The origins of formal educational and gender inequality in Zambia, 1924–1990

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Abstract

This paper examines the origins of formal education in colonial Zambia and its long-term consequences for educational attainment and gender inequality. Combining novel panel data on the location of missionary stations and mission school enrolment by gender and missionary society from 1924 to 1953 with contemporary data from the 1990 Zambian census, we analyze the long-term effects of missionary education. Our results are threefold. First, we document that despite substantial schooling expansion after the mid-1930s, overall enrolment remained low and uneven between the sexes at the end of the colonial period. Although Protestant missions provided more equal gender access than Catholic schools, this was insufficient to close the overall gender inequality in education by the end of the colonial period. Second, we find that historical missionary presence is associated with higher educational attainment post-independence. We document that the impact of early mission density on educational outcomes was smaller for early cohorts compared to the more substantial effects of later mission density on later cohorts, with no significant difference between Protestant and Catholic mission activity. Third, we find that the difference in years of education between males and females has narrowed post-independence, most prominently in areas with historically more mission activity.

Keywords: colonial Zambia, Christian missionaries, gender inequality, regional inequality, education.

JEL codes: N3, N37, I21, J16, Z12.

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1. Introduction

Despite considerable progress made by African states in raising school enrolment and educational attainment across sub-Saharan Africa in the post-independence era, it remains the region with the highest rates of educational exclusion (UNESCO 2019). Up to 30 percent of children between the ages of 6 and 14 remain out of school, and access to schooling is often unequally divided along regional and gender lines (Lloyd and Hewett 2009; UNESCO 2024). Of the 17 countries worldwide where girls have not yet caught up with boys in primary school enrolment, 12 are in sub-Saharan Africa (Baten et al. 2021). This paper contributes to the literature on the historical roots of contemporary gender inequality in education by exploring both the immediate and long-term consequences of access to Christian missionary education on educational attainment and the educational gender disparity in Zambia. We investigate: (1) the influence of missionary educational provision on educational attainment and the gender inequality in education during the colonial era and the post-independence period in Zambia, and (2) whether this effect differed for Protestant versus Catholic missionary educational efforts.

The impact of Christian missions in colonial Africa, India, and Latin America on various outcomes, such as local economic development, education, health, fertility, social mobility, culture, and political participation, has been extensively studied (see Jedwab, Meier zu Selhausen and Moradi 2022 for a comprehensive overview). Since missions were the primary providers of education in Africa during the colonial period, their impact on long-term educational outcomes for African countries has garnered significant attention (Becker and Meier zu Selhausen 2023; Kudo 2017; Montgomery 2017; Nunn 2014). Most studies find substantial positive effects of early colonial missionary activities on contemporary educational outcomes (Gallego and Woodberry 2010; Wantchekon, Klašnja and Novta 2015; Jedwab, Meier zu Selhausen and Moradi 2022; Cappelli and Baten 2021; Becker and Meier zu Selhausen 2023). Additionally, various studies find a denomination effect, where especially Protestant missions have been linked to improved educational outcomes in sub-Saharan Africa (Alesina et al. 2021; Cagé and Rueda 2016; De Haas and Frankema 2018). However, recently Becker and Meier zu Selhausen (2023) documented that Catholic missions contributed equally to present-day educational outcomes.

Additionally, there is an expanding literature on the gendered impact of educational outcomes. Girls received fewer years and lower quality of education during the colonial period, discouraging parents from sending their daughters to school (Baten et al. 2021). Various studies highlight a denominational effect in these gender differences. Some studies show that Catholic missions prioritized boys' education, leading to gender inequality (Becker and

Woessmann 2008; Nunn 2014), while others link Protestant missions to more female educational progress and gender equality (De Haas and Frankema 2018; Kudo 2017; Okoye and Pongou 2022; Nunn 2014; Montgomery 2017). Meier zu Selhausen (2014) and Meier zu Selhausen and Weisdorf (2016) found decreasing gender inequality in Uganda from the late colonial period onward between Protestant couples, with more women entering the formal workforce. Nunn (2014) noted the positive influence of Protestant missions on both historical and contemporary female education. Montgomery (2017) observed improvements in educational outcomes for both Protestant and Catholic missions in Tanzania, but only Protestant missions reduced current gender inequality. Recent studies however also question these denominational differences. Baten et al. (2021) documented that both Protestant and Catholic missions reduced the educational gender disparity to a similar extent. Becker and Meier zu Selhausen (2023) found no denominational differences in positive influences on women's education and labor market outcomes. Relatedly, Jedwab, Meier zu Selhausen and Moradi (2022) and Baumert (2022) observed no significant denominational effects on literacy or gender inequality.

Several factors make Zambia a particularly compelling case for studying educational development. First, Zambia was one of the wealthiest African countries in 1960 due to its large copper reserves (Broadberry and Gardner 2022). Second, as in other parts of colonial Africa, formal education in Zambia was initially provided by missionary societies, later supported by government grants (Bolt and Bezemer 2009; Frankema 2012; Snelson 1974; Woodberry 2004). After the first missionaries entered the region in 1883, Christianity quickly gained a strong foothold, making Zambia one of the colonies in Africa with the highest mission density (Beck 2007; Chiseni 2022). However, despite increasing government revenues from copper and high missionary presence, primary school enrollment rates in the colony did not exceed average levels for the continent (Meier zu Selhausen 2019), and gender inequality in education was substantial. In 1963, 75 percent of Zambian males and 93 percent of females above the age of 16 had fewer than four years of primary schooling (Census Report 1963). The gender unequal access to education has persisted, even though enrollment rates increased after independence (UNESCO 2015). In 2010, 27 percent of females in rural Zambia had not received any education, compared to 18 percent of males (Masaiti and Chita 2014). Women are still more likely to drop out of school after their first years in primary school (Nkosha and Mwanza 2009).

What sets Zambia apart as a case study is its combination of significant natural resources and extensive missionary activity, set against relatively low levels of school enrollment and persistent gender inequality in education at the end of the colonial period compared to other neighboring countries, such as Zimbabwe and Malawi (Frankema 2012). This paper provides new insights

by analyzing how missionary activity in colonial Zambia shaped the development of education and gender inequality over time. By creating novel spatial data on missionary activities throughout the colonial period, we explore the mechanisms through which missionary exposure contributed to overall educational development and current educational inequalities.

Using newly collected annual information, we construct a panel dataset at the mission society level, covering: (1) the locations of all main Christian mission stations, (2) enrollment rates for boys and girls in primary school per provider (missionary societies and colonial government), and (3) government educational expenditures in colonial Zambia for each year between 1925–1953. Compared to the commonly used mission atlases, such as Roome (1925), we created a more complete dataset mapping the location of missions over 25 years (1924–1948). During the post-1924 period, we observe exponential growth in the number of mission stations. The panel data structure allows us to analyse temporal changes and long-term effects of missionary activities. Specifically, we can examine whether the influence of early missions differs from those that were established post-1924 (we use the following years: 1925, 1936, and 1948).[1]

We use this data to study the role of missionary societies in establishing formal education and gender inequality in school enrollment in colonial Zambia. To study the long-term effects of missionary schooling, we combine our data on the spatial location of mission stations with individual-level data on educational attainment from the 1990 population census for Zambia. Specifically, we use three 20-year birth cohorts (1910–1929, 1930–1949, 1950–1969) and link them to the density of missions in the individual's district of birth, with missionary density measured during each birth cohort for the first two cohorts (1925 and 1936 respectively), and in 1948 for the last cohort (1950–1969).

Our findings are fourfold. First, consistent with previous literature, we find that Christian missionary efforts played an important role in the provision of education in colonial Zambia (Bolt and Bezemer 2009; Gallego and Woodberry 2010; Frankema 2012; Meier zu Selhausen 2019). However, sizeable schooling expansion did not occur until the mid-1930s despite early missionary presence, due to both limited supply and demand (especially for girls). As indicated by Snelson (1974), parents generally remained unconvinced of the value and relevance of education for their daughters, as they feared Western education would make them unattractive for marriage. We find no denominational differences between Protestant and Catholic missionaries in terms of early expansion. Although Protestant missions enrolled more students overall, this was due to their larger supply of mission schools. The average num-

1 We use the density in 1924 and 1945 as robustness checks, see Appendix Table A2.

ber of pupils per mission school was almost identical between Catholic (79 students per school) and Protestant missions (77 students per school) over the 1925–1953 period.

Second, we observe a clear gender disparity in colonial education, with boys receiving preferential access. This was further compounded by the reluctance of many African parents to educate their daughters, especially in the early decades of the 20th century (in line with Snelson 1974; Baten et al. 2021; Becker and Meier zu Selhausen 2023). In 1925, only one out of three children attending primary school were girls, and this share decreased continuously until the 1940s, after which it gradually increased back to the 1925 level (Annual Educational Reports 1924–1953). Further, we find a differential denominational effect in terms of gender access to education: Protestant missionary schools provided more gender-even access than Catholic schools, though not enough to close the overall gender inequality. By the end of the colonial period, approximately 40 percent of Zambian girls aged 7 to 14 attended school, compared to 60 percent of boys (Annual Educational Report 1963).[2]

Third, we find a pronounced long-term effect of historical missionary presence on contemporary years of education attained and literacy rates. Those born in districts with historically greater density of mission schools obtained more years of education, were more literate, and this effect strengthened for later cohorts. The results further show that although girls' educational attainment lagged behind boys across all cohorts, the gap in years of schooling and literacy first widened for the 1930–1949 cohort and then narrowed for the 1950–1969 cohort, most prominently in areas with higher mission density.

Fourth, when we decompose the results by denomination, we find that Protestant and Catholic missionaries are both associated with positive long-term educational outcomes and a smaller gender inequality in terms of years of attainment and literacy, although the effect is slightly larger for Protestant missions. This observation shows that the initially more benign effects of the Protestant missionary presence for female educational outcomes were not persistent and contrast with much of the literature, which shows that historical Protestant missionary activity is more strongly correlated with contemporary educational outcomes than Catholic missionary activity (Gallego and Woodberry 2010; Alesina et al. 2021; Cagé and Rueda 2016; De Haas and Frankema 2018). However, our finding aligns with recent studies, which dismiss the denominational effect on long-run outcomes in Africa (Baten et al. 2021; Becker and Meier zu Selhausen 2023).

