# Historical Missionary Activity, Schooling, and the Reversal of Fortunes: Evidence from Nigeria

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## Abstract

This paper shows that historical missionary activity has had a persistent effect on schooling outcomes, and contributed to a reversal of fortunes wherein historically richer ethnic groups are poorer today. Combining contemporary individual-level data with a newly constructed dataset on mission stations in Nigeria, we find that individuals whose ancestors were exposed to greater missionary activity have higher levels of schooling. This effect is robust to omitted heterogeneity, ethnicity fixed effects, and reverse causation. We find inter-generational factors and the persistence of early advantages in educational infrastructure to be key channels through which the effect has persisted. Consistent with theory, the effect of missions on current schooling is larger for population subgroups that have historically suffered disadvantages in access to education.

# 1    Introduction

> Let missionaries and school masters, plough and spade, go together and agriculture
> will flourish, the avenues to legitimate commerce will be opened, confidence between
> man and man will be inspired, whilst civilization will advance as the natural effect,
> and Christianity operate as the proximate cause, of this happy change — *T.F. Buxton*
> *in The African Slave Trade, and Its Remedy (1840).*

The persistent effects of historical events on contemporary economic outcomes have recently received a lot of attention in the economics literature. Widely studied events include the effects of European colonization, the transatlantic slave trade, and their interactions with geography.[1] In comparison, the long-term effects of nineteenth century missionaries on economic development remain underexplored in the literature.[2] The arrival of Christian missionaries in Africa was an important historical episode with a longstanding effect on African religions and cultural practices (Sundkler and Steed, 2000; Nunn, 2010). Missionary societies were vital to nineteenth century efforts to end the transatlantic slave trade, and were driven by the firm belief this would be achieved through the introduction of Western education, and Christianity, as a means of advancing civilization (Buxton, 1840).

This paper empirically examines the contemporary effects of nineteenth century missionary activities in Africa. In particular, we use data from Nigeria to study the long-term effects of historical missionary activity on schooling and wealth, and explore the reasons why the effects of missionary activity have persisted. As in other studies examining the effects of historical shocks on economic development within homogenous territories (see Huillery (2009), Wantchekon et al. (2013), and Acemoglu et al. (2014)), we focus on a single country because it makes the sources of differences in missionary activity easier to identify, and immediately accounts for any country and colonial history fixed effects. Nigeria also presents an interesting case study because of the rich variation in missionary activity generated by the timing of the British colonial government's policy of indirect rule.

As the most populous country in Africa, and a major source of slave exports to the Americas, the area now known as Nigeria attracted several Protestant and Catholic missionaries whose primary

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[1]Contributions to this literature are too numerous to mention, but some important empirical studies on the effects of colonization are Acemoglu et al. (2001), Acemoglu et al. (2002) and Michalopoulos and Papaioannou (2013). The effects of the slave trade are documented in Nunn (2008) and Nunn and Wantchekon (2011). Evidence on the importance of geography on African economic development can be found in Nunn and Puga (2012), and Fenske (2013), amongst several other important contributions. Analysis of the persistent effects of colonial investments in French West Africa can be found in Huillery (2009), and Jedwab et al. (2014) provide some evidence from Kenya in East Africa. Nunn (2013) and Spolaore and Wacziarg (2013) offer reviews of the literature documenting the importance of history for contemporary economic performance.

[2]Recent studies of the effects of missionary activity on schooling in Africa are Gallego and Woodberry (2010), Nunn (2014), and Wantchekon et al. (2013). Waldinger (2013) studies the effects of Catholic missionaries in Mexico.

method for proselytizing was the school.[3] Aided by freed slaves who had been resettled in Sierra Leone, missionary work began on the Southern coasts of the country and gradually proceeded to the Northern hinterlands. By the early 1900's, however, Nigeria had become an official British colony and government administrators, who wished to govern through traditional rulers (indirect rule), actively discouraged missionary activities in the Northern parts of the country. The effectiveness of indirect rule, and availability of freed slaves from different ethnic groups, generated large early differences in schooling infrastructure, and attainment, between Nigerian ethnic groups. As early as 1914, when the North and South were merged into one country, there were 37,500 primary schools in the South, but just 1,100 primary schools in the North where the colonial government had taken primary responsibility for schooling (Csapo, 1981).[4]

First, we examine the persistence of these early schooling infrastructure differences on schooling attainment in modern Nigeria. We construct a new dataset on the location of primary mission stations in Nigeria as at 1928, and show that, all else equal, individuals from ethnic groups with more mission stations as at 1928 have significantly higher levels of schooling attainment today. In the most basic specification, an additional mission station per 1000 $km^2$ of an individual's ethnic homeland is associated with an additional 3.6 years of schooling, on average. This positive result is robust to different measures of exposure to missionary activity, controls for individual and household characteristics, and fixed effects for the individual's state of residence.

We argue that these effects are causal, because the distribution of mission stations across ethnic groups was primarily driven by supply-side factors: the policy of indirect rule and availability of returnee slaves. To further address concerns about the endogeneity of mission stations to ethnic group specific characteristics, we calculate the number of mission stations, as at 1928, per area of current states in Nigeria.[5] We use the fact that individuals from the same ethnic group have been split into various states to estimate a model with ethnicity fixed effects. The persistent effect of mission stations on schooling remains strong and positive using the state-based measure.

Furthermore, we use an ethnic group's distance to the coast, and Timbuktu, Mali, as instruments for the intensity of Christian missionary activity. Distance to the coast is negatively associated with missionary activity because it meant that missionaries were more likely to arrive

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[3]The most active missionary societies in Nigeria were Baptists, Irish and French Catholics (Spiritans and the SMA), the Anglican C.M.S., Presbyterians and Wesleyan Methodists.

[4]The populations of Northern and Southern Nigeria have always been roughly equal ((Coleman, 1963, Table 1),(Ostien, 2012)). The emphasis on primary education is important because this is the level of education at which missionaries invested their efforts. In comparison to the number of primary schools, there were less than 15 secondary schools in the country as at 1914 (Ajayi et al., 1996), because missionaries saw no evangelistic purpose to higher education (Ayandele, 1966, p. 284–290, 293).

[5]See Aghalino and Danmole (1995) for a brief history of state creation in Nigeria; the authors find that state boundaries are arbitrary and politically motivated, unrelated to any observable characteristics. Also, Johnson (1967) finds that access to clean water, high altitude with a comfortable climate, and the possibility of establishing contact with Europe for supplies determined the locations of the mission stations within an area. If individuals in states with the above factors also have greater demand for education, the location of mission stations could be statistically endogenous to state-specific characteristics. To deal with this possibility, we control for state-level geographic variables in the regressions.

later in the time period when indirect rule became effective. Distance to Timbuktu, which was an important centre for trade and Islamic scholarship in pre-colonial West Africa (Lulat, 2005), is positively associated with missionary activity. This is because distance to Timbuktu would have led to less competition from Islamic missionaries. From the IV results, we find that an additional mission station, per 1000 $km^2$ of an individual's ethnic homeland, increases years of schooling by 2.17 years on average.

The above results are consistent with the findings of Nunn (2014), Gallego and Woodberry (2010), and Wantchekon et al. (2013), but our paper differs from theirs in scope and other important respects. We empirically investigate reasons why the effect of missions on schooling has persisted at the level of the ethnic group. The persistence of the effect of early missions on schooling we find is a little puzzling because Nigeria has been governed as a single entity since 1914 (Falola and Heaton, 2008). We find that controlling for household characteristics, especially wealth, significantly reduces the point estimate for the impact of missionary activity across most specifications. This is consistent with Wantchekon et al. (2013), who use data from Benin to show that the inter-generational transmission of human capital is important for the sustained effects of missionary activity on schooling. [6]

In addition to the inter-generational transmission channel, we find that the missionary effect on education has been sustained because of increased schooling infrastructure in areas with historically more missionary activities. Two features of the data provide direct support for the infrastructure explanation: First, individuals from ethnic groups exposed to greater historical missionary activity tend to live in areas with more schooling infrastructure, even controlling for demand for schooling. Secondly, we find that the positive effect of historical missionary activity on schooling is only robust at basic levels of education, which is exactly the level of education at which missionaries focused their education investments.[7] The persistence of historical missionary investments in primary education is consistent with the results in Huillery (2009) on the persistence of French colonial infrastructure investments.

