well-known factors affected locational choices, [Table 1](#) compares DHS localities in which a mission was present to those without one. Statistical tests show significant differences for several determinants. With one exception, i.e. agricultural suitability, all of them point in the expected direction. A few variables differences remain insignificant. However, they point in the direction suggested by earlier studies.

It can also be seen that mission presence appears to be somewhat higher in polygamous localities. However, the difference is small in substantive terms and not statistically significant. As such, there is no evidence that missionaries preferred to set up stations in either polygamous or non-polygamous localities. Nevertheless, even these minor imbalances are accounted for in the matching analysis.

Results

Polygamy and missionary legacy

Proximity analysis

In this section I determine the effects of historical mission locations on contemporary educational outcomes using a proximity analysis. Corresponding to the main hypothesis, I test whether proximity to historical mission locations leads to better contemporary educational outcomes, especially in traditionally non-polygamous localities. This hypotheses

is tested with a model that regresses the respective educational outcome (\mathbf{Y}), i.e. primary school completion and literacy, on distance to missions (\mathbf{MD}), interacted with whether the respondent lives in a locality in which polygamy was historically practised (**Polygamy**). Individual and local control variables, \mathbf{Z}_1 and \mathbf{Z}_2 , are also included.²¹ All models include country fixed-effects (α_c) and, unless otherwise stated, use a logit link function to fit the binary dependent variables. A full description of the control variables has been provided above.

$$Y_i = \alpha_c + \beta_1 MD_j + \beta_2 \text{Polygamy}_j + \beta_3 (MD_j \times \text{Polygamy}_j) + \gamma_k Z_{1i} + \gamma_m Z_{2j} + \varepsilon_{ij} \quad (1)$$

Earlier scholarship suggests that missions have a positive effect on long-term educational outcomes. Thus, outcomes should decline with increasing distance to mission stations. This would be supported by a negative β_1 . The main hypothesis put forward in this paper adds further nuance. Mission stations should benefit individuals residing in traditionally polygamous localities less than their counterparts in non-polygamous localities. This implies that polygamy should depress educational outcomes in the immediate proximity of missions stations, i.e. a negative β_2 , and that differences to non-polygamous localities disappears with greater distance to mission stations, i.e. a positive β_3 .

Results from the model estimation are presented in [Table 2](#). Models 1 and 2 estimate the effect of missions, and its interaction with polygamy, on primary school completion, while models 3 and 4 estimate effects on literacy. The difference between the paired models lies in the use of control variables. In all models, it can be seen that distance to missions and contemporary educational outcomes are negatively related (as expected for β_1), thus respondents benefit from proximity to historical mission locations. However, of main interest are the conditioning effects of polygamy. Here, the negative main effect confirms the expectation (for β_2) that contemporary educational outcomes in localities where polygamy was practised are lower in the immediate vicinity of mission stations. This is further supported by a positive interaction effect (as expected for β_3), which attest to a smaller diffusion effect in polygamous localities.

Calculations based on Model 2 reveal that the effects of missions on contemporary educational outcomes are of considerable magnitude. Moving from 50 to 5 km distance to a historical mission location increases the primary school completion rate by 5.2 percentage points in non-polygamous localities. In polygamous localities, the rate grows by only 3.7 percentage points over the same distance. In the immediate proximity of missions, the primary school completion rate in non-polygamous localities is about 97.5% as opposed to 95.2% in polygamous localities. Furthermore, these differences fade over time. This can be seen in [Figure 2](#), which displays how diffusion patterns have changed. While proximity to historical mission locations continues to benefit the youngest generation, there are virtually no differences between localities that traditionally practised polygamy and those that did not.

The overall effects for literacy reveal a similar picture. Zooming in from 50 to 5 km literacy rates increase by 11.1 percentage points in non-polygamous localities and 8.8 points in polygamous localities. Interestingly, literacy benefits are larger than gains in primary school attainment, which suggests that reading skills spread well beyond the

²¹For the estimation, all distance variables are logged.

Table 2. Effects on contemporary educational outcomes (proximity analysis, logit).