Our contribution is twofold. First, we add to the large body of literature on the impact of Christian missions on long-term educational outcomes

2 Primary school-going age was between 7–14 as given in the Annual Educational Report (1963)

(Woodberry 2004; Bolt and Bezemer 2009; Frankema 2012; Meier zu Selhausen 2019; Alesina et al. 2021; Cagé and Rueda 2016; De Haas and Frankema 2018; Becker and Meier zu Selhausen 2023). Our annual data for the colonial period allow us to determine both the magnitude and timing of the missionary contribution to educational expansion, showing that while missionaries were crucial for educational expansion in colonial Zambia, this expansion only occurred after the mid-1930s. Further, while Protestant missions had the largest effect in terms of total enrollment, this was due to the greater number of Protestant mission schools. The positive association between missionary presence and educational outcomes is both persistent and increasing over time. Our analysis captures missionary density throughout the colonial period, revealing that the impact of early mission density on educational outcomes was smaller for early cohorts compared to the more substantial effects of later mission density on later cohorts. Specifically, a higher historical presence of missionary schools at the end of the colonial period is associated with significantly more years of schooling attained and higher literacy rates today for both Protestant and Catholic mission schools.

Second, we contribute to the literature on the gendered impact of Christian missionaries on educational outcomes, highlighting the positive effects of both mission denominations on women's educational achievements (Baten et al. 2021; Becker and Meier zu Selhausen 2023; De Haas and Frankema 2018; Kudo 2017; Okoye and Pongou 2022; Nunn 2014; Montgomery 2017). Using a comprehensive measure of missionary presence throughout the colonial period, we show that missionary education in colonial Zambia was biased towards males until the 1940s, after which the gender ratio in enrollment slowly improved. We document that Protestant missionaries had a stronger effect on female education than Catholic missionaries by enrolling relatively more female pupils, leading to lower gender inequality in their schools in colonial Zambia. In the long run, we find that greater missionary density within a district is associated with lower gender inequality in education, while the denominational effect disappears. Both Protestant and Catholic mission density during the colonial period is associated with smaller differences between females and males in terms of years of schooling and literacy rates, although the effect seems slightly larger for Protestant missions.

The remainder of this paper is structured as follows. Section 2 discusses the background. Section 3 presents the data and descriptive evidence on the historical development of education and gender inequality in education in colonial Zambia. Section 4 describes the empirical strategy and presents the results. Section 5 concludes.

2. Historical background

2.1. The inception of formal education in colonial Zambia

As in other British African colonies, formal education in colonial Zambia was primarily provided by missionary societies (Frankema 2012; Woodberry 2004). The first missionary school was established at the end of the 19th century, when the area of contemporary Zambia was under the control of The British South Africa Company (BSAC). In 1883, the Scottish missionary Frederick Stanley Arnot established the first missionary school in colonial Zambia among the Lozi people in the Barotse region. However, the school closed shortly afterward due to irregular attendance (Snelson 1974). Soon after, the Paris Evangelical Mission, with King Lewanika's support, opened another school in the Barotse region. In 1889, the London Mission Society (LMS) established their first successful school at Fwambo in Northern Zambia among the Bemba people.

The White Fathers, a Catholic missionary society from France, began their work in Northern Zambia more than a decade after the Protestants had established their first schools (Rotberg 1965). With larger financial resources, they paid children attending their school one penny a day, which resulted in a higher demand for schooling. By 1925, the White Fathers had established over 500 village schools with about 25,000 children enrolled (Snelson 1974; Educational Report 1929). Overall, Catholic mission schools totaled 638 schools, enrolling close to 30,000 pupils. In contrast, by 1925 the Protestant missionary societies had established 1,366 schools, enrolling nearly 70,000 pupils. Meanwhile, the BSAC had only built one school, the Barotse National School, which enrolled about 570 pupils in 1924 (Snelson 1974).

2.2. Education in Zambia under the British Protectorate

In 1924, colonial Zambia transitioned into a British Protectorate and Crown Colony. Initially, the number of white settlers was low, but the social structure mirrored that of South Africa and Southern Rhodesia. Settler interests were prioritized over African development, resulting in limited investment in the broader population's economic and social development (Gann 1964). Early colonial spending on public services was constrained by limited revenues. However, with the onset of World War II and rising copper prices, government income increased, benefitting educational expenditures per pupil, which resulted in a significant increase in the number of schools (as seen in Figure 4a) as well as a concomitant increase in pupil enrollment (Figure 4b) from the end of the 1930s onward (Gann 1964).[3]

3 See also Appendix Figure A1 for educational expenditure per capita and per pupil.

Upon assuming administration of the territory, the British government inherited responsibility for the Barotse National School from the BSAC, while missionary societies ran 2,000 schools, educating close to 100,000 children (Annual Educational Report 1929). However, the colonial administration deemed the quality of education provided by these missionary societies inadequate (Carmody 1999). Many teachers lacked formal training and were deployed to village schools with minimal resources and teaching aids. In response, the government enacted the *Native School Ordinance* in 1927, requiring schools to provide a minimum of 120 days of instruction annually by trained teachers. Only 495 missionary schools, a quarter of the total, enrolling a third of all pupils, met this criterion as "proper schools" under this ordinance and received partial financial support for certified teacher salaries (Snelson 1974: 160). The remaining missionary schools were classified as sub-schools and did not receive any financial aid.

Initially, the colonial government made minimal efforts to develop schooling beyond implementing the *Native School Ordinance*. Missionary schools were considered equivalent to government schools if they met the quality standards specified in the *Ordinance*, leading to limited direct government involvement in schooling. Consequently, the Barotse National School stood as the sole government school until the establishment of the Jeanes School in 1929. However, from 1937 onward, colonial authorities began encouraging local governments, known as "Native Authorities", to establish secular government schools. In 1938, the first Native Authority (NA) school opened in the Eastern Province, followed by five more NA schools in the Northern Province in 1939. Despite these efforts, government provision of schooling progressed slowly until the conclusion of World War II, with only 23 NA schools and 28 central government schools in existence by 1946 (Annual Educational Report 1939 and 1949).[4]

Missionary education served multiple roles beyond preparing Africans for the colonial economy. While its primary objective was to propagate the Christian gospel, local demand for schooling was closely associated with its provision of opportunities for social mobility, literacy, and integration into new social and economic networks (Wantchekon, Klašnja and Novta 2015; Meier zu Selhausen, van Leeuwen and Weisdorf 2018). Africans actively sought mission schooling not only to embrace Christianity and read the Bible but also to improve their social standing and access new opportunities under colonial rule (Snelson 1974; Viera 2007). Consequently, missionary education catalyzed significant cultural transformations across African societies (Nunn 2010;

4 From the 1930s onwards there were also other private schooling provided, such as the mines in Nkana and Luanshya, however, the number of pupils enrolled in their schools was low and they were not aided by the government.

Rotberg 1965). Central to the missionaries' evangelizing mission was the belief that girls needed to be educated to be suitable wives for Christian men (Leach 2008). As a result, girls were typically taught separately from boys by female teachers (Becker and Meier zu Selhausen 2023). The lack of female missionaries, especially in the earlier years, proved to be a significant obstacle to the expansion of more gender-equal education.

Not only did the overall provision of education to girls lag behind boys, but girls also often received a different kind of education (Gadsden 1992; Meier zu Selhausen 2019). Adams (2006) and Meier zu Selhausen and Weisdorf (2023) argue that most missionaries supported the concept of domesticity. As a result, the curricula for girls focused on domestic skills such as needlework, cookery, and laundry, preparing them for Christian marriage and motherhood (Gadsden 1992). Education for boys prioritized writing, arithmetic, and vocational skills. Domestic skills were taught during the first years of primary school, leading to lower school attendance for girls beyond the initial years. In 1945, most girls attended school for only three years. By 1963, of the 145,000 girls in primary school, over 100,000 were under 11 years old. Only 1,379 girls received secondary schooling compared to 5,671 boys (Annual Educational Report 1963).

3. Data and descriptive evidence

3.1. Data

3.1.1. Historical education data

To analyze access to missionary education for girls and boys in colonial Zambia (1925–1953), we utilize data from annual education reports (1929–1963) and colonial Blue Books (1925–1948). These records detail the number of government-aided schools and student enrollment by gender across various institutions (government, missionary, and Native Authority). They also provide information on annual government spending and missionary education grants. We measure gender inequality in historical schooling by the absolute difference between the total number of boys and girls enrolled in primary schools for both Protestant and Catholic missions.[5] It is important to note that changes in reporting format limit our ability to analyze data beyond 1953.

5 The absolute difference between the number of boys and girls registered at school is the only gendered measure the data allows for. This measure is sensitive to the size of the school: without any change in the propensity of boys and girls to go to school, a larger school will appear as having a larger gap. However, we show that the size of schools is similar between denominations, and we control for the size of schools in our regressions.

3.1.2. Christian mission locations

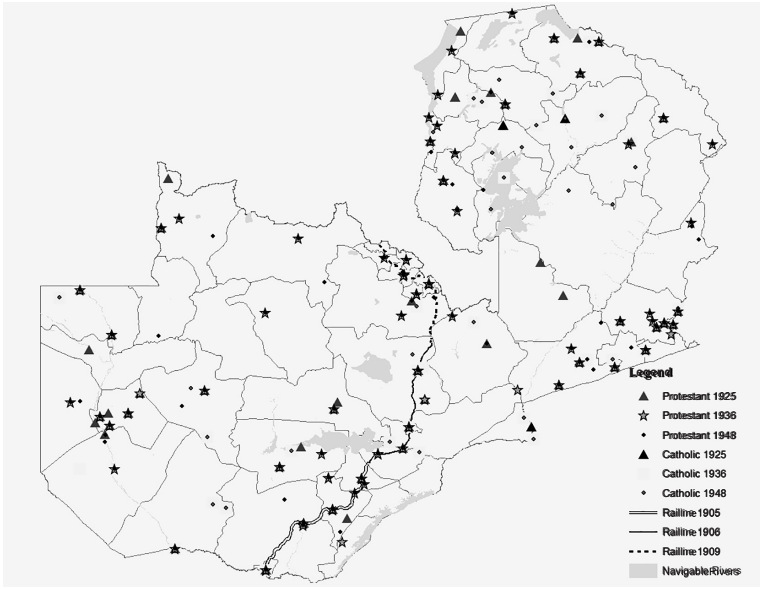
We obtain annual historical information on church locations from the ecclesiastical reports published in the colonial Blue Books for the period 1924–1948. Figure 1 shows the spatial distribution of Protestant and Catholic churches in colonial Zambia for 1925, 1936 and 1948. The ecclesiastical reports do not provide information on outstations, so we only geocode main stations. This limitation minimally affects our ability to capture the provision of missionary schooling, since it was primarily the main stations that operated schools meeting the criteria for a proper school under the *Native Educational Ordinance* of 1927. Moreover, as Jedwab, Meier zu Selhausen and Moradi (2022) pointed out, outstations would mushroom within a 22 km radius of the main stations, which is likely to fall within the district's parameters. Our dataset provides a more complete picture of missionary presence compared to commonly used mission atlases, such as Roome (1925). Specifically, our panel dataset includes 10 additional mission stations in the year 1924, 83 more in 1936, and 151 more in 1948, compared to 61 mission stations in 1924 listed in Roome (1925). To understand the influence of missionary presence on educational attainment, we follow Baten et al. (2021) by using district mission density, calculated as the number of mission stations per individual's birth district. We use the number of missions per district in 1925 for the first cohort (1910–1929) and in 1936 for the (1930–1949) and 1948 for the (1950–1969) cohort.