Based on a model of education infrastructure and schooling, we generate some predictions that allow us to test the heterogeneous effects of historical missionary activity. We find that the

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[6]Some studies emphasize the differences between Catholics and Protestants in education. We do not distinguish between types of missions (Catholics v. Protestants), because all missions aggressively adopted schools as the primary method for gaining converts in Nigeria and schooling efforts by Catholic missions were even more successful in some parts of Nigeria. Catholic and Protestant missions actively competed for converts using schools and health services as enticements for young children and their parents. In 1886 a C.M.S. schoolmaster complained that the Catholic Spiritans have "taken from our school about a dozen children over whose parents they had exercised some influence" (Okwu, 2010, p.127). Another complained in 1895 that "the Romanists...seek to win our children to their schools, they visit the houses of our converts, they try to bribe the most able of our teachers" (Okwu, 2010, p.111). In fact, at some point in the early twentieth century, enrolment in Catholic schools was greater and outpaced enrolment in Protestant schools by a significant margin in Eastern Nigeria (see (Ayandele, 1966, p.302) and Table 1 in (Okwu, 2010, p.164).

[7]The importance of schooling infrastructure is also supported by evidence from Benin, where Wantchekon et al. (2013) find that villages with missionary schools in the colonial period have higher levels of schooling today, compared to neighbouring villages with no missionary schools.

sustained effect of missionary activity is not religion specific, and Muslims from ethnic groups exposed to more missionary activity also have significantly higher levels of schooling compared to other Muslims. Thus, the effect of missions on schooling is not primarily a result of religion and demand for schooling. Consistent with the model, the point estimates reveal that the effect of missionary activity on schooling is stronger among Muslims, because of the lower average levels of schooling infrastructure in Muslim areas.

Our estimates also show that the sustained effect of missionary activity on schooling is predominantly from differential female education across ethnic groups. The predominant effect of missionary activity on female education is also consistent with our model of increased education infrastructure in an environment, like Nigeria's, with labour market discrimination against females.[8] Thus, an increase in schooling infrastructure from missionary activity in an area lowers the marginal cost of education, and encourages relatively more female education. A preference for male education in the early missionary period as a result of economic realities is also supported by some historical evidence; for example, the Chiefs of Bonny, in Southern Nigeria, asked in 1877, "what profit is there to us for girls?" They felt that female education was not profitable because "they cannot trade on board ships when they grow up only live in the house" (Tasie, 1978, as quoted in p.34).

The results of this paper have implications for the importance of human capital, in addition to institutions, for the reversal of fortunes in Africa upon European contact (Acemoglu et al., 2002). Our estimates reveal that the effectiveness of indirect rule among ethnic groups with stronger pre-colonial institutions led to less exposure to missionary activity in Nigeria. Thus, these ethnic groups are now significantly less wealthy partly as a result of the educational advantages brought about by missionary activity.

Our study also contributes to the literature on the historical determinants of comparative economic development in Africa. It is related to Michalopoulos and Papaioannou (2014) who find that national institutions are not strongly related to subnational development in Africa. Our findings show that this may be explained by differential exposure to historical shocks across ethnic groups within a country. In the Nigerian context, ethnic groups exposed to more missionary activity gained an advantage in education infrastructure which has been sustained 100 years after Nigeria was amalgamated into one country in 1914.

Last, but not the least, our paper provides further insight into the long-term effects of the transatlantic slave trade in Africa. Nunn (2008) finds that countries with higher levels of exposure to the slave trade have lower incomes per capita, and in Nunn and Wantchekon (2011), the authors find that this may have been due to the negative effect of the slave trade on social capital. In Nigeria, we find that, by acting as a stimulant for missionary activity, historical exposure to the slave trade is positively related to schooling and is reflected in higher contemporary wealth. Thus the effect of the slave trade on income may be different at the individual level, within a country,

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[8]Evidence on trends in gender wage discrimination is discussed in Blau and Kahn (2000), and Oostendorp (2009) presents evidence on the gender gap in earnings using cross-country wage data.

compared to aggregate effects across countries. This indicates that the positive human capital effect of missions might have more than compensated for the deleterious effects of the slave trade within countries.

In the next section we present a historical background for missionary activity, and discuss the construction of the dataset in section 3. Section 4 presents a simple model of education infrastructure and schooling, in the presence of labour market discrimination, which provides the context for all the empirical results that follow in section 5. The final section concludes.

# 2    Historical Background

In this section, we present a brief discussion of the factors behind the distribution of mission stations in Nigeria. We find that supply-side factors were primarily responsible for the distribution of mission stations between ethnic groups as at 1928, as opposed to initial differences in the demand for education, or missionary activity, across ethnic groups.

## Motivations for Missionary Activity

To understand the primary factors driving missionary activity in West Africa, we begin with a discussion of the motivations behind increased missionary activity in the nineteenth century. Christian missionaries arriving in nineteenth century West Africa were keenly aware of the failures of earlier missionary activities, as well as the tremendous gains Islam had made in the intervening period. Spurred on by T.F. Buxton's *The African slave trade and its remedy* published in 1839, and the evangelical revival of John Wesley in Britain, missionaries were eager to reach as many African societies as they could. This grew out of the perceived need to advance civilization, curb the slave trade, and counteract the spread of Islam.

The work of T.F. Buxton was instrumental in convincing the British public to finance the Niger Expedition of 1841, at a cost of about £100,000 (about £280 million in 2010). The expedition failed and of the 145 Europeans on board, 130 contracted malaria fever and 40 had died within a year ((Sundkler and Steed, 2000, p.224),(Ajayi, 1965, p.7-8)). However, this failure did not discourage missionary activity, instead it cemented the need for African missionaries who could survive in the West African environment. The necessity of having African converts who would be able to carry on the missionary work from the Coasts to the hinterlands created an important link between education and missionary activity. Thus, mass education was necessary to expand the supply of missionaries in Nigeria, and elsewhere in tropical West Africa (Ajayi, 1965; Tasie, 1978, Chapter 1).[9]

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[9]Frankema (2012) also finds the Africanization of various missions across Africa and argues that this was necessary to meet growing *demand*. In contrast, we are arguing that missionaries were willing to reach every community regardless of demand conditions, but climatic conditions made Africanization necessary. As we show later with some examples, invitations for missionaries came from sections of every major ethnic group,

## Missionary Activity and the Legacy of Slavery

In the meantime, the different missions (Baptists, Catholics, C.M.S., Presbyterians, Wesleyan Methodists) had to look to the liberated African slaves living in Sierra Leone to carry on the missionary work. The ethnic backgrounds of these Sierra Leonean returnees became the primary factor behind the historical variation in missionary activity between Southern ethnic groups (see Figure 1). The demand for schooling, and missionaries, was high among various Southern groups. Some groups were motivated by the protection missionary presence afforded them in times of war (especially in Yorubaland in the Southwest), and others in the Southeast were primarily motivated by the need to have their communities participate in the growing trade in legitimate commodities (Ajayi, 1965, p.134).[10]

Even with the high demand, the supply of missions to any ethnic group over this period was limited, and was greatly influenced by the availability of recaptured slaves living in Sierra Leone, who spoke the local language (or a variant). Thus, the larger number of slaves exported from the major southern ethnic groups (Ibo and Yoruba) early in the nineteenth century, meant that they also received a larger supply of missionaries eager to return "home" (Ajayi, 1965, Chapter 2). Recaptured slaves from these ethnic groups also wrote letters to different missions requesting that missionaries be sent to their hometowns (Tasie, 1978, p.14–16). The same was true for the Ibibio (Efiks), who controlled the slave port of Calabar. Efiks in Jamaica were instrumental to the founding of the *United Presbyterian Calabar* in 1846 (Tasie, 1978, p.16).

The other large Southern ethnic group, the Ijaws, controlled the ports on the Bight of Biafra through which slaves were exported, but did not export members of their own ethnic groups in significant numbers (Tasie, 1978, p.14–17). Other Southern groups included in this study did not have significant slaves exported from their own communities early in the nineteenth century, perhaps due to declining population densities from slave raiding in earlier time periods. In sum, ethnic groups that accounted for most of the slaves exports in the nineteenth century, from the Bights of Benin and Biafra, also had a larger supply of missionaries because they were able to attract missionaries who spoke their native languages. This supply side factor primarily explains the variation in missionary activity between ethnic groups in the South of Nigeria. .[11]

Next, we turn to explaining the larger variation of missionary activity between Northern and Southern Nigeria, and we find that restrictions on supply played the significant role.