	(1) Primary	(2) Primary	(3) Literacy	(4) Literacy
Mission distance (MD)	−0.57 (0.03)***	−0.37 (0.02)***	−0.53 (0.02)***	−0.35 (0.02)***
Polygamy	−0.84 (0.14)***	−0.67 (0.12)***	−0.59 (0.10)***	−0.46 (0.09)***
MD*Polygamy	0.22 (0.04)***	0.15 (0.04)***	0.17 (0.03)***	0.10 (0.03)***
Country FE	X	X	X	X
Individual controls		X		X
Local controls		X		X
AIC	248089.24	219270.08	335141.97	307992.82
BIC	248400.74	219753.45	335453.48	308476.19
Log Likelihood	−124015.62	−109590.04	−167541.99	−153951.41
Deviance	250683.44	222062.21	338578.00	311629.84
Num. obs.	341,688	341,688	341,688	341,688

Note: Mission distance logged. Individual controls are age, gender, and religion; local controls correspond to determinants of mission locations in Table 1, with exception of colonial power (captured by country FE). Standard errors clustered at locality level. (***) $p < 0.001$; (**) $p < 0.01$; (*) $p < 0.05$.

classroom. In the immediate proximity of missions, literacy rates of 92.6% and 88.8% are attained. Looking at diffusion patterns by age cohort, it can be seen that close to historical mission location differences in literacy increase over time. This suggests that there are still discernible legacies of the struggle over polygamy in the youngest cohort. Furthermore, legacies might have disappeared among older cohorts due to life course effects, such as the non-institutional acquisition of literacy during adulthood.

The results of the cohort analysis summarized in Figure 2 could be explained by different transmission mechanisms. On the one hand, differences in institutional capacity that emerged in the colonial era carry forward but slowly fade over time. This could explain the effects on primary school completion rates, and if one considers life course effects also literacy rates. On the other, the divergent patterns for literacy could also imply that non-institutional mechanisms are at play. As such, colonial-era differences in literacy rates might have also carried forward through intergenerational transmission of human capital.

One possibility to further consider intergenerational transmission is to estimate the long-term effects of polygamy and missionary presence through ethnic relationships rather than considering localized effects. For this purpose, historic exposure is computed on the basis of conditions in the historical homelands of respondents' ethnic group rather than conditions in their current place of residence. The full analysis is presented in the online Supplemental Material. It provides no support for intergenerational transmission.

Another transmission mechanism that needs to be considered is changes in the practice of polygamy itself. This paper is interested in how polygamy conditions mission effects, but other studies have shown that polygamy directly affects demand for education (Edlund and Lagerlöf 2006; Tertilt 2005). In line with Fenske (2015), additional analyses, which are included in the online Supplemental Material, confirm that missionary presence reduces the prevalence of polygamy. However, this effect is the same in traditionally polygamous and non-polygamous localities. Further, the main results are robust to controlling for respondents' marital status, i.e. whether they have more than one partner. This suggests that the legacy of the struggle over polygamy cannot be explained by changing rates of polygamy.