There are currently 54 districts in Zambia (Admin 3 level). Figure 1 shows the district boundaries overlaying the location of missions during the colonial period for the three benchmark years of 1925, 1936, 1948.[6] The average number of missions per district increased from 1.5 in 1925 to 3.7 in 1948 (see Table 1). In 1925, most missions were established in Chama (8 stations), on the border with colonial Malawi. Chama remained the area with the highest concentration of mission stations, having 9 in 1936 and 12 in 1948. Other districts with similar numbers of missions in 1945 included Luanshya in the Copperbelt, Lundazi in the Eastern Province, Choma in the Southern Province, and Luangwa in the Lusaka Province on the border with Mozambique and Zimbabwe. In 1925, there were 22 districts without any mission station. This number decreased to 12 districts in 1936 and 9 in 1948.

In terms of mission density per 1,000 km², the average density increased from 0.25 mission stations in 1925 to just over 1 per 1,000 km² in 1948. The highest concentration of mission stations was found in small districts, such as Livingstone (the smallest district), which had 5 stations in 1925 and 10 in 1948, translating to more than 13 per 1,000 km². Other districts with high missionary density include Kitwe and Luanshya (both in the Copperbelt).

6 See Appendix Tables A1, A3 and A4 for details on the number of missions per district and number of mission stations per missionary society.

FIGURE 1 ▪ *Spatial distribution of Protestant and Catholic missionaries per district in Zambia, 1925, 1936, 1948*



Sources: created by authors based on colonial Blue Books 1925, 1936, 1948.

Note: the district boundaries are contemporary Admin 3 boundaries.

TABLE 1 ▪ Summary statistics of number of missions and mission density per district

	Number of mission stations			Mission density per 1,000 km^2		
	1925	**1936**	**1945**	**1925**	**1936**	**1945**
Average	1.50	2.37	3.65	0.24	0.63	1.01
Max	8.00	9.00	12.00	6.65	7.34	13.30
Min	0	0	0	0	0	0
Districts without missions	22	12	9			

3.1.3. Contemporary educational data

Post-independence educational attainment information is obtained from the 1990 Census of Population, Housing, and Agriculture data for Zambia (IPUMS). The census provides detailed individual-level data on years of education and literacy and population estimates for the district of birth. We focus on the 1990 Census, which is the earliest publicly available census. Further, we use this rather than the later censuses due to its closer proximity to the establishment of the mission stations (1924–1948). This means the popu-

lation captured in the census is more likely to have been directly influenced by the missionary activities. Our analysis includes three birth cohorts: 1910–1929, 1930–1949, and 1950–1969. Restricting the sample to those at least 21 years old in 1990 ensures that the individuals included in the analysis have likely completed their primary and secondary education, providing a clearer picture of educational attainment. We also restrict the sample to those aged 80 years and below because the elderly (>80 years) are more likely to overstate their age and educational attainment (Baten et al. 2021; Crayen and Baten 2010). The 1910–1929 cohort includes 15,914 individuals, the 1930–1949 cohort comprises 55,102 individuals, and the 1950–1969 cohort comprises 141,000 individuals. The census provides individual and household characteristics, including information on educational attainment, ethnicity, age and district of birth. Table 2 provides summary statistics for the variables included in our empirical analysis.

TABLE 2 ▪ *Descriptive statistics*

Variable	Obs	Mean	Std. dev.	Min	Max
Years of education	455,341	3.941	3.993	0	13
Literacy (dummy)	455,341	0.588	0.492	0	1
Mission density 1925 (log)	382,287	0.847	0.657	0	2.079
Mission density 1936 (log)	498,706	1.037	0.600	0	2.197
Mission density 1948 (log)	500,656	1.475	0.589	0	2.485
Protestant density 1925 (log)	352,332	0.647	0.582	0	1.791
Protestant density 1936 (log)	450,219	1.035	0.697	0	2.197
Protestant density 1945 (log)	449,864	1.300	0.629	0	2.197
Catholic density 1925 (log)	166,233	0.498	0.453	0	1.100
Catholic density 1936 (log)	304,974	0.436	0.465	0	1.610
Catholic density 1945 (log)	353,783	0.661	0.551	0	1.791
Female (dummy)	541,326	0.520	0.500	0	1
Born in capital (dummy)	541,326	0.290	0.454	0	1
Distance to rail (log)	541,326	4.362	1.991	–2.800	6.351
District Population (log)	541,326	11.824	0.676	8.101	12.901
Cash Crop (dummy)	541,326	0.415	0.493	0	1
Copper district (dummy)	541,326	0.204	0.403	0	1
Distance to coast (log)	541,326	1,614.26	223.074	1,208.076	2,051.65
Distance to river (log)	541,326	18.083	14.796	0.528	91.315
Land elevation (log)	541,326	3.805	0.610	2.920	6.162
Provincial fixed effects	541,326	4.299	2.339	1	8
1910–1929 cohort	15,914	1	0	1	1
1930–1949 cohort	55,102	2	0	2	2
1950–1969 cohort	141,000	3	0	3	3

3.1.4 Geographical and economic data

Chiseni (2022) has shown that the locations of mission stations in colonial Zambia were not random but strategically chosen based on various geographic and economic factors, as documented by Jedwab, Meier zu Selhausen and Moradi (2022), Baumert and Bolt (2021), Chiseni (2024), Alpino and Hammersmark (2021), Mantovanelli (2013), Nunn (2010), Johnson (1967). Failing to account for these locational factors when analyzing the influence of mission schools on contemporary outcomes can lead to endogeneity bias in empirical estimations. To address this, we control for several factors.

First, we digitize the historical railway line constructed in 1905–1909, connecting Livingstone in the south with the Copperbelt in the north, to control for the distance to the railway line for each birth district.[7] It is important to note that distance to the railway, representing market access, also directly influences educational expansion and gender inequality (Baten et al. 2021). Second, we use information on Zambia's rivers from Open Knowledge International (OKI) to account for the distance from each birth district to the nearest river. The Eastern-Southern African coastline data from the African Marine Atlas (AMA) is used to measure distance to the coastline. Information on land elevation is sourced from DIVA-GIS (2017). We obtain information on copper mining districts from Aurélien, Ousmane and Pitiya (2022). We obtain information on cash crop growing districts in colonial Zambia from Momba (1985).

3.2. Descriptive evidence

3.2.1. Development of formal education in colonial Zambia

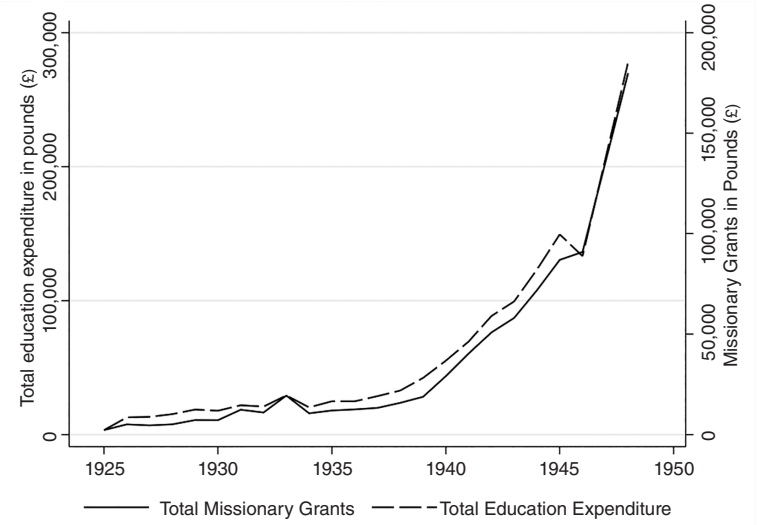
After taking over from the BSAC, the British government aimed to improve schooling quality by implementing the *Native Educational Ordinance* in 1927. Mission schools that met the requirements set by the *Ordinance* received funding from the colonial government. Figure 2 shows that for most of the 1920s and 1930s, total government expenditure on African education remained low, primarily consisting of grants to missionary societies.[8] With the outbreak

7 We include the Euclidean distance from an individual's birth district centroid for all distance measures.

8 In Appendix Figure A1, we plot expenditure on African education per capita and per student enrolled. Expenditures pc and per pupil overall increased but never exceeded 1.1 pound per pupil per annum. Frankema (2012) shows that expenditure on African education in colonial Zambia was low compared to other British colonies, with per capita spending never exceeding 25 percent of the average spending on education in those other colonies.

of World War II, military demand for strategic minerals increased, boosting output and revenues from the colonial Zambian copper mines (Juif and Frankema 2018; Frankema and Meier zu Selhausen 2024). At the same time, the colonial government started to spend more on social services, including education, after 1939 (Butler 2007).