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including the Muslim Hausas of the North.

[10]In the major trading town of Bonny, for example, the Chiefs of Bonny provided about £300 towards the erection of a missionary house in the community (Tasie, 1978, p.30). The King of Calabar also invited missionaries in 1841, hoping they would be of assistance towards his goal of gaining control of a neighbouring town (Berman, 1974).

[11]The patterns in slave trading described here are also confirmed in the estimates of slave exports by ethnicity in Nunn and Wantchekon (2011). A regression of the number of slaves per square km, taken from Nunn and Wantchekon (2011), on the number of missions per square km has an $R^2$ of .34. Including a measure of the ethnic group's distance to sea increases the $R^2$ to .44.

## Missionary Activity in the North: Legacy of Indirect Rule

One reason for the lack of missionary activity in the North is geographic; the South is closer to the Atlantic Coast, so it was easier and less risky for missionaries to set up stations in those areas. However, by 1900, the British colonial administration already had a significant presence in Northern Nigeria and the area was accessible to European traders and missionaries (Ayandele, 1966, p.120–126). By 1911, there was a rail line going from Lagos to Kano in the heart of the North, and by 1926, another line went from Port Harcourt in the Southeast to another major Northern city, Kaduna. Furthermore, Europeans had made contact with the Northern Emirates as early as 1821 (Sundkler and Steed, 2000, p.254), and attempted to establish a mission station in the Illorin Emirate as early as 1855. There were various attempts to establish mission stations in Northern Nigeria between 1855 and 1900, which were met with varying degrees of success (Ajayi, 1965, p.97). Similar to the activities of the Southern ethnic groups, a Kanuri recaptive Wesleyan agent, W. Allakurah Sharpe, had also desperately pleaded with the Wesleyan mission to send missionaries to Kanuris in the Northeast of Nigeria in 1879 (Ayandele, 1966, p.118).

Distance to sea explains why missionaries arrived in Northern Nigeria in great numbers much later in the time period under consideration, but does not explain why they never set up significant numbers of mission stations by 1928.[12] Take for example, the case of the Ibo ethnic group in Southern Nigeria; missionaries did not penetrate the Ibo hinterlands until after the Aro Expedition of 1902 (Sundkler and Steed, 2000, p.248-253), but from Figure 1, we see that a significant number of mission stations had been established in Ibo areas by 1928. Thus, timing, or inaccessibility, does not fully explain why missionaries failed to penetrate the Hausa, Fulani, and Kanuri areas of the North, that were already under British control by 1903.

The absence of missionary activity in Northern Nigeria was, above all, a result of the colonial government's policy of "indirect rule" established around 1900. Indirect rule meant that the protectorate of Northern Nigeria would be administered by the Emirs of the Islamic Sokoto Caliphate in the Northwest, and the Islamic Borno Emirate in the Northeast. The policy strengthened the opposition of the Islamic Northern rulers to Christianity, and the administration opted for government-provided schools in order to preserve the power of the Emirs.

Furthermore, missionary activity in Northern Nigeria was significantly restricted by the policy prohibiting missionary activity from most parts of Northern Nigeria under the control of the Emirs (Ayandele, 1966, Chapter 4);(Barnes, 1995).[13] The colonial government's attitude towards missionary activity in the North is perhaps best illustrated by the statement below:

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[12]The mean number of missions per $1000km^2$ is .7 in the South, but only .05 in the North.

[13]This did not entirely eliminate missionary activity from the area, as several pagan ethnic groups in the North, who were not under the direct political control of the Emirates saw significant missionary activity among the Tiv, Igala, and Idoma peoples (Sundkler and Steed, 2000, p. 257–259)(Ayandele, 1966, p.117). Historical records also indicate the establishment of mission stations in parts of the Emirate at Bida, Kontagora, and Zaria. Led by the evangelist Dr. Walter Miller, several European missionaries also preached in the large cities of the Emirates without the government's approval (Ayandele, 1966, p.133).

> Personally I should like to see the Missions withdraw entirely from the Northern States, for the best missionary for the present will be the high-minded clean living British Resident. — *Sir Percy Girouard, Governor of Northern Nigeria (1907-1909), as quoted in (Ayandele, 1966, p.116).*

Indirect rule was primarily necessitated by the loose political grip the government had on the vast areas of Nigeria (Sundkler and Steed, 2000, p. 255), as well as the limited resources available to administer the area (Ayandele, 1966, 145). Secondly, the administration did not want to create more trouble for themselves in Northern Nigeria, especially not of the religious kind. As Lord Salibury said in an address to the Wesleyan Missionary Society in 1900, "You will not convert them...and the danger of creating great perils and producing great convulsions, and it may be bloodshed..., is a danger you must bear in mind" (as quoted in (Ayandele, 1966, p.137)). This was a conflict the colonial government wanted to avoid as much as possible, as they believed that allowing missionary activity in a region dominated by Islam would be tantamount to preaching at gunpoint (Barnes, 1995). The administration also believed that the effect of Islam on Northern peoples has been positive, and was best suited to Africans as a "religion of the tropics" (Sundkler and Steed, 2000, p.256).

Other colonial officials believed that imposing Christianity on the Emirate would lead to disorder, and would amount to "...[replacing] a patriarchal and venerable system of government by a discontented and irresponsible democracy of semi-educated politicians [referring to the African converts of the time]" (Hesketh Bell, quoted in (Ayandele, 1966, p. 149)). The administration also developed significant antipathy towards African converts to Christianity, and consistently cited the breakdown of law and order among some of the Southern peoples, and the difficulty of managing "Black White Men," as evidence for the wisdom of indirect rule (Barnes (1995) presents a thorough discussion of the administration's views towards African converts).[14]

The net result of indirect rule was that missions could not rely on the support of British force in the face of opposition as they had enjoyed in Southern Nigeria. Not only did the colonial administration withdraw support for missionary activity in Northern Nigeria, they actively sought to slow down extant missionary activities. There are cases of Northern ethnic groups, such as the Maguzawa (an Hausa subgroup), who had their requests for missionaries turned down on the grounds that it would create disloyalty to the Muslim rulers. Another example could be found in the actions of the Resident, Captain Orr, who desired to move the mission station in Zaria outside of the city, and in Kano where the mission station was actually moved outside the city in order to avoid missionary contact with the native population (see pages 146-152 in Ayandele (1966)). As a result of these and other actions, the administrators in Northern Nigeria were accused of being pro-Islam by the missions (Sundkler and Steed, 2000, p.256).

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[14]Some of the antipathy is of course motivated by the early nationalist sentiments already developing among the educated Southerners, their refusal to submit to forced labour schemes, and other anti-colonial activities (see page 434 in (Barnes, 1995).)

A few missionary schools that were established in Northern Nigeria operated under the condition that religious education would not to be permitted. When the Emirs protested against these schools, the administration had some of them closed (Sundkler and Steed, 2000, p.256). This is in stark contrast to earlier attitudes when missionaries faced local opposition. For example, when the people of Badagry (on the Atlantic Coast) decided to expel the missionaries in 1845, the British government responded by sending a cruiser, H.M.S. *Albatross* (Ajayi, 1965, p.37). Or consider the fate of Old Town of Calabar, which was destroyed by the Royal Navy for attempting to impede missionary activities in 1855 (Ayandele, 1966, p.22–24). A last example is the military expedition against the Ijebus (a Yoruba sub-group) between 1890-1891, which was brought about by opposition to missionary activity (and trade disputes) in Yorubaland (Ayandele, 1966, p. 54–68).