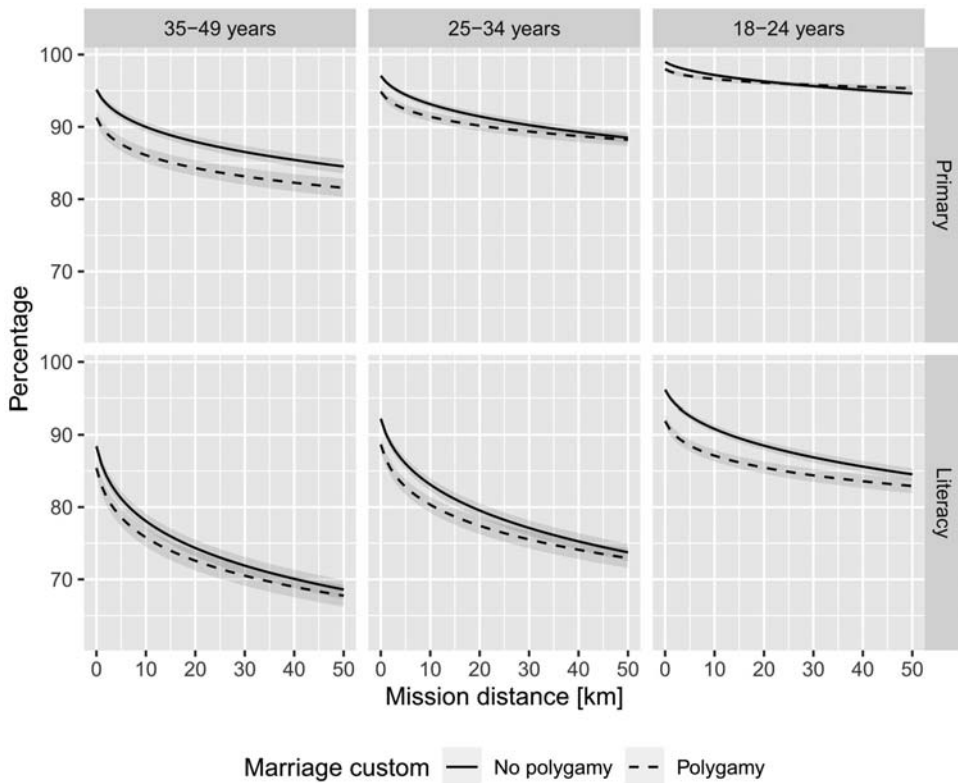


Figure 2. Conditional Effect Plots by Birth Cohort.

Note: Average predicted values of contemporary outcomes based on models 2 and 4 in online Supplemental Material Table S3. Mission distance computed based on location of DHS respondents and nearest historical mission station (1924).

Matching analysis

An important method to improve the estimation of causal effects based on observational data is matching. Matching addresses the potentially confounding effects in observational data that result from the sample composition, in particular imbalances in covariates across treatment and control groups. Matching methods reduce such imbalances and thus increase the plausibility of causal interpretations of statistical effects (Ho et al. 2007).

The treatment here is the presence of a mission in a respondent's locality during colonial times. In particular, this binary variable indicates whether a mission was present within 25 km of respondents' place of residence. Whether a respondent's locality received this treatment is influenced by a number of covariates which might also affect the outcome of interest, educational attainment today. To balance these covariates across treatment and control groups I use one-to-one greedy matching, joining up each treated locality with one untreated locality based on the smallest Mahalanobis distance. The Mahalanobis distance is computed based on the determinants of treatment assignment, i.e. the determinants of mission locations discussed in the previous sections.

As a preparatory step, I remove all observations that are not within the range of common support, i.e. have scores outside of the range of scores in the other experimental group. Furthermore, I constrain the matching procedure to exact matching on several

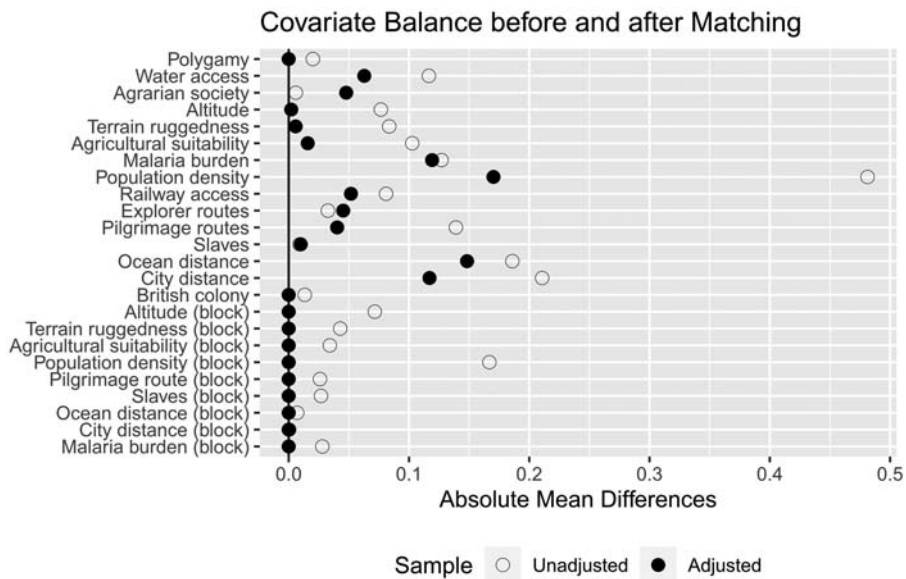


Figure 3. Covariate balance before and after matching.

Note: Absolute mean differences of standardized values. Blocks of continuous variables correspond to whether or not unit is above median value in treatment group.

variables. Doing so is most important for the polygamy variable as this assures the independence from treatment status, which is important to reliably estimate the interaction between the two. As missions enjoyed greater liberties in British colonies, the corresponding variable is also matched exactly. The overall balance is further improved by exact matching on blocks of all continuous variables.²²

As Figure 3 – a covariate balance plot of all the variables included in the matching procedure – shows, imbalances could not be entirely removed, but they have been greatly reduced. The largest differences that remain concern population density, ocean distance, and city distance. For all other variables the standardized mean differences between the treatment and control group could be reduced considerably (all below one tenth of a standard deviation). Following the matching procedure, the matched localities are merged with the survey data. This procedure leads to a sample of 179,592 respondents. To assure equal weighting of each locality in the following analysis, observations are reweighted by accounting for the differential numbers of respondents per locality.