FIGURE 2 ▪ *Government expenditure on education and missionary grants, 1925–1948*

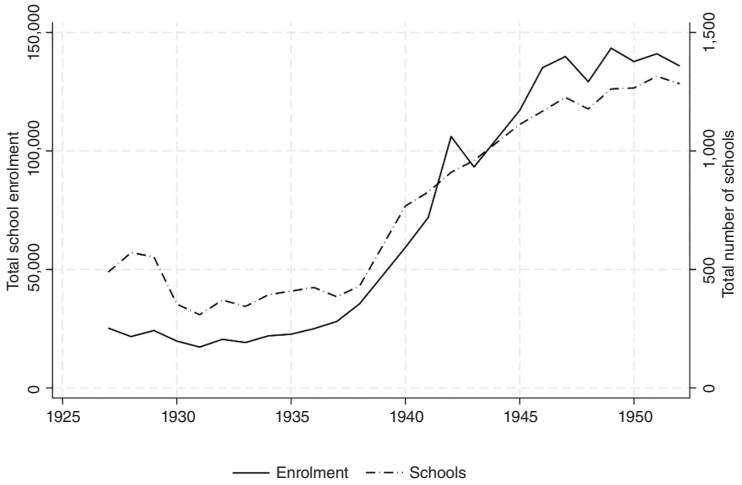


Source: colonial Blue Books 1925–1948.

Figure 3 shows that the expansion of the number of schools and student enrollment mirrors educational expenditures, remaining low and stagnant until the late 1930s. This was not only due to a lack of funding but also limited demand for education. Children played a crucial role in the village economy and were needed for work during planting and harvesting seasons, making schools secondary to immediate labor demands (Rotberg 1965; Snelson 1974).

Given increasing government revenue from booming copper exports (Butler 2007) and rising local demand after the mid-1930s, due to new economic opportunities that required Africans to have some level of education (Meier zu Selhausen 2019), both Protestant and Catholic societies rapidly expanded their schooling supply (Figure 4a). Although Protestant societies operated most schools throughout the period, their share of the total number of schools declined towards the end of the colonial period. In 1940, Protestants ran 71 percent of all primary schools in colonial Zambia, compared to 25 per-

FIGURE 3 ▪ *Total number of schools and total enrollment 1925–1953*

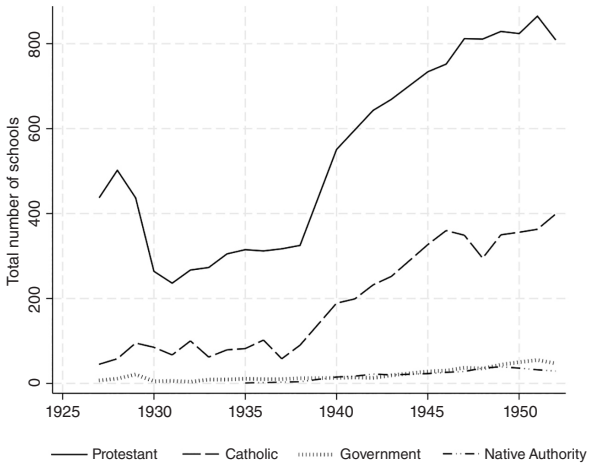


Source: Annual Educational Reports 1929–1953.

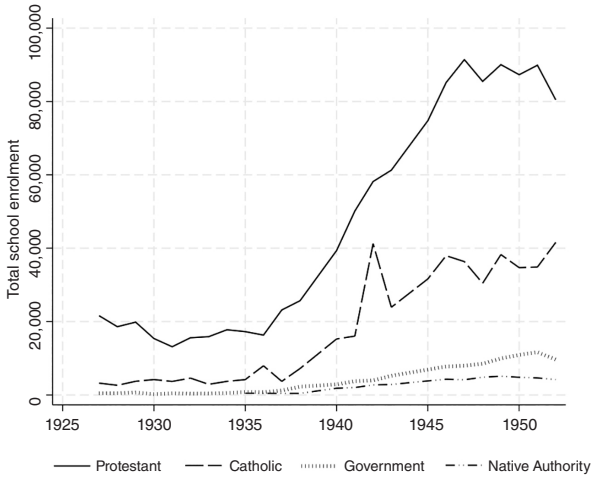
cent for Catholic societies, with the remainder being government schools. By the early 1950s, Figure 4a shows that Protestant societies operated 800 compared to 400 Catholic-run schools, representing 63 percent and 32 percent of total primary schools, respectively. School enrollment in missionary schools increased alongside the number of schools. Figure 5 shows that despite differences in the total number of schools, the average school size per society was comparable. In 1925, Protestant schools had an average of 51 pupils, compared to 46 pupils for Catholic schools. By 1953, this had increased to 101 pupils for Protestant schools and 113 for Catholic schools. The number of government and Native Authority schools and enrolled pupils remained very small throughout the colonial period.

FIGURE 4 ▪ *Number of schools and enrollment by agent, 1925–1953*

(*a*)



(*b*)



Source: Annual Educational Reports 1929–1955.

FIGURE 5 ▪ *Average number of students per school for Protestant and Catholic mission schools, 1925–1950*

Source: Annual Educational Reports 1929–1955.

3.2.2. Gender inequality in formal education

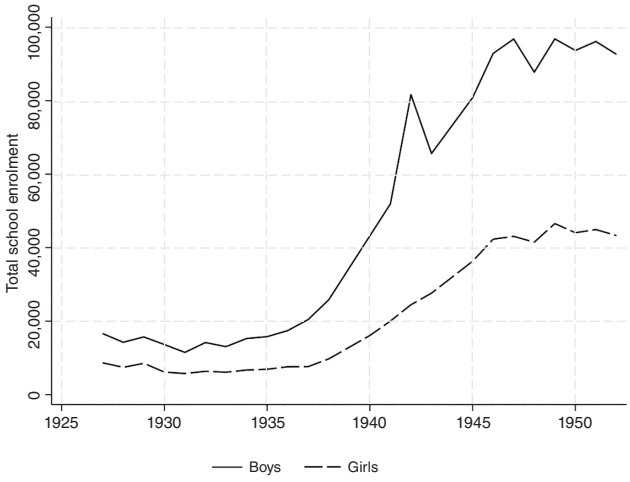
From the 1930s, the government emphasized the need to increase girls' education. This shift was driven by both local demand for educated women to support economic and social development, and metropolitan directives reflecting broader British educational policies and international advocacy (Whitehead 2007; Meier zu Selhausen 2019). As a response, the government subsidized missionary boarding schools, which enrolled nearly 500 girls in 1930. However, these boarding schools could accommodate only a small number of girls, prompting the establishment of other more accessible educational opportunities for girls at central village schools. Figure 6a documents that despite the colonial government's emphasis on expanding girls' access to education, it developed substantially slower than male education throughout the period resulting in a widening educational gap. Figure 6b indicates that while total enrollment expanded rapidly, the share of girls declined until the early 1940s, when girls made up only around 27 percent of the total number of pupils.[9] After World War II, female enrollment begins to catch up. Colonial administrators mentioned persistent prejudice against "educated" girls in colonial Zambia (Annual Educational Report 1938). Snelson (1974) argues that parents remained unconvinced of the value of education for their daughters,

9 This is not considering the spike in enrollment for boys in 1942, which resulted in a decline in the share of girls enrolled in school for that year to below 25 percent.

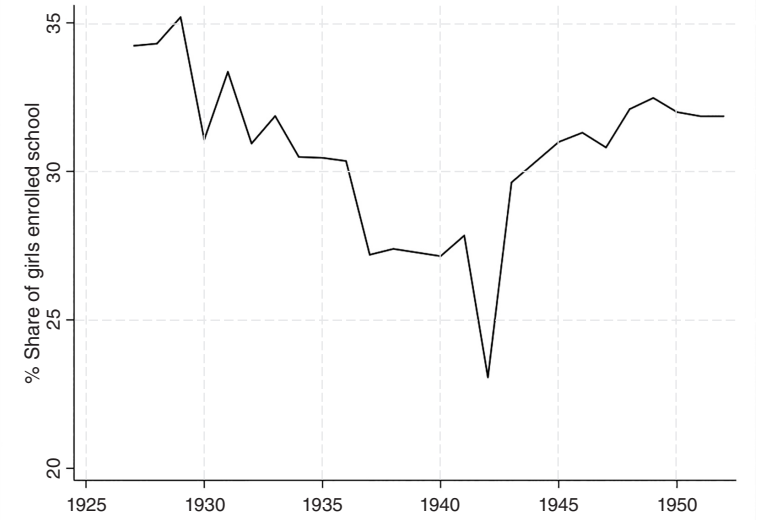
fearing it would reduce their marriage opportunities. It was only after 1945 that this trend reversed, and the share of girls enrolled returned to 1930 levels. On the eve of independence in 1963, 40 percent of girls compared to 60 percent of boys of school-going age were enrolled in primary school (Triennial Survey 1963).

FIGURE 6 ▪ *Primary school enrollment by gender, 1924–1953*

(*a*) Total primary school enrollment by sex



(*b*) Share of girls enrolled



4. Empirical strategy and results

4.1. Empirical strategy

4.1.1. Historical gender inequality in access to education 1924–1948

In this section we present the empirical equation used to analyze the historical gender inequality in access to education; the unit of analysis is the mission society. The number of mission stations for each mission society is detailed in Table A4 in the Appendix. To study the influence of Christian missionaries on the historical gender gap in education in colonial Zambia, we estimate the following panel model:

$$GGap_{it} = \beta_0 + \beta_1 Protestant_{it} + \beta_2 logExpenditure\_PS_{it} + \beta_3 logGrants_{it} + \beta_4 Rail_{it} + \beta_4 Schoolsize_{it} + u_{it}, \quad (1)$$

where $GGap_{it}$ is our dependent variable capturing the educational gender gap (absolute difference between the number of boys and girls enrolled in school) for mission society i at time t. $Protestant_{it}$ is a dichotomous variable that takes the value of one if the mission society is Protestant and zero if it is Catholic.[10] $logExpenditure\_PS_{it}$ captures the expenditure per student by mission society i at time t in (log) British Pounds. $logGrants_{it}$ measures the value of government grants in pounds received by mission society i at time t. We control for access to markets as a driver of educational outcomes, following Jedwab, Meier zu Selhausen and Moradi (2022) as well as Baten et al. (2021). The railway dummy takes the value of one if the mission society has a mission station situated along the rail line and zero otherwise. Finally, we control for the size of the school, measured by the number of enrolled pupils (log). Table 3 presents the results.