The above examples illustrate the point that opposition to missions by Northern rulers was only made effective by the colonial administration's attitude towards missionary activity. Prior to the implementation of indirect rule, several mission stations were successfully set up in Northern cities at the request of the administration (Ayandele, 1966, p.141–142). If missionaries had the support of the administration, the opposition of the Northern Emirs, like that of other rulers in the South, would have come to nought in the face of a superior British military force.[15]

In a bid to satisfy the demand for schooling in the North, the government decided to establish non-missionary schools in the North, and the effort was spearheaded by the famous Sir Hanns Vischer (Sundkler and Steed, 2000, p.256). Nevertheless, the government's effort could not match the more organic community-focused effort of the missionaries. As early as 1914, there were already 37,500 primary schools in the South, but just 1,100 primary schools in the North with an equal population. In a country where 97% of the student population were enrolled in missionary schools as at 1942, the negative effects of this infrastructural deficit was already apparent in significantly lower literacy rates (in Roman scripts) among ethnic groups of Northern Nigeria as at 1952 (Barnes, 1995; Prothero, 1956). We study the sustained impact of these differences in the historical supply of schools, brought about by missionary activity, on modern day Nigeria.

# 3  Data

The dataset is built on the male and female individual recode files from the Nigerian 2008 *Demographic and Health Survey* (DHS). The DHS is a survey implemented in several countries with a focus on obtaining comprehensive information on nationally-representative households, and selected individuals within the household. The DHS provides data on years of schooling, level of education completed, and several demographic variables for individuals and the households in which they live. The DHS provides information on ethnicity for over 30,000 individuals, between the ages of 15-59,

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[15]This is not to say that missions would have gained converts in these areas mostly governed by Islamic rulers. Evidence from other parts of Nigeria indicates that, even with the establishment of mission stations, missions found it difficult to attract converts without military intervention (Okwu, 2010).

belonging to the ten major ethnic groups that make up about 90% of the country's population.

Data on the location of mission stations in Nigeria are taken from two sources. The first is a map published by Roome (1925) showing the location of *principal* mission stations (Protestant and Catholic) in Africa in 1924. The map, which is highly regarded as accurate, is also used in Nunn (2014), and several other papers.[16] We combine the map from Roome (1925) with another map, from Ayandele (1966), which provides the location of mission stations in Southern and Northern Nigeria as at 1928. Information from both maps were manually cross-checked, and in order to minimize the risk of double-counting, we add a mission station from Ayandele (1966) if it does not belong to the same local government area (a county in the U.S.) as the mission station in Roome (1925). There is significant overlap in both maps, but the map from Ayandele (1966) provides information on 30 additional mission locations (out of 159) in Nigeria.

We use three different measures of historic exposure to missionary activity: two are related to the individual's ethnicity, and the third is related to the individual's current state of residence. We use differences in the distribution of missions across different states inhabited by an ethnic group to identify the effect of missions within an ethnic group. For the ethnicity based measure, we combine the map of mission stations with information on the land area historically inhabited by different ethnic groups provided on a map by the anthropologist G.P. Murdock (Murdock, 1959).

Using the map by Murdock (1959), we compute the number of mission stations per 1000 $km^2$ of the individual's ethnic homeland. The 10 major ethnic groups, their homelands, and the mission stations located within them are shown in Figure 1. However, given that all individuals within an ethnic group may not have equal access to these mission stations, we also compute the number of mission stations within 25 and 50 kilometre radii of the geometric centre of the individual's homeland, as shown in Figure 2.[17] The measures of missionary activity turn out to be highly correlated, with Spearman rank correlation coefficients above above .82 for the centroid-based and area-based measures, and a rank coefficient of .95 for both centroid-based measures. We use similar methods to compute the number of mission stations per 1000 $km^2$ of the individual's current state of residence. The Spearman rank correlation coefficient between the measure based on ethnic homeland and current state of resident is .8, and a Pearson correlation coefficient of .76.

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[16]Some authors make the distinction between Catholic and Protestant missions, but this distinction is not particularly relevant in Nigeria as both mission types actively competed for converts using education as an inducement. In fact, in the Eastern part of Nigeria, enrollment in schools run by Catholic missions outpaced that of Protestant missions (Ayandele, 1966, p.302).

[17]For example, among the Hausa ethnic group, the mission stations were located on the outskirts of their homeland (in Kano, Zaria). As will be made clear later on, this was in response to colonial policy of keeping missionaries away from proselytizing among the Islamic Hausas. These stations effectively served early Christian converts who had migrated from the South (Barnes, 1995; Ayandele, 1966).
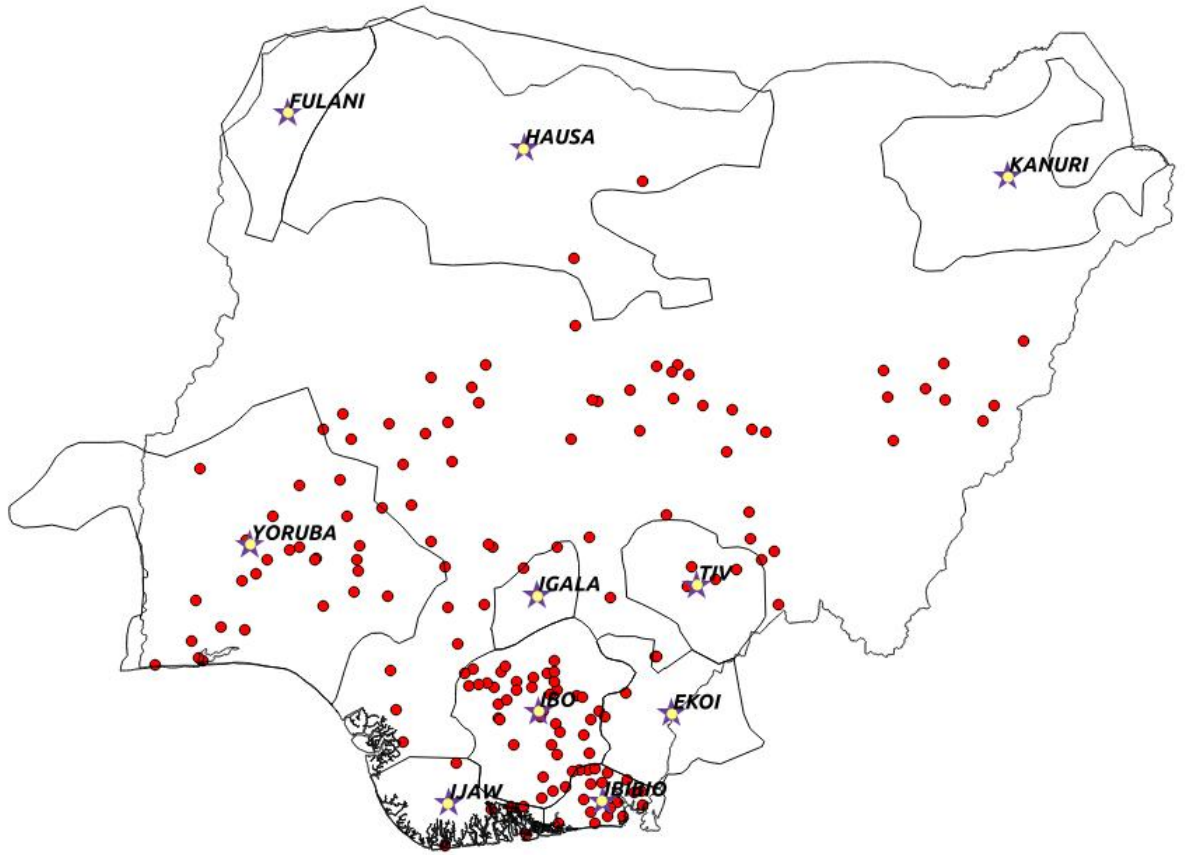
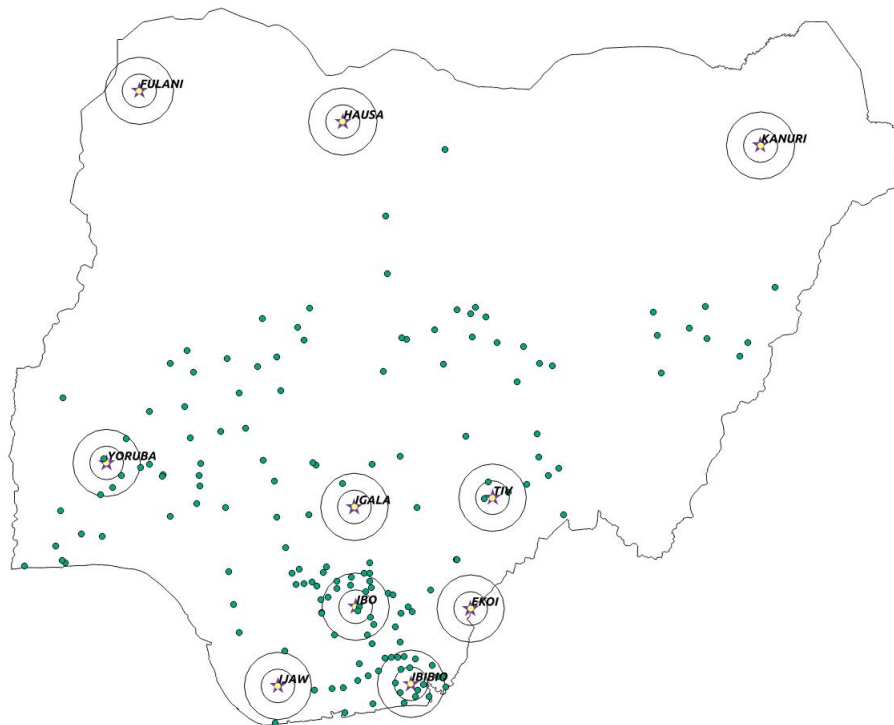**Figure 1:** Mission stations within ethnic homelands (as dots)