Based on the matched sample and using the binary treatment variable, *Mission*, instead of the distance to the nearest mission, I re-estimate the models used in the proximity analysis.²³ The first model (5) in Table 3 attests to a positive statistically significant effect of the mission variable on contemporary primary school completion. The interaction with Polygamy indicates that this effect is only half as strong in localities that practised polygamy. In substantive terms, mission presence increases the probability of

²²This is done by dichotomizing each continuous variable by determining whether or not it exceeds the median value in the treatment group. As a result, matches across these thresholds are ruled out.

²³For comparison purposes, the online Supplemental Material includes regression results using the treatment variable on the full sample (without matching). The results are similar but reveal somewhat larger effects.

Table 3. Effects on contemporary educational outcomes (matching analysis, logit).

	(5) Primary	(6) Primary	(7) Literacy	(8) Literacy
Mission	0.73 (0.06)***	0.57 (0.06)***	0.65 (0.05)***	0.48 (0.05)***
Polygamy	0.06 (0.09)	−0.08 (0.08)	0.02 (0.06)	−0.13 (0.06)*
Mission*Polygamy	−0.41 (0.07)***	−0.31 (0.07)***	−0.29 (0.06)***	−0.17 (0.06)**
Country FE	X	X	X	X
Individual controls		X		X
Local controls		X		X
AIC	140043.27	126765.22	197323.72	184825.30
BIC	140336.11	127219.62	197616.55	185279.70
Log Likelihood	−69992.64	−63337.61	−98632.86	−92367.65
Deviance	130649.95	117198.40	183473.85	170965.91
Num. obs.	179,472	179,472	179,472	179,472

Note: Mission indicates historical presence in DHS locality. Individual controls are age, gender, and religion; local controls correspond to determinants of mission locations in Table 1, with exception of colonial power (captured by country FE). Standard errors clustered at locality level. (***) $p < 0.001$; (**) $p < 0.01$; (*) $p < 0.05$.

primary school completion by 8.2 percentage points in non-polygamous localities and 3.9 percentage points in polygamous localities. These results are corroborated by model 6, which adds controls that account for imbalances that remain after the matching.

Models 7 and 8 estimate the treatment effect on contemporary literacy. The effect for the mission variable is almost identical to the effects on primary school completion. The interaction term also shows a reduced effect in localities with polygamy. Calculations based on model 7 show that the probability of someone living in a non-polygamous locality to be literate increases by 11.0 percentage points as a result of missionary presence. This effect is only 6.4 percentage points in polygamous localities.

The absolute effect sizes show clearly that missions contributed less to educational outcomes in polygamous localities. However, formal education appears to have had a greater multiplier effect in polygamous localities. For every additional primary school graduate, there are on average an additional 1.7 persons who can read. The same factor is only 1.3 in non-polygamous localities. This indicates that literacy rates in polygamous localities improved at a relatively faster rate than in non-polygamous localities. I discuss the implications of this result below.

Robustness

The presented results are – with a few exceptions regarding literacy effects in the matching analysis – robust to a variety of checks, such as the already mentioned re-specifications of key variables, including polygamy and mission presence. The robustness checks include omitting respondent weights, restricting the sample to a narrower band around mission stations, and excluding observations from Madagascar, the only non-continental case in the sample. Further details and the corresponding regression tables can be found in the online Supplemental Material.

Discussion

In spreading Christianity in Africa, colonial-era missions often sought to overcome local norms that did not align with their own. The struggle over polygamy was particularly intense due to high stakes for missions and local populations. In order to understand how this struggle affects contemporary development, the analyses in this paper

zoomed in on one of the most important legacies of missionary work: the expansion of Western-style education.