4.1.2. Long-term influence of mission schools on educational attainment

To study the long-term effects of mission schools on educational attainment in Zambia, we create a novel spatial dataset by combining historical mission stations, geographical, economic, and pre-colonial ethnic data with individual-level 1990 population census data. We divide the sample into three birth cohorts of individuals ages 21–80 years: 1910–1929, 1930–1949, and 1950–1969.

We estimate an OLS equation with first years of schooling and subsequently literacy rates as our main dependent variable. We hypothesize that in-

10 In the regression analysis we exclude government schools.

dividuals born in districts with more mission schools obtained more years of education and higher literacy rates due to easier access to missionary education. Additionally, due to the persistence of educational infrastructure established by Christian missions (Huillery 2009), we hypothesize that the cohort (1950–1969) born after independence continued to benefit from these establishments.[11]

Our estimation equation is:

$$EO_{ij} = \alpha + \beta_1 logMissionary\ Density_j + \beta_2 Capital_i + \beta_3 Cash\ Crop_j + \beta_4 Copper\ District_i + \beta_5 Female_i + \beta_6 MissionaryDensity_j \#Female_i + \beta_k Dist_j + \beta_7 Elevation_j + \beta_8 logPop_j + District_j + \varepsilon_{c,ij} \quad (2)$$

where EO_{ij} is our educational outcome variable, first schooling years attained by individual i in birthplace j and subsequently a dummy for literacy taking the value of one if the individual i in birthplace j is literate and zero otherwise; $logMisionaryDensity$ measures the log number of mission stations in the birth district.[12] $Female_i$ is a dummy variable that takes the value of one if the individual is female and zero if male. $MisionaryDensity_j \#Female_i$ is the interaction term between the female dummy and missionary density variable. $Dist_j$ includes variables measuring the Euclidean distance from the centroid of an individual's birth district to the nearest railway line, main river and coastline. $Capital_i$ is a dummy variable which takes on the values of one if the individual was born in a district capital city and zero otherwise. $Copper\ District_i$ is a dummy variable that takes on the value of one if individuals are born in a copper producing district. $Cash\ Crop_j$ is a dummy variable that takes on the value of one if the birth district cultivates cash crops (e.g. cotton, tobacco, and groundnuts). $logPop_j$ measures the log population of each district j in 1990. $Elevation_j$ measures the average land elevation in meters per birth district. Finally, we include district fixed effects to account for unobserved heterogeneity.

To understand the influence of missionary exposure on long-term educational outcomes, we first estimate Equation (2) using the total number of mission stations in a birth district, regardless of denomination. Next, we differentiate the effects by including separate variables for Protestant and Catholic mission stations. Tables 4–7 present the results.

11 Our latest cohort includes those born between 1950–1969, and Zambia became independent in 1964. Until then missionaries continued to play a key role in the provision of education.

12 For the regression that includes those born between 1910–1929, we utilize 1925 as the benchmark year, and for the 1930–1949 we use 1936 mission stations and 1950–1969 we use the 1948 mission stations.

4.2. Results

4.2.1. Gender inequality by schooling agent during the colonial period

We study the influence of missionary societies on gender-unequal educational attainment, as evidenced by Equation (2). Table 3 presents the results. Despite the British colonial government's emphasis on education for girls from the 1930s onward, limited progress was made as girls never accounted for more than a third of the total number of pupils enrolled in primary school throughout the colonial period (see Figure 6b). While girls were disadvantaged relative to boys in all forms of education provided, we show in Table 3 that the gender gap for Protestant mission societies is substantially lower than for

TABLE 3 ▪ *Missionary societies and gender gap in access to education in Zambia, 1924–1953*

Dependent variable:			
Gender Enrollment Gap	**(1)**	**(2)**	**(3)**
Protestant mission society (dummy)	–655.4***	–753.0***	–484.9***
	(200.2)	(198.4)	(177.8)
Log Government grant (£)	306.2***	286.0***	669.4***
	(42.23)	(41.83)	(53.21)
Railway (Dummy)		–612.9***	–381.6***
		(157.0)	(140.5)
Log Expenditure per student (£)			–737.0***
			(68.01)
Log school size	956.9***	985.4***	434.8***
	(143.3)	(141.0)	(137.0)
Constant	–4,502.12***	–4,049.96***	–4,933.37***
	(629.5)	(629.5)	(569.4)
Observations	408	408	387
R-squared	0.271	0.298	0.451

Notes: The unit of analysis is the missionary society. We estimate an OLS model; the gender gap is the absolute difference in the number of boys and girls enrolled in school, measured per mission society over time. The Protestant mission variable is a dummy variable that takes on the value of 1 if the mission society is a Protestant mission and 0 otherwise. The log school size variable captures the student-to-school ratio for the various mission societies, controlling the effect size has on the absolute difference in the number of boys and girls enrolled in school. The railway variable is a dummy variable that takes on the value of 1 if the mission society has a mission station along the railway line and 0 otherwise. Log Expenditure per student is the expenditure per student across the different mission societies. Log Grant is the amount of grants received by each mission society in pounds. The results are estimated using Equation 1. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Catholic societies, even when controlling for school size (see Table 3).[13] This suggests that the findings by Nunn (2010) and Montgomery (2017), which associate Protestant mission education with lower gender inequality today, could result from persistent effects of Protestant mission education on gender inequality during the colonial period.

Further, we find that missionary societies receiving more grants focused more on educating boys than girls. This may be due to grants initially being awarded based on the number of qualified teachers (Snelson 1974). As initially most qualified teachers were men teaching primarily boys, most grants went to male-oriented schools. Moreover, we find a negative relationship between distance to the railway and the gender gap.

4.2.2. Long-term influence of missionary presence on educational attainment

To explore the long-term influence of missionary presence on educational attainment, we present results from estimating Equation (2) using individuals' educational attainment reported in the 1990 Census of those born in Zambia during 1910–1969. In Table 4, our dependent variable is years of education and Table 5 uses literacy. In both tables, the "log of missionary density" (measured by the number of missions in an individual's birth district) serves as the primary independent variable.[14] We find a positive association between missionary presence in an individual's birth district and their years of education (Table 4). We observe an increasing association between missionary activity and educational attainment across the cohorts, with the association being the strongest for those born in the 1930–1949 and 1950–1969 cohorts. In column 1, for the 1910–1929 cohort, a 1 percent increase in the log of missionary density corresponds to an approximate 0.6 percent increase in years of education. In column 2, for the 1930–1949 cohort, a 1 percent increase in the log of missionary density corresponds to an approximate 1.6 percent increase in years of education. In column 3, for the 1950–1969 cohort, a 1 percent increase in the log of missionary density corresponds to an approximate 3 percent increase in years of education.

13 The fact that the size of schools is positively and strongly associated with the gender gap is a result of how we calculate the gender gap. Without any change in the propensity for boys and girls to go to school, a larger school will appear as having a larger gap. But including the size of schools shows that the negative results found on the Protestant mission society variable is not driven by the effect of school size.

14 In Appendix Table A5, columns 1 to 3, we test the sensitivity of our main results to ethnic fixed effects. We observe that including ethnic fixed effects in columns 1 to 3 does not significantly alter our results. Thus, our results are not sensitive to fixed effects. Therefore, we focus our interpretation on the results presented in Table 4 without ethnic fixed effects, columns 1 to 3.

In terms of inequality in education, we find that although girls' educational attainment lagged behind boys across all cohorts (Table 4), the gap in years of schooling first increased for the 1930–1949 cohort and then narrowed for the last cohort (1950–1969). Specifically, between the last two cohorts, the difference in years of education decreased from around 2.5 years less schooling for girls born during the colonial period to about 1.8 years less schooling for women born post 1950, reflecting that most of the expansion of schooling was initially biased towards men. This finding mirrors also the development of enrolment during the colonial period (Figure 6b), where the share of girls over total enrolment declined until 1945, after which it started to improve. Baten et al. (2021) finds similar patterns across 21 sub-Saharan countries and coins this the educational gender Kuznets curve, relating the initial increase in the gap to the strong male bias in the initial educational expansion. Additionally, we find that mission density is associated with a smaller gender inequality in education for the last cohort (1950–1969), as in column 3 the interaction between missionary density and the female dummy is positive and significant. This implies that the overall positive association between mission density and years of education as described above is significantly higher for females compared to males (a 0.2 percent extra increase in years of education for a 1 percent increase in missionary density).

In Table 5, we also find a positive and statistically significant long-run link between missionary density and literacy, both during the colonial period and post-independence. Similarly to the years of schooling results, the effect is largest for the cohort born during the last decade of colonial rule (1950–1969 – column 3), although the increase in literacy is less pronounced compared to years of schooling. Additionally, we find a gender difference in terms of literacy, which show the same pattern as years of education with first an increase of the gap for the 1930–1949 cohort (column 2) and then decreasing gap for the last cohort. Finally, the interaction term of missionary density and the female dummy is positive and increasing for the second and third cohort (columns 2 and 3), suggesting that missionary density decreased the gender difference in terms of literacy, most prominently for the last cohort. The fact that we find a continuous and strong association between missionary density and educational outcomes could be due to our panel data of missionary presence; we capture the rapidly increasing missionary activity up until 1948, which provided much of the education for those born between 1950–1969.[15] Overall, our results align with various studies observing a positive effect of missionary activity during the colonial period on contemporary educational outcomes (Alesina et al. 2021; Baumert and Bolt 2021; Cappelli and Baten 2021;

15 Zambia gained independence in 1964, and until then missionaries continued to provide the majority of education.

Gallego and Woodberry 2010; Jedwab, Meier zu Selhausen and Moradi 2022; Montgomery 2017; Nunn 2010; Wantchekon, Klašnja and Novta 2015).