**Figure 2:** Mission stations within 25 and 50 km radii of centroid of ethnic homeland
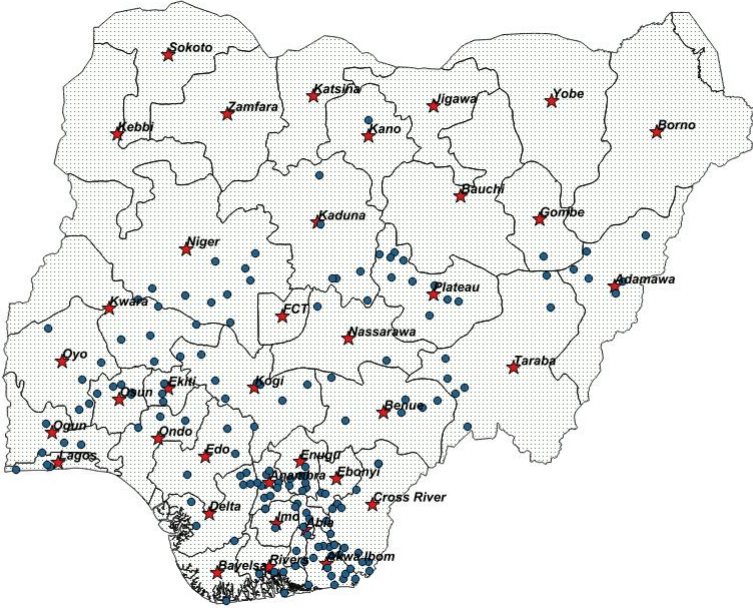


**Figure 3:** Mission stations within states of Nigeria

Individual level controls include age, age-squared, occupation (in 8 groups), sex, and type of residence (urban or rural). We also include controls for the individual's household which may influence investments in schooling. These include the age and sex of the household head, the size of the individual's household, and an index of household wealth. All individual and household control variables are taken directly from the DHS.

We also make use of ethnicity level controls that may influence an ethnic group's outlook towards education. We include estimates of the population density of the individual's ethnic homeland during the colonial period taken from Nunn and Wantchekon (2011). Ethnicity-level controls include an indicator for the presence of a city in the individual's ethnic homeland in the fifteenth century, and a measure of organizational hierarchies beyond the local community of the ethnic group also taken from Nunn and Wantchekon (2011), with the ultimate source being the *Ethnographic Atlas* by Murdock (1967). These are all different measures of the prosperity of the ethnic group during the pre-colonial period. We do not include controls for contact with Europeans, or controls controlling for ease of European access to the ethnic group's homeland for Europeans. As noted in the historical discussion, these latter missionaries were mostly Africans (see (Ajayi, 1965, p.11)), and had no problems making contact with all the major ethnic groups by 1903.

The last set of data we use are geographic data across states in Nigeria, including suitability of land for agriculture. Land suitability may have influenced schooling outcomes because in areas where farming was viable, parents were less likely to send their children to school, because education often meant leaving farmwork (Ayandele, 1966, p.296). Data on the suitability of land for agriculture is obtained from the geographic section of the *2010 General Household Survey* (GHS),

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published by NBS (2013). We use three measures of land suitability to agriculture for each state: the first is an increasing scale of "workability," which is measured for 10 enumeration areas within each state. We take the population-weighted average of land workability for residents in a state as the state's measure of land workability. The second measure is a set of indicator variables for the terrain in the state (plain, lowland, plateau, hilly), and the last is a set of indicator variables for the state's agricultural zone (tropic-cool/subhumid, tropic-warm/semiarid, tropic-warm/subhumid, tropic-warm/humid).

Summary statistics are shown in Table 1, which presents the means of some key variables across the ten ethnic groups. Full summary statistics are show in Table 13 of the appendix. We see systematic variation in the number of missions across various ethnic groups, with the ethnic groups of Northern Nigeria that were exposed to indirect rule (Hausa, Kanuri, and Fulani) having almost no mission stations. While the number of mission stations per 1000 $km^2$ is our preferred measure of exposure to missionary activity, we also use the number of mission stations within a 25 km and a 50 km radius of the ethnicity's homeland as alternate measures. As already mentioned earlier, these measures are quite correlated, and the rankings are generally consistent across measures. Lastly, notice the correlation between the number of slaves exported from an ethnic group's homeland and the number of missions per 1000 $km^2$. For example, the Ibo had one of the highest numbers of slave exports at 2.5, and also has one of the highest numbers of missions at 1.11. This can be contrasted with the Ekoi who had comparatively fewer slaves exported from their homeland (.2), and also fewer subsequent missionary activity (.08).

**Table 1:** Some Summary Statistics

| | Ethnicity Variables | | | | Individual Variables | | | Household Variables | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Missions | | | | | | | | | |
| Ethnicity | Per 1000 $km^2$ | 25 km | 50 km | Slave Exports | Schooling | Male | Age | Size | Wealth | Rural |
| Ekoi | 0.08 | 0.00 | 0.00 | 0.20 | 5.45 | 0.48 | 29.34 | 6.37 | 2.97 | 0.76 |
| Fulani | 0.00 | 0.00 | 0.00 | 0.00 | 0.82 | 0.50 | 30.09 | 7.67 | 1.65 | 0.88 |
| Hausa | 0.01 | 0.00 | 0.00 | 0.68 | 1.79 | 0.49 | 30.09 | 7.82 | 2.41 | 0.74 |
| Ibibio | 2.00 | 6.00 | 15.00 | 1.91 | 6.09 | 0.47 | 29.30 | 6.10 | 3.80 | 0.66 |
| Igala | 0.20 | 0.00 | 1.00 | 0.00 | 4.86 | 0.50 | 28.48 | 7.22 | 3.17 | 0.69 |
| Ibo | 1.11 | 2.00 | 13.00 | 2.50 | 6.01 | 0.46 | 30.07 | 5.72 | 3.85 | 0.48 |
| Ijaw | 0.25 | 0.00 | 0.00 | 0.99 | 5.79 | 0.48 | 29.15 | 5.58 | 3.18 | 0.82 |
| Kanuri | 0.00 | 0.00 | 0.00 | 0.04 | 0.95 | 0.50 | 30.01 | 7.36 | 2.00 | 0.66 |
| Tiv | 0.18 | 3.00 | 3.00 | 0.02 | 3.73 | 0.49 | 27.95 | 7.89 | 2.02 | 0.79 |
| Yoruba | 0.23 | 1.00 | 5.00 | 2.71 | 6.12 | 0.48 | 30.22 | 5.43 | 4.04 | 0.40 |

We also briefly examine the relationship between average years of schooling and missionary activity. Again, we find the Northern ethnic groups (Hausa, Fulani, Kanuri),e exposed to very little missionary activity, also have the lowest average years of schooling. For example, the average years of schooling among Hausas is just .82 years, compared to 6 years for the Yorubas. The composition of males amongst the ethnic groups, as well as average ages of individuals, do not seem to vary systematically with missionary activity. Lastly, wealth, as measured in the DHS, also appears to be lower among the Northern ethnic groups. Some of this wealth differential could be

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due to the schooling differences between ethnic groups, and other factors unrelated to missionary activity.