In line with earlier work, I find that colonial-era missions do have a lasting impact on educational outcomes, in particular primary school completion and literacy. However, there are considerable spatial differences. Missionary presence is associated with relatively higher educational outcomes in traditionally non-polygamous localities than in polygamous ones. This supports the main hypothesis that missions' insistence on and promotion of monogamy curbed local demand for education. Until today the educational landscape of sub-Saharan Africa reflects the colonial struggle over polygamy.²⁴

The simultaneous analysis of formal and informal educational outcomes provides two valuable insights. First, it shows that missions are not only associated with improved formal educational attainment, in particular primary school completion, but also informal outcomes, such as reading skills, which are of more immediate benefit. Second, the analysis showed that there are more additional literates for every primary school graduate in polygamous localities than in non-polygamous localities. This suggests that it was generally easier for missions to control access to schooling rather than the spread of skills beyond schools.²⁵

The findings also inform our understanding of potential transmission channels. Research on colonial legacies frequently emphasizes persistence of colonial-era institutions to explain contemporary outcomes (Acemoglu, Johnson, and Robinson 2001; Bolt and Bezemer 2009). As such, missionary investments in educational facilities and resources might have carried over into the post-independence era (Nunn 2014). Alternatively, non-institutional mechanisms such as the intergenerational transmission of values and skills might also underlie the legacy. As such, educated parents might have higher educational aspirations for their children or might themselves teach their children certain skills. Most findings here are compatible with both channels. On the one hand, the relevance of non-institutional mechanisms finds support in the finding that in polygamous localities literacy spread to a greater degree outside of the institutional classroom setting. On the other, the fact that effects could only be found locally but not when considering historical conditions in ethnic homelands speaks against the intergenerational transmission of human capital. That being said, more research on transmission channels are needed, even if effects are limited locally.

The empirical analysis is not free of caveats. As such, the research design does not allow for a causal identification of the hypothesized effects. While the extensive use of control variables and the application of matching techniques accounts for numerous alternative explanations, the possibility of an omitted variable cannot be excluded. Another important caveat is that the historical data only features a share of all mission stations, covering only those led by Europeans. It misses the larger number of African-run stations, which were often located in rural areas where polygamy was more prevalent. At the same time, African missionaries might have enforced monogamy less strictly. It therefore

²⁴Further analyses in the online Supplemental Material provide preliminary evidence that the struggle over polygamy also affected the pace at which Christianization proceeded, with non-polygamous areas being more favourable.

²⁵A reviewer has pointed out that this might also be due to self-selection, i.e. children of polygamous parents might be less likely to go to school but those who do might be more likely to go to better schools.

remains an open question how exactly and how intensively the struggle over polygamy manifested beyond European-run missions stations. Despite their own limitations in scope and generalizability, smaller studies, such as country cases, for which more detailed geographic data sources are available, could be a suitable complement to this study (Jedwab, Meier zu Selhausen, and Moradi 2019).

Conclusion

This paper has shown that the colonial struggle over polygamy continues to affect Africa's educational landscape until today. Arguably, missions' insistence on monogamy decreased local demand for education where polygamy was traditionally of high economic and social import. As a result, polygamous localities continue to have lower educational outcomes. As such, it was not only the external imposition of education, i.e. its supply, that marked colonial-era developments, but Africans played a decisive role in where and how education could spread lastingly.

Do these findings have implications beyond sub-Saharan Africa? While Christian missions were active all around the globe, and have left a lasting imprint on societies in Latin America and Asia (Calvi, Hoehn-Velasco, and Mantovanelli 2020; Valencia Caicedo 2019), polygamy was not as prominent anywhere else in the world. As such, it is possible that the struggle over polygamy is largely an African phenomenon. However, missions set out to overcome many other local norms, such as bride price, genital cutting, or matrilineality, and one could reasonably expect similar struggles and legacies to unfold.

More generally, the present study showcases the benefits of integrating local conditions and actors into the analysis of colonial legacies. So far, most research incorporates pre-colonial variables to account for the potential endogeneity of colonial-era interventions. The present paper took a different route, explored interactions between the two kinds of variables, and thereby developed the importance of local responses to external interventions. Considering local actors and context not only enhances our understanding of historical processes, like colonialism, but also present-day phenomena, like international aid and development projects in particular. It might also help in overcoming some of the Western-centrism that results from a dominant focus on external actors in historical and contemporary research on developing countries.

The findings presented here should be probed and expanded by future studies. One way forward would be the exploitation of natural experiments or other sources of exogenous variation in missionary activity. Furthermore, case studies could make use of more detailed and more complete data sources. Such sources can also provide more room to dissect the transmission mechanisms underlying the long-run effects of the struggle over polygamy. Finally, future research could explore whether the struggle over polygamy has affected other contemporary disparities, such as in economic or health outcomes.

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