Further, we find that those born in district capital cities had lower educational outcomes on average. The effect could be driven by the fact that missionary societies provided most of their education in rural areas, and urban education was underdeveloped (Snelson 1970: 163; Native Educational Re-

TABLE 4 ▪ *Correlates of years of education, 1910–1969*

Dependent variable:	**(1)**	**(2)**	**(3)**
Years of education	**1910–1929**	**1930–1949**	**1950–1969**
Mission Density (log)	0.570***	1.552***	3.024***
	(0.173)	(0.133)	(0.163)
Female (dummy)	–1.411***	–2.553***	–1.852***
	(0.063)	(0.059)	(0.063)
Female Mission Interaction	0.016	-0.005	0.204***
	(0.063)	(0.052)	(0.039)
Born in Capital (dummy)	0.201	–0.522***	–0.448***
	(0.349)	(0.198)	(0.117)
Distance to Rail (log)	–0.144**	–1.484***	0.298**
	(0.070)	(0.177)	(0.137)
Cash Crop (dummy)	1.127**	2.247***	–2.119***
	(0.506)	(0.185)	(0.196)
Copper District (dummy)	1.719*	0.656	14.429***
	(0.983)	(0.992)	(1.042)
Constant	14.262	–16.369***	–64.178***
	(9.816)	(6.307)	(5.218)
District Fixed Effects	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes
Observations	12,524	50,799	130,580
R-squared	0.101	0.156	0.093

Notes: The table reports OLS estimates. The unit of analysis is an individual. The dependent variable is years of education attained by the individual. All distances are measured in kilometres. Distance to the railway station is included as a log for easy interpretation. In the estimations, we also control for the population log in the individual's birth district. The Born in Capital is a dummy that indicates whether an individual is born in the capital of one of the districts, namely Kitwe, Kabwe, Luanshya, Mufurila, Ndola, Livingstone, or Lusaka and Chingola. We also include a Copper District dummy, indicating whether an individual was born in a copper-producing district. These include Chingola, Kabwe, Lunshya, Mufurila, Ndola, Kitwe, Solwezi, Chililabombwe and Kalulushi. Cash Crop in District dummies capture whether the district the individual was born in grows one or more cash crops; altogether, there are 19 cash crop-growing districts. We use the 1925 mission stations for the 1910–1929 birth cohorts, 1936 mission stations for the 1930–1949 birth cohorts and 1948 Missionary station locations for the 1950–1969 birth cohort. We include district-fixed effects. There are 54 districts in the sample. We also control for district population as a log. The geographic controls include distance to rivers, distance to the coastline, and land elevation. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

port 1929). While the government emphasized the need for extra schools to serve the increasing urban population, they only managed to open one school in Broken Hill (present-day Kabwe) in 1935 and one school in Ndola in 1937 (Snelson 1970). We also find a positive association between access to the railway line and educational outcomes for those born in the 1910–1929 and 1930–

TABLE 5 ▪ *Correlates of literacy, 1910–1969*

Dependent variable:	**(1)**	**(2)**	**(3)**
Literacy	**1910–1929**	**1930–1949**	**1950–1969**
Mission Density (log)	0.060*	0.207***	0.280***
	(0.033)	(0.017)	(0.015)
Female (dummy)	–0.373***	–0.446***	–0.223***
	(0.012)	(0.008)	(0.006)
Female Mission Interaction	0.004	0.033***	0.052***
	(0.011)	(0.007)	(0.004)
Born in Capital (dummy)	0.070	–0.129***	–0.049***
	(0.061)	(0.023)	(0.010)
Distance to Rail (log)	–0.037**	–0.224***	0.043***
	(0.015)	(0.024)	(0.014)
District Population (log)	–0.114	–0.538***	0.286***
	(0.101)	(0.054)	(0.031)
Cash Crop (dummy)	0.105	0.304***	–0.262***
	(0.102)	(0.025)	(0.019)
Copper District (dummy)	0.068	0.303**	1.459***
	(0.197)	(0.128)	(0.095)
Constant	2.353	–2.600***	–5.297***
	(1.689)	(0.809)	(0.459)
District Fixed Effects	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes
Observations	12,524	50,799	130,580
R-squared	0.178	0.206	0.086

Notes: The table reports OLS estimates. The unit of analysis is an individual. The dependent variable is literacy. All distances are measured in kilometres. Distance to the railway station is included as a log for easy interpretation. In the estimations, we also control for the population log in the individual's birth district. The Born in Capital is a dummy that indicates whether an individual is born in one of the capital districts, namely Kitwe, Kabwe, Luanshya, Mufurila, Ndola, Livingstone, or Lusaka and Chingola. We also include a Copper District dummy, indicating whether an individual was born in a copper-producing district. These include Chingola, Kabwe, Lunshya, Mufurila, Ndola, Kitwe, Solwezi, Chililabombwe and Kalulushi. Cash Crop in District dummies capture whether the district the individual was born in grows one or more cash crops; altogether, there are 19 cash crop-growing districts. We use the 1924, 1925, 1936, 1945 and 1948 Ecclesiastical Reports for Missionary station locations. We control for district-fixed effects. Thare 54 districts in the sample. The geographic controls include distance to rivers, distance to the coastline, and land elevation. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

1949 cohorts. This aligns with findings by Baten et al. (2021), who argue that openness to external trade were linked to economic development in areas around railways, which increased employment opportunities, generated family income to finance education, and stimulated demand for education (Deane 1953). For the 1950–1969 cohort, the effect changes indicating that those who lived further from the railway line had better educational outcomes (both in terms of years of education and literacy). This could reflect that the expansion of education first took place in more commercialized areas along the railway and subsequently moved to less developed regions. Similar to the results for access to railway, we find that cash crop growing regions are associated with higher levels of education for the 1910–1929 and 1930–1949 cohorts. However, the effect changes for those born in the 1950–1969 cohort, those born in cash crop areas have lower education outcomes – again suggesting that over time educational expansion moved to regions which were less commercialized. Finally, we find that educational outcomes are better for those born in mining districts, and this effect is especially pronounced for the last 1950–1969 cohort.

In Tables 6 and 7, we decompose missionary density and estimate Equation (2) to examine the effects of Protestant and Catholic missions separately on educational attainment (Table 6) and literacy (Table 7).[16] Our findings indicate an increasingly positive association between missionary activity and educational outcomes for both denominations, particularly for those born after 1930. For Protestant missions, historical missionary activity positively correlates with educational attainment across all cohorts. For the 1910–1929 cohort (column 1), a 1 percent increase in the log of Protestant missionary density corresponds to an approximate 0.5 percent increase in years of education. This association increases to approximately 1 percent for the 1930–1949 cohort (column 3). For the 1950–1969 cohort, the increase corresponds to an approximate 7 percent increase (column 5). For Catholic missions, the results show that for the 1910–1929 cohort (column 2), a 1 percent increase in the log of Catholic missionary density is associated with a 0.05 percent increase in years of education, though this result is not statistically significant. For the 1930–1949 cohort (column 4), the increase in missionary density corresponds to 4.6 percent and for the 1950–1969 cohort (column 6), the increase corresponds to 5.6 percent. As before, the increasing association we find between missionary density and educational outcomes likely is a result of our panel data capturing the expansion in missionary activity throughout the colonial period.

16 Due to multicollinearity, we cannot include the Protestant and Catholic densities in the same equation.

TABLE 6 ▪ *Correlates of years of education by denomination, 1910–1969*

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Years of education	**1910–1929**	**1910–1929**	**1930–1949**	**1930–1949**	**1950–1969**	**1950–1969**
Protestant Density (log)	0.459***		1.017***		6.964***	
	(0.133)		(0.090)		(0.364)	
Catholic Density (log)		0.045		4.604***		5.554***
		(0.184)		(0.866)		(0.243)
Female (dummy)	–1.350***	–1.292***	–2.381***	–2.524***	–1.818***	–1.805***
	(0.060)	(0.094)	(0.052)	(0.055)	(0.059)	(0.052)
Female Protestant Interaction	–0.057		–0.130***		0.227***	
	(0.070)		(0.045)		(0.039)	
Catholic Female Interaction		–0.042		–0.171*		0.300***
		(0.175)		(0.102)		(0.059)
Constant	8.544	6.985**	11.504***	–52.901***	–3.802	35.231***
	(8.605)	(3.455)	(1.827)	(7.268)	(4.700)	(4.570)
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
All Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,225	5,482	43,177	28,182	116,795	87,713
R-squared	0.103	0.094	0.160	0.157	0.098	0.084

Notes: The table reports OLS estimates. The unit of analysis is an individual. The dependent variable is years of education attained by the individual. All distances are measured in kilometres. Distance to the railway station is included as a log for easy interpretation. In the estimations, we also control for the population log in the individual's birth district. The Born in Capital is a dummy that indicates whether an individual is born in the capital of one of the districts, namely Kitwe, Kabwe, Luanshya, Mufurila, Ndola, Livingstone, or Lusaka and Chingola. We also include a Copper District dummy, indicating whether an individual was born in a copper-producing district. These include Chingola, Kabwe, Lunshya, Mufurila, Ndola, Kitwe, Solwezi, Chililabombwe and Kalulushi. Cash Crop in District Dummies capture whether the district the individual was born in grows one or more cash crops; altogether, there are 19 cash crop-growing districts. We use the 1925 mission stations for the 1910–1929 cohorts, 1936 mission stations for the 1930–1949 cohorts and 1948 Missionary station locations for the 1950–1969 cohort. We include district-fixed effects. There are 54 districts in the sample. The geographic controls include distance to rivers, coastline, and land elevation. We also include all the other controls from the main regression in Table 4. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 7 shows similar results for literacy rates, where both Protestant missions and Catholic missions separately are associated with increasing literacy rates, although for Catholic missions this relationship only appears for those born after 1930. The association is strongly increasing for subsequent cohorts for Protestant missions (columns 3 to 6), while for Catholic missions the association with literacy rates is strongest for the 1930–1949 cohort, after which it declines for the last cohort. Overall, we find no significant differences in the effect of Catholic and Protestant missions on long-term educational outcomes in line with Baten et al. (2021), who show that both Protestant and Catholic missionaries are associated with lower educational gender gaps in various SSA

TABLE 7 ▪ *Correlates of literacy by denomination, 1910–1969*

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Literacy	**1910–1929**	**1910–1929**	**1930–1949**	**1930–1949**	**1950–1969**	**1950–1969**
Protestant Density (log)	0.047*		0.123***		0.671***	
	(0.026)		(0.011)		(0.034)	
Catholic Density (log)		–0.054		0.707***		0.405***
		(0.035)		(0.117)		(0.022)
Female (dummy)	–0.365***	–0.365***	–0.420***	–0.404***	–0.210***	–0.174***
	(0.011)	(0.017)	(0.007)	(0.007)	(0.006)	(0.005)
Female Protestant Interaction	–0.003		0.016***		0.049***	
	(0.013)		(0.006)		(0.004)	
Catholic Female Interaction		–0.009		0.009		0.047***
		(0.032)		(0.012)		(0.005)
Constant	1.741	0.952	2.543***	–6.950***	0.642	4.539***
	(1.428)	(0.628)	(0.248)	(0.955)	(0.418)	(0.475)
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
All Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,225	5,482	43,177	28,182	116,795	87,713
R-squared	0.179	0.176	0.209	0.199	0.090	0.072