Next, we systematically assess the relationship between the exposure of an individual's ethnic group to missionary activity and current schooling outcomes. We begin with a simple model illustrating how increases in infrastructure translates into higher schooling attainment. The model also generates some predictions that we test in the data; specifically, the model predicts that marginal impact of missionary activity should be greater in Muslim areas with less average missionary activity, and also greater for females as a result of wage discrimination.

# 4 A Model of Schooling and Schooling Infrastructure

Let $i$ be an individual who has to decide on the amount of education he/she would like to acquire. The benefits of education such as higher incomes, better living standards, prestige, and knowledge, increase with the level of education. Education is also costly to acquire, and the cost is lower with a higher supply of educational infrastructure. By education infrastructure, we mean physical infrastructure, as well as the availability of teachers and teaching materials used in schools.

Individual $i$'s utility function is:[18]

$$u(e) = \alpha b(e) - \frac{c(e)}{I}$$

Where $e$ is the amount of education, $b(e)$ the benefit of acquiring $e$ units of education, and $c(e)$ the cost of $e$ units of education. The parameter $\alpha$ denotes the degree of gender discrimination in the labour market, and we assume $\alpha = 1$ if $i$ is male, and $0 < \alpha < 1$ if $i$ is female. We include this parameter to recognize substantial labour market discrimination against women in Nigeria, as documented in Aromolaran (2006). The quantity of available educational infrastructure is denoted by $I$. For simplicity, $e$ and $I$ are assumed to be positive real numbers. Also, $b$ is assumed to be twice-continuously differentiable, increasing, and strictly concave, and $c$ is assumed to be twice-continuously differentiable, increasing, and strictly convex.

Individual $i$ maximizes his or her utility function by choosing the optimal amount of education $e^*$ given $I > 0$. From the first order condition of the consumer problem, we know that at the optimal level of education, marginal benefits must equal marginal costs:

$$g(e^*, I) = 0, \quad \text{where} \quad g(e, I) = \alpha b'(e) - \frac{c'(e)}{I}. \tag{1}$$

The first implication of the model which we test is given by proposition 1 below:

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[18]Note that an alternative way to model educational choice would be to assume that $i$ derives utility from consumption, but consumption depends on income (first constraint), and income depends on education level (second constraint incorporating a parameter of income discrimination against females). Also, education is costly, but the cost is lower with higher educational infrastructure (budget constraint). Solving this problem will be similar to the one we solve.

**Proposition 1.** *The optimal amount of education, $e^*$, is increasing in the amount of education infrastructure, $I$.*

To see why proposition 1 is true, note that the function $g$ is decreasing in education because the marginal benefit, $b$, is decreasing in education and the marginal cost, $c$ is increasing. Increasing the quantity of education infrastructure lowers the marginal cost, which means that $g(e, I) > 0$. By the assumptions on $b()$ and $c()$, the intermediate value theorem implies that the quantity of education must increase to equate marginal benefits and costs as in equation (1). Our primary argument in the rest of the paper is that the sustained increase in schooling across ethnic groups is driven by the increase in education infrastructure brought by missionaries, once we control for inter-generational factors.

Next, we explore other results which we use to test the implications of the model. The model also implies that in the presence of gender discrimination against females, $0 < \alpha < 1$, the marginal impact of missionary activity driven by increases in infrastructure would be greater for females. This is summarized in proposition 2 below:

**Proposition 2.** *The marginal effect of increasing education infrastructure on schooling attainment is decreasing in $\alpha$. Thus, as long as there is some wage discrimination against females compared to males, $0 < \alpha < 1$, the marginal impact of missionary education on schooling would be larger for women.*

To show the proposition above formally, we apply the implicit function theorem to equation (1), and take derivatives to find that:

$$\frac{de^*}{dI} = -\frac{\frac{c'(e^*)}{I^2}}{\alpha b''(e^*) - \frac{c''(e^*)}{I}}. \tag{2}$$

Given that $c' > 0$, $c'' > 0$, $b'' < 0$, equation (2) implies that the impact of increases in infrastructure is higher for females, because the denominator in (2) is smaller when $0 < \alpha < 1$. The intuition for this result is as follows: wage discrimination implies that females have higher marginal benefits to education because they choose lower levels of schooling in equlibrium. With an increase in infrastructure, the marginal increase in educational attainment would be more responsive for women compared to men who already have higher levels of education and lower marginal benefits. In the extreme case, think of a community where all males must go to school first before females because of infrastructural constraints. The responsiveness of female education to expanded infrastructure would be greater than that of males, because more males are already in school.

Lastly, the model implies that the marginal effect of educational infrastructure on the optimal amount of education decreases with the supply of educational infrastructure. We want to show that $\frac{d^2 e^*}{dI^2} < 0$. Differentiating equation (2) yields:

$$\frac{d^2 e^*}{dI^2} = -\frac{-\alpha b''(e^*)\frac{2c'(e^*)}{I^3} + \frac{c'(e^*)c''(e^*)}{I^4}}{(\alpha b''(e^*) - \frac{c''(e^*)}{I})^2} \tag{3}$$

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Given that $c' > 0$, $c'' > 0$, and $b'' < 0$, equation (3) implies that $\frac{d^2 e^*}{dI^2} < 0$ . The result implies that within groups with less historical missionary activity, and less supply of educational infrastructure today, the marginal effect of missionary activities on educational attainment would be larger. This is an immediate implication of decreasing marginal benefit to education for an individual, so that further reductions in costs would lead to smaller increases in educational attainment. The third result is summarized below:

**Proposition 3.** *The marginal effect of increasing education infrastructure on schooling attainment is decreasing in the amount of infrastructure, $I$.*

Importantly, the result means that the marginal effect of missionary activity on schooling would be greater for ethnic groups with less average historical exposure to missionaries. This is a result that illustrates the contrast between our model and models where missionaries simply increased tastes for education (benefits). In such a model, the impact of missionary activity would be greater in areas with more missionary activity where one would expect the change in tastes to be greater. We test this last prediction by splitting the sample into Christians (high missionary activity) and Muslims.

# 5 Empirical Results

## 5.1 OLS Estimates

We first examine the relationship between mission stations in 1928 and the schooling attainment of individuals in modern Nigeria. The most general equation we estimate is:

$$Y_{i,e,h,s} = \alpha_s + \beta M_e + \mathbf{X_i} \mathbf{\Pi} + \mathbf{X_e} \mathbf{\Lambda} + \mathbf{X_h} \mathbf{\Gamma} + \epsilon_{i,e,h,s}. \tag{4}$$

The independent variable is years of schooling for individual $i$, who belongs to ethnic group $e$, household $h$, and lives in state $s$. The key variable in the estimation is $M_e$ which measures the exposure of the individual's ethnic group to missionary activity. We measure this variable in three ways: one is the number of mission stations per 1000 $km^2$ of the ethnic group's ancestral homeland, and the other two are the number of mission stations within 25 and 50 $km$ radii of the centroid of the ethnic group's ancestral homeland. We also include state fixed effects, $\alpha_s$, to capture state-specific characteristics which may influence education attainment.[19]

We include individual level controls, $\mathbf{X_i}$, which include age, age-squared, occupation (in 8 groups), sex, and type of residence (urban or rural) in all regressions. It is not clear that occupation should be included as a control variable, because missions could influence schooling and subsequent

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[19]It should be noted that these states are somewhat arbitrary creations, and have grown from 2 (North and South) in 1914 to 36 today. It is unlikely that these states are systematically correlated with missionary activity beyond the fact that individuals from the same ethnic groups are likely to belong to the same state.

choice of occupation. On the other hand, it could be that missionary activities increased the demand for education by introducing occupations requiring more schooling. We control for occupation in order to focus on the impact of missionary activity through increases in the supply of education.[20] Thus, our estimates may be interpreted as the effect of missionary activity on schooling, controlling for the effect of missionary activity on schooling through choices of occupation.

We also include household controls which are contained are in $\mathbf{X_h}$, and these include the size of the household, age and sex of the household head, and household wealth. We control for household wealth in order to account for inter-generational effects of missionary activity. Additionally, as our focus is on increases in the supply of schooling brought about by missionary activity, we control for any inter-generational wealth effects on the demand for schooling, which might have been brought about by early exposure to missionary schools. Some regressions include ethnicity controls that may be correlated with missionary activity in $\mathbf{X_e}$, which includes an indicator for the presence of a city in 1400, the organizational structure of the ethnic group, and population density in the colonial era. Lastly, all standard errors are clustered at the primary sampling unit, and there are over 600 clusters in all regressions.

**Table 2:** Missionary Activity and Years of Schooling

| Dependent Variable is Years of Schooling | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Missions** | (1) | | | (2) | | | (3) | | |
| **Per 1000 $km^2$** | 3.611*** [19.01] | | | 1.703*** [14.20] | | | 0.542** [3.14] | | |
| **Within 25 km** | | 1.352*** [3.79] | | | 0.700*** [10.73] | | | 0.257*** [3.33] | |
| **Within 50 km** | | | 0.389*** [22.76] | | | 0.193*** [15.94] | | | 0.104*** [5.35] |
| **Individual Controls** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Household Controls** | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| **State Fixed Effects** | No | No | No | No | No | No | Yes | Yes | Yes |
| **Observations** | 34187 | 34187 | 34187 | 34076 | 34076 | 34076 | 34076 | 34076 | 34076 |
| **Adjusted $R^2$** | 0.382 | 0.373 | 0.409 | 0.552 | 0.555 | 0.558 | 0.628 | 0.629 | 0.63 |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, sex, and 8 occupation dummies, are included in all regressions. Household controls include the household size, sex of the household head, age of the household head, and wealth of the household. State fixed effects include fixed effects for 36 states and the federal capital territory.

Table 2 shows the OLS estimates from a regression of years of schooling on various measures of missionary activity by ethnic group. The general result is that the exposure of an individual's ethnic group to missionary activity, in 1928, has a large and significant effect on current education. The

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[20]On this note, we find that not controlling for occupation (especially professionals), increases the point estimate of the impact of missionaries on schooling by about .1 years.

estimates in first three columns (1), which do not include any controls for household characteristics and state fixed effects, shows that an extra mission station per 1000 $km^2$ of an individual's ethnic homeland is associated with 3.6 extra years of schooling on average. Using the number of mission stations within 25 km of the centroid of the ethnic group, the estimates imply that an extra mission station is associated with an additional 1.35 years of schooling. An additional mission station within 50 km of the ethnic group's centroid, increases years of schooling by .389 years.

When we control for household characteristics in the next set of columns (2), we see that the effects of missions on current years of schooling falls by half, which suggests that some of the effect of missionary activity could be explained by the effect of missionaries on parents. This decline in the effect of missions is approximately the same across the three different measures, which gives us some confidence in the effect we are estimating, and in our measures of missionary exposure.

Household characteristics reflect the importance of inter-generational transmission mechanisms, as individuals from ethnic groups exposed to missionary activity live in households with higher levels of wealth (as we show in section 5.5. below). These effects account for about half of the impact of missionary activity on current years of schooling.

The last set of results in (3), controls for state fixed effects. Again, the decline in our point estimates are the same across all measures (with the exception of missions within a 50 km radius. These estimates show that even with state fixed effects, an extra mission station per 1000 $km^2$ of the individual's ethnic homeland, increases schooling by about half a year. Note that even though the point estimate falls with distance from the ethnic group's homeland, the economic significance of mission stations does not change with the measure of exposure to missionary activity. This is best seen by looking at standardized coefficients that account for differences in the standard deviations of our measures of intensity of missionary activity.

The *beta-coefficients* are shown in Table 3, and reveal that the effect of mission stations is quite uniform across all 3 measures. Without controlling for household and state fixed effects, a one standard deviation increase in the number of mission stations, within an individual's ethnic homeland, increases years of schooling by about .31 of a standard deviation. This falls to about .15 of a standard deviation once we include household controls (household wealth importantly). The standardized effect of mission stations per 1000 $km^2$ once we control for state fixed effects is .049 of a standard deviation. This is very similar to the standardized effect of .047 for the effect of mission stations on schooling across Africa reported by Nunn (2014) using a different dataset. Given the stability of the estimates across different measures, we use the number of missions per 1000 $km^2$ as the measure of missionary activity in most of the estimations that follow.[21]

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[21]Also examining Table 3 above, we see that the number of missions per $1000km^2$ tend to have the smallest standardized coefficient. Using this measure allows us to be as conservative as possible with our estimates.

**Table 3:** Missionary Activity and Years of Schooling (Standardized Coefficients)

| Dependent Variable is Years of Schooling | | | |
|---|---|---|---|
| **Missions** | (1) | (2) | (3) |
| **Per 1000** $km^2$ | 0.325*** | 0.153*** | 0.049*** |
| | [75.35] | [38.38] | [6.77] |
| **Within 25 km** | 0.309*** | 0.160*** | 0.059*** |
| | [71.09] | [41.27] | [8.98] |
| **Within 50 km** | 0.370*** | 0.184*** | 0.099*** |
| | [86.54] | [44.59] | [13.06] |
| **Individual Controls** | Yes | Yes | Yes |
| **Household Controls** | No | Yes | Yes |
| **State Fixed Effects** | No | No | Yes |

**Notes:** Columns (1) – (3) correspond to the set of estimates (1) – (3) in Table 2

## 5.2 Establishing Causality

The estimates in Table 2 do not imply causality if ethnic groups that are inherently less inclined to attend school, were also less receptive, or attractive, to missions. We have argued from historical evidence that this is unlikely to be the case, because indirect rule, and the availability of recaptured and resettled slaves from Sierra Leone, were key determinants of missionary activity between ethnic groups. The historical evidence also shows that factors such as European contact or transportation networks were not important at the ethnic group level in Nigeria. In addition to the available river networks (Niger and Benue), by 1928, there were already well developed rail networks crossing the homelands of the ethnic groups.

Nevertheless, we further explore the causal effect of missionary activity on schooling outcomes using three strategies. The first strategy we employ is to control for observable characteristics of different ethnic groups, and the second exploits the spatial variation (by state of residence) in missionary activity within an ethnic group. We also use an ethnic group's distance to sea and Timbuktu as instruments for the intensity of missionary activity after controlling for ethnic characteristics.

### 5.2.1 Controlling for Observable Ethnic Characteristics

We estimate Equation (4) but add controls for variables that may be correlated with historical missionary activity at the level of the ethnic group. These include the hierarchical structure of the ethnic group, population density during the colonial period, and an indicator for the presence of a city as at 1400. These measures indicate relative economic prosperity, which could be related to an willingness to accept missionary activity and ability to fend off missionary interests.[22]

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[22]We also controlled for malaria ecology in some of the regressions, and it does not change the results we obtain. We decided to exclude it from the results reported here because, as noted earlier, malaria fever did not negatively impact the location of mission stations. First, the prevalence of malaria fever was the reason why European missionaries sought out Africans to go into the hinterlands as missionaries. Further

**Table 4:** Missions and Ethnicity Controls

| Ethnicity | Missions | Hierarchy | City in 1400 | Pop. Density |
|-----------|----------|-----------|--------------|--------------|
| **Ekoi** | 0.08 | 1.00 | 0.00 | 2.60 |
| **Fulani** | 0.00 | 3.00 | 0.00 | N/A |
| **Hausa** | 0.01 | 3.00 | 1.00 | 3.62 |
| **Ibibio** | 2.00 | 2.00 | 0.00 | 4.77 |
| **Igala** | 0.20 | 4.00 | 0.00 | 3.01 |
| **Ibo** | 1.11 | 2.00 | 0.00 | 4.71 |
| **Ijaw** | 0.25 | 3.00 | 0.00 | 2.38 |
| **Kanuri** | 0.00 | 4.00 | 1.00 | 3.03 |
| **Tiv** | 0.18 | 2.00 | 0.00 | 3.56 |
| **Yoruba** | 0.23 | 4.00 | 1.00 | 3.51 |

Table 4 shows the number of missions per 1000 $km^2$ of the ethnic group's homeland, and the ethnicity control variables. First, notice that the Northern ethnic groups with cities in 1400 (Hausa and Kanuri) had virtually no missionary activity, while the only Southern group with a city (Yoruba) had some missionary activity, but not as much as other ethnic groups with no cities (such as Ibo and Ibibio). The same pattern can also be seen with the hierarchical organization of the ethnic group's communities, where we find that ethnic groups with more hierarchies beyond the immediate community (increasing scales) tend to have less missionary activity. Again, the Hausa and Fualni in the North presents the best contrast with the Ibo and Ibibio in the South.

The OLS estimates of equation (4) including ethnicity controls are shown in Table 5. Missionary activity still has a strong positive effect on schooling outcomes. An extra mission station per 1000 $km^2$ of the area of an individual's ethnic homeland, increases years of schooling by 1.08 years on average, and an additional mission station within 25 km increases years of schooling by .52 years. The point estimates are smaller than those in Table 2, and this suggests some role for historical ethnic specific characteristics for the effect of missionary activity on schooling.

Interestingly, there is an element of reversal of fortunes in Nigeria whereby ethnic groups that had cities in 1400, and higher population densities in the pre-colonial period have less schooling today. The estimates here provide evidence that the location of missions have played a role in this reversal in Nigeria. Indirect rule meant that the more "advanced" ethnic groups were shielded from missionary interference and Western forms of schooling which, we show later on, has had a positive impact on current wealth. Thus, the reversal of fortune may have been driven by institutions (as in Acemoglu et al. (2002)), and changes in the supply of factors of production (human capital) brought about by contact with missionaries.

evidence that malaria did not discourage missionary activity could be seen from the fact that malaria is more dominant in the Southern rainforest areas where there was more missionary presence. The correlation between the measure of malaria ecology and missionary stations in the South is .65.

**Table 5:** Missionary Activity and Years of Schooling (Controlling for Ethnic Observables)

Dependent Variable is Years of Schooling

| | (1) | (2) | (3) |
|---|---|---|---|
| **Missions** | | | |
| **Per 1000 $km^2$** | 1.083*** | | |
| | [3.41] | | |
| **Within 25 km** | | 0.518*** | |
| | | [6.82] | |
| **Within 50 km** | | | 0.598*** |
| | | | [16.64] |
| **City in 1400's** | -3.189*** | -3.203*** | -0.25 |
| | [-8.96] | [-12.93] | [-1.08] |
| **Pop. Density** | -0.540* | -0.586*** | -3.898*** |
| | [-2.57] | [-4.27] | [-17.15] |
| **Individual Controls** | Yes | Yes | Yes |
| **Household Controls** | Yes | Yes | Yes |
| **Ethnicity Controls** | Yes | Yes | Yes |
| **State Fixed Effects** | No | No | No |
| | | | |
| **Observations** | 30622 | 30622 | 30622 |
| **Adjusted $R^2$** | 0.561 | 0.583 | 0.557 |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, sex, and 8 occupation dummies. Household controls include the household size, sex of the household head, age of the household head, and wealth of the household. Ethnicity controls include an indicator for having a city in 1400, population density during the colonial period, and the hierarchical organization of the community in pre-colonial times, taken from Nunn and Wantchekon (2011). State fixed effects include fixed effects for 36 states and the federal capital territory.

### 5.2.2 Controlling for Ethnic Fixed Effects

We realize that the ethnic controls we have included may not be completely convincing to all, so we adopt a second strategy to uncover the causal effect of missions. The strategy utilizes the fact that traditional ethnic homeland have been separated into different states after the establishment of these mission stations. The continuous process of state creation has generated differences in exposure to missionary activity for individuals within an ethnic group. To implement this strategy, we estimate the equation below:

$$Y_{i,e,h,s} = \alpha_e + \beta M_s + \mathbf{X_i}\mathbf{\Pi} + \mathbf{X_h}\mathbf{\Gamma} + \mathbf{X_s}\mathbf{\Delta} + \epsilon_{\mathbf{i,e,h,s}}. \tag{5}$$

Equation (5) is very similar to (4), except that we now include an ethnicity fixed effect and examine the impact of missionary activity across states, $M_s$. All individual and household control variables are the same, and we include control variables for the suitability of the state to agriculture, and perhaps missionary activity. The state level controls are contained in $\mathbf{X_s}$, and include a measure the workability of land in the state, dummies for land terrain of the state and the agricultural zone of the state. OLS estimation results are shown in Table 6.

**Table 6:** Missionary Activity and Years of Schooling (Across States)

Dependent Variable is Years of Schooling

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Missions per 1000 $km^2$** | 2.855*** | 0.339*** | 0.213* | 1.073*** |
| | [16.79] | [3.73] | [2.37] | [7.39] |
| | | | | |
| **Individual Controls** | Yes | Yes | Yes | Yes |
| **Household Controls** | Yes | Yes | Yes | Yes |
| **Ethnicity Fixed Effects** | No | Yes | Yes | No |
| **State Controls** | No | No | Yes | Yes |
| | | | | |
| **Observations** | 47660 | 47533 | 47533 | 47660 |
| **Adjusted $R^2$** | 0.341 | 0.574 | 0.578 | 0.461 |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, sex, and 8 occupation dummies. Household controls include the household size, sex of the household head, age of the household head, and wealth of the household. State level controls include the workability of land in the state, 4 terrain fixed effects, and fixed effects for the agricultural zone in which the state lies. Ethnicity fixed effects include fixed effects for 10 major ethnicities and a group including the other minor ethnic groups. The sample size increases because individuals from other ethnicities are now included in the regression.

The effect of mission stations in Table 6 remains positive and statistically significant, even with ethnic group fixed effects. In column 2, we estimate that within an ethnic group, an additional mission station per 1000 $km^2$ of an individual's state of residence increases years of schooling by .34 years, on average. The estimate falls to .21 once we control for state characteristics, and the precision of the estimate weakens. In column 4 of Table 6, we examine the impact of including ethnicity fixed effects. Without controlling for ethnicity, but controlling for household and state characteristics, we find that an additional mission station increases years of schooling across states by 1.07 on average (compared to .21 with ethnicity fixed effects).

We interpret this finding as showing that treatment at the level of the ethnic group is important and that within an ethnic group, the location of mission stations across states may not be as important. This is perhaps a consequence of higher rates of mobility across states, within ethnic homelands, compared to mobility across ethnic homelands. Thus we would naturally expect to find the effect of missionary activity to be stronger across ethnic groups than within an ethnic group across locations.

### 5.2.3 Instrumental Variable Estimates

Here, we further explore the causal interpretation of the persistent effect of missionary activity on schooling using two instruments for the intensity of missionary activity. The use of instrumental variables solves two problems: it addresses the potential endogeneity of mission stations to ethnic group specific characteristics and also helps us deal with problems related to measurement error

in the intensity of missionary activity. Problems with measurement errors arise because, while we have estimates of the number of mission stations in any given area, we do not know the size of the mission staff nor how long they had been in the area before 1928.

The first instrument is the measure of the ethnic group's distance to the sea. An ethnic group's distance to sea is negatively correlated with missionary activity because indirect rule was more effective in the Northern parts of the country, where missionaries only arrived in great numbers after the establishment of British colonial administration. Furthermore, ethnic groups further away from the coast were relatively less exposed to the slave trade (Nunn and Wantchekon, 2011), and were unable to attract enough missionaries who spoke the native language.[23]

Our second instrument is an ethnic group's distance to Timbuktu, Mali, which was a major centre for the trans-Saharan trade and spread of Islam in West Africa (El-Hareir and Mbaye, 2011; Lulat, 2005). The River Niger, which flows through Timbuktu and Nigeria, provided access for traders and Islamic missionaries to Nigeria. We conjecture that the farther an ethnic group is from Timbuktu, the more difficult it would have been for Islamic missionaries to become established. This would mean that, given the lack of competition from Islamic missionaries, it would have been easier for Christian missionaries to establish themselves in areas farther away from Timbuktu. We compute distance from Timbuktu as the shortest route from the centroid of the ethnic group's homeland to Timbuktu.

We use both instruments simultaneously, and also control for the ethnic group's exposure to the slave trade, the hierarchical structure of the ethnic