Notes: The table reports OLS estimates. The unit of analysis is an individual. The dependent variable is a dummy for literacy taking the value of one if the individual is literate and zero otherwise. All distances are measured in kilometres. Distance to the railway station is included as a log for easy interpretation. In the estimations, we also control for the population log in the individual's birth district. The Born in Capital is a dummy that indicates whether an individual is born in one of the capital districts, namely Kitwe, Kabwe, Luanshya, Mufurila, Ndola, Livingstone, or Lusaka and Chingola. We also include a Copper District dummy, indicating whether an individual was born in a copper-producing district. These include Chingola, Kabwe, Lunshya, Mufurila, Ndola, Kitwe, Solwezi, Chililabombwe and Kalulushi. Cash Crop in District dummies capture whether the district the individual was born in grows one or more cash crops; altogether, there are 19 cash crop-growing districts. We use the 1925, 1936 and 1948 Ecclesiastical Reports for Missionary station locations. We control for district-fixed effects. There are 54 districts in the sample. The geographic controls include distance to rivers, distance to the coastline, and land elevation. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

countries and in line with Becker and Meier zu Selhausen (2023), who find no denominational differences in missions' positive influence on present-day.

We also examined the impact of missionary activity on female education specifically, by interacting denomination densities with a female dummy (Table 6 for years of education, Table 7 for literacy). We find both denominations are associated with an initially increasing gender inequality in terms of years of schooling for the 1930–1949 cohort (Table 6, columns 3 and 4), after which mission density is associated with a more rapid narrowing of the gap, in line with Baten et al. (2021). For Protestant missions, in the 1930–1949 cohort (column 3), a 1 percent increase in the log of Protestant missionary density results

in a 0.89 percent increase in years of education for females. This is derived from a main effect of 1.02 percent minus an interaction effect of –0.13 percent. In the 1950–1969 cohort (column 5), the increase results in a 7.19 percent increase for females, combining a main effect of 6.96 percent and an interaction effect of 0.23 percent. For Catholic missions, in the 1930–1949 cohort (column 4), a 1 percent increase in the log of Catholic missionary density results in a 4.43 percent increase in years of education for females, combining a main effect of 5.55 percent and an interaction effect of –1.12 percent. In the 1950–1969 cohort (column 6), the increase results in a 5.85 percent increase for females, with a main effect of 5.55 percent and an interaction effect of 0.30 percent. Also, in terms of literacy (Table 7), we find no clear differences between denominations, as for both denominations, mission density is associated with higher literacy rates for females, most particularly for later cohorts. The effect for Catholic missions only becomes significant for the last cohort (column 6). These findings suggest that the initially more benign effect of Protestant education on female education became less pronounced over time. This contradicts the findings of Nunn (2010) and Montgomery (2017), who associate Protestant mission education with persistent lower gender inequality today. We demonstrate that although initial denominational differences in gender inequality in education existed in colonial Zambia, these disparities did not persist over time.

5. Conclusion

This study underscores the important role of missionary efforts in shaping formal education in colonial Zambia and its long-term effects on educational attainment and gender inequality. Our analysis, using newly collected annual data on missionary presence and school enrollment, reveals several findings.

Firstly, the provision of formal education by missionary societies was crucial in increasing school enrollment during the colonial period. Despite this, significant expansion in schooling did not occur until the mid-1930s. Protestant missions enrolled more students overall due to a higher number of schools, yet the average number of pupils per school was similar between Protestant and Catholic missions. This indicates that while Protestant missions had a broader reach, the intensity of educational provision per school was comparable across denominations.

Secondly, we observed a pronounced gender disparity in school enrollment, with boys receiving more educational opportunities than girls. This gender bias was evident throughout the colonial period, peaking in the 1940s before gradually improving. Protestant missionary schools were more effective in providing equal gender access compared to Catholic schools, although this was insufficient to close the overall gender inequality.

Thirdly, we find that individuals born in districts with more mission schools attained higher education levels and literacy rates, with the effect strengthening over time. While girls' educational attainment lagged, the gender inequality narrowed significantly for later cohorts, especially in areas with high missionary presence. Fourthly, when we decompose the results by denomination, we find that both Protestant and Catholic missions positively impacted long-term educational outcomes and reduced the gender inequality, though Protestant missions had a slightly larger effect. This aligns with recent studies challenging the notion of a strong denominational difference in long-term impacts.

Overall, our findings contribute to the literature on the historical roots of contemporary educational outcomes and gender inequality by considering the expansion in missionary efforts in providing education under colonial rule. We demonstrate that while missionary education played a crucial role in expanding educational access, its influence on gender equality was complex and varied over time. The initial advantages provided by Protestant missions in reducing gender disparities were not uniformly sustained, indicating that the relationship between historical missionary presence and contemporary educational outcomes is dynamic and influenced by various factors over time. Our research emphasizes the importance of considering historical context and temporal changes when linking past educational policies to present-day outcomes. Understanding these nuances can inform current educational strategies and policies aimed at addressing gender inequality and improving educational access in Zambia and similar contexts.

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Author contribution statement

Michael Chanda Chiseni: framework, methodology, software and code, formal analysis, investigation, dataset, writing, visualization. Jutta Bolt: framework, methodology, investigation, writing, supervision.

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Appendix

TABLE A1 ▪ *Summary statistics alternative benchmark years 'mission density'*

Variable	Obs	Mean	Std. dev.	Min	Max
Mission Density 1924 (Log)	367,791	0.53	0.63	0	2.19
Mission Density 1935 (Log)	476,842	1.19	0.72	0	2.39
Mission Density 1945 (Log)	498,718	1.52	0.66	0	2.39

Table A1 presents the summary statistics for the alternative benchmark years for the number of missions overall and per denomination. Using the alternative years (1924, 1935 and 1945) we re-estimate Equation (2) for years of schooling including the same variables as for the main specification, see section 3.1.3 of the main text. The data presented here are qualitatively similar to results presented in the main text, although there are some minor differences. The results for 1924 are weaker (and not significant) than we found for 1925, likely due to the fact that fewer missions were present (the mean for 1924 is 0.53, compared to 0.85 for 1925). The coefficient for mission density is increasing for later cohorts, similarly to our main results presented in the text (although the size of the coefficient for the last cohort is somewhat smaller than when we use the density of missions in 1948 as in our main results).

TABLE A2 ▪ *Correlates of years of education 1910–1969*

Dependent variable:	**(1)**	**(2)**	**(3)**
Years of education	**1910–1929**	**1930–1949**	**1950–1969**
Mission Density (Log)	0.436	1.162***	2.440***
	(0.315)	(0.100)	(0.151)
Female (Dummy)	–1.298***	–2.550***	–1.928***
	(0.056)	(0.054)	(0.058)
Female Mission Interaction	-0.072	0.002	0.247***
	(0.063)	(0.042)	(0.036)
Born in Capital	–0.063	0.256	–1.061***
	(0.528)	(0.168)	(0.132)
Distance to Rail (Log)	–0.619***	-0.011	0.503***
	(0.102)	(0.154)	(0.116)
District Population (Log)	–1.699***	1.060***	3.160***
	(0.470)	(0.298)	(0.289)
Cash Crop (Dummy)	1.021***	–0.746***	–1.163***
	(0.140)	(0.181)	(0.167)
Copper District (Dummy)	1.317	3.929***	4.466***
	(1.298)	(1.066)	(0.630)
Constant	15.872***	–17.789***	–14.766***
	(5.421)	(6.327)	(1.843)
District Fixed Effects	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes
Observations	12,342	48,010	130,414
R-squared	0.101	0.156	0.097

Note: The table reports OLS estimates. The unit of analysis is an individual. The dependent variable is years of education attained by the individual. All distances are measured in kilometres. Distance to the railway station is included as a log for easy interpretation. In the estimations, we also control for the population log in the individual's birth district. The Born in Capital is a dummy that indicates whether an individual is born in the capital of one of the districts, namely Kitwe, Kabwe, Luanshya, Mufurila, Ndola, Livingstone, or Lusaka and Chingola. We also include a Copper District dummy, indicating whether an individual was born in a copper-producing district. These include Chingola, Kabwe, Lunshya, Mufurila, Ndola, Kitwe, Solwezi, Chililabombwe and Kalulushi. Cash Crop in District dummies capture whether the district the individual was born in grows one or more cash crops; altogether, there are 19 cash crop-growing districts. We use the 1924 mission stations for the 1910–1929 cohorts, 1935 mission stations for the 1930–1949 cohorts and 1945 Missionary station locations for the 1950–1969 cohort. We include district-fixed effects. There are 54 districts in the sample. The geographic controls include distance to rivers, coastline, and land elevation. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

TABLE A3 ▪ *Number of missionaries by district 1924–1948*

District	Missions 1924	Missions 1925	Missions 1936	Missions 1945	Missions 1948	Area Size
Kabwe	5	5	6	8	9	27,453
Mkushi	2	2	2	3	4	23,096
Mumbwa	0	2	1	0	1	21,949
Serenje	0	2	2	0	0	23,785
Chililabombwe	0	0	0	0	0	949
Chingola	0	0	1	3	5	1,769
Kalulushi	0	0	0	0	0	1,126
Kitwe	0	0	6	9	7	892
Luanshya	0	0	7	10	9	954
Mufulira	0	0	4	5	9	1,169
Ndola	1	2	2	11	4	23,383
Chadiza	2	1	2	1	1	2,631
Chama	9	8	9	11	12	17,714
Chipata	1	0	0	0	1	12,386
Katete	2	0	2	3	3	4,073
Lundazi	4	4	7	10	11	15,153
Petauke	3	2	2	2	2	19,304
Kawambwa	3	2	3	4	4	9,399
Mansa	0	1	4	6	7	15,430
Mwense	1	1	2	2	2	6,439
Nchelenge	0	0	0	2	2	6,903
Samfya	0	1	1	1	1	10,924
Luangwa	1	5	3	9	4	4,089
Lusaka	0	0	0	0	0	17,402
Chilubi	1	1	2	2	4	5,362
Chinsali	2	1	2	3	3	15,612
Isoka	0	0	1	1	1	14,673
Kaputa	0	0	1	2	2	13,550
Kasama	0	0	0	1	1	21,542
Luwingu	1	2	2	6	5	9,012
Mbala	1	2	1	2	2	20,051
Mpika	2	5	3	6	6	41,486
Mporokoso	2	3	3	6	8	12,494
Kabompo	1	0	0	1	1	14,076
Kasempa	0	0	1	2	2	21,712
Mufumbwe	1	0	0	0	0	19,357

Mwinilunga	1	2	2	3	3	21,076
Solwezi	0	0	1	2	2	29,946
Zambezi	1	4	3	3	3	17,945
Choma	2	2	7	8	11	7,082
Gwembe	0	0	0	0	0	4,093
Kalomo	2	1	3	2	3	32,259
Livingstone	3	5	5	8	10	752
Mazabuka	0	0	2	4	5	6,541
Monze	1	1	3	3	4	4,753
Namwala	0	3	3	4	4	21,774
Siavonga	0	0	0	0	0	4,337
Sinazongwe	0	0	0	1	0	4,907
Kalabo	2	0	3	2	2	18,510
Kaoma	0	2	1	4	4	22,273
Lukulu	0	1	0	0	0	16,039
Mongu	3	6	6	5	6	10,371
Senanga	1	1	1	3	4	31,718
Sesheke	1	1	6	3	3	29,823

TABLE A4 ▪ *Number of Mission Stations by Mission Society 1924–1948*

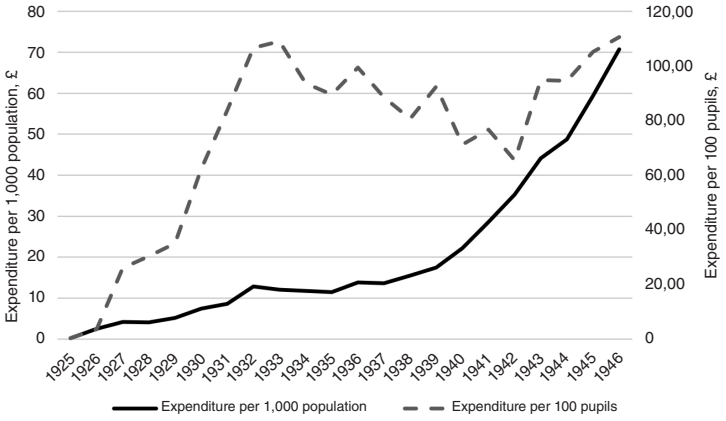
Missionary society	Frequency	Percent
African Methodists	20	3.49
Baptist (Scandinavian)	11	1.92
Baptist (South Africa)	18	3.14
Baptists	12	2.09
Bible Class Mission	23	4.01
Brethren in Christ	29	5.06
Capuchin Fathers Mission	19	3.32
Christian Mission in Many Lands	29	5.06
Church of Christ Mission	29	5.06
Church of Scotland	8	1.4
Copperbelt United Mission	2	0.35
Dutch Reformed	29	5.06
Franciscan Fathers	22	3.84
Jesuit Fathers Mission	29	5.06
Livingstonia Mission	6	1.05
London Mission Society	29	5.06
Methodists	22	3.84
Paris Evangelical Mission	29	5.06
Pilgrim Holiness Mission	19	3.32
Primitive Methodists	7	1.22
Salvation Army	26	4.54
Scottish Mission	16	2.79
Seventh Day Adventist	29	5.06
South African General Mission	29	5.06
United Mission in Copperbelt	16	2.79
Universities Mission to Central Africa	29	5.06
Wesleyan Methodists	7	1.22
White Fathers	29	5.06

TABLE A5 ▪ *Correlates of years of education 1910–1969 with ethnic fixed effects*

Dependent variable:	**(1)**	**(2)**	**(3)**
Years of education	**1910–1929**	**1930–1949**	**1950–1969**
Mission Density (Log)	0.475**	1.155***	2.039***
	(0.231)	(0.157)	(0.185)
Female (Dummy)	–1.412***	–2.528***	–1.815***
	(0.063)	(0.059)	(0.062)
Female Mission Interaction	0.017	–0.009	0.187***
	(0.062)	(0.052)	(0.039)
Born in Capital	0.502	–0.350	–0.070
	(0.444)	(0.234)	(0.129)
Distance to Rail (Log)	–0.146	–1.788***	–0.831***
	(0.101)	(0.198)	(0.157)
District Population (Log)	–0.745	–3.299***	0.579*
	(0.627)	(0.461)	(0.348)
Cash Crop (Dummy)	0.589	1.556***	–1.413***
	(0.597)	(0.199)	(0.229)
Copper District (Dummy)	0.781	1.550	11.475***
	(1.169)	(1.018)	(1.131)
Constant	16.247	–24.216***	–63.995***
	(12.745)	(6.359)	(5.229)
Ethnic Fixed Effects	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes
Observations	12,524	50,799	130,580
R-squared	0.110	0.167	0.110

Note: The table reports OLS estimates. The unit of analysis is an individual. The dependent variable is years of education attained by the individual. All distances are measured in kilometres. Distance to the railway station is included as a log for easy interpretation. In the estimations, we also control for the population log in the individual's birth district. The Born in Capital is a dummy that indicates whether an individual is born in the capital of one of the districts, namely Kitwe, Kabwe, Luanshya, Mufurila, Ndola, Livingstone, or Lusaka and Chingola. We also include a Copper District dummy, indicating whether an individual was born in a copper-producing district. These include Chingola, Kabwe, Lunshya, Mufurila, Ndola, Kitwe, Solwezi, Chililabombwe and Kalulushi. Cash Crop in District dummies capture whether the district the individual was born in grows one or more cash crops; altogether, there are 19 cash crop-growing districts. We use the 1925 mission stations for the 1910–1929 cohorts, 1936 mission stations for the 1930–1949 cohorts and 1948 Missionary station locations for the 1950–1969 cohort. We include district-fixed effects. There are 54 districts in the sample. We control for ethnic fixed effects. There are 38 unique tribes reported in the census. The geographic controls include distance to rivers, distance to the coastline, and land elevation. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

FIGURE A1 ▪ *Expenditure on African education per capita (left axis) and per pupil (right axis), 1925–1945*



Note: The expenditure per capita is expressed per 1,000 people, the expenditure per pupil is expressed per 100 pupils.

Expenditure on African education per capita started to increase at the end of the 1930s. The maximum spent was 70 pounds per annum per 1,000 people.[17]At the same time, expenditure per pupil increased immediately with the implementation of the *Native School Ordinance* in 1927. It rose to a pound per pupil per annum in the early 1930s, after which the expenditure per pupil slowly declined as the number of pupils rose faster than expenditure. After 1049, expenditure per pupil started rising again and reached levels of the early 1930s – on average 1.1 pound per pupil per annum.

17 This is in nominal expenditure per capita.

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Els orígens de l'educació formal i la desigualtat de gènere a Zàmbia, 1924-1990

Resum

Aquest article examina els orígens de l'educació formal a la Zàmbia colonial i les seves conseqüències a llarg termini per al nivell educatiu i la desigualtat de gènere. Analitzem els efectes a llarg termini de l'educació missionera combinant noves dades de panel referides a la ubicació de les missions i la matriculació en escoles missioneres per gènere i societat missionera de 1924 a 1953 amb dades contemporànies del cens zambià de 1990. Els nostres resultats són triples. En primer lloc, documentem que, malgrat la considerable expansió de l'escolarització a partir de mitjan dècada de 1930, la matriculació general seguia sent baixa i desigual entre sexes a finals del període colonial. Si bé les missions protestants van proporcionar un accés més igualitari per als dos sexes que les escoles catòliques, això no va ser suficient per eliminar la desigualtat general de gènere a l'educació a finals del període colonial. En segon lloc, observem que la presència històrica dels missioners està associada a un nivell educatiu més alt després de la independència. Documentem que l'impacte d'una densitat missionera primerenca en els resultats educatius va ser menor a les primeres cohorts en comparació amb uns efectes més substancials d'una densitat missionera tardana a les cohorts posteriors, sense diferències significatives entre l'activitat missionera protestant i la catòlica. En tercer lloc, observem que la diferència en anys d'educació entre homes i dones s'ha reduït després de la independència, sobretot a les zones on històricament hi ha hagut una major activitat missionera.

Paraules clau: Zàmbia colonial, missioners cristians, desigualtat de gènere, desigualtat regional, educació.

Codis JEL: N3, N37, I21, J16, Z12.

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Los orígenes de la educación formal y la desigualdad de género en Zambia, 1924-1990

Resumen

Este artículo examina los orígenes de la educación formal en la Zambia colonial y sus consecuencias a largo plazo para el nivel educativo y la desigualdad de género. Analizamos los efectos a largo plazo de la educación misionera combinando nuevos datos de panel referidos a la ubicación de las misiones y la matriculación en escuelas misioneras por género y sociedad misionera de 1924 a 1953, junto con datos contemporáneos del censo zambiano de 1990. Nuestros resultados son triples. En primer lugar, documentamos que, a pesar de la considerable expansión de la escolarización después de mediados de la década de 1930, la matriculación general seguía siendo baja y desigual entre sexos a finales del periodo colonial. Aunque las misiones protestantes proporcionaron un acceso más igualitario para ambos sexos que las escuelas católicas, fue insuficiente para eliminar la desigualdad general de género en la educación a finales del periodo colonial. En segundo lugar, observamos que la presencia histórica de los misioneros está asociada a un mayor nivel educativo después de la independencia. Documen-

tamos que el impacto en los resultados educativos de una densidad misionera temprana fue menor en las primeras cohortes en comparación con los efectos más sustanciales de una densidad misionera tardía en cohortes posteriores, sin diferencias significativas entre la actividad misionera protestante y católica. En tercer lugar, observamos que la diferencia en años de educación entre hombres y mujeres se ha reducido después de la independencia, sobre todo en las zonas donde históricamente ha existido más actividad misionera.

Palabras clave: Zambia colonial, misioneros cristianos, desigualdad de género, desigualdad regional, educación.

Códigos JEL: N3, N37, I21, J16, Z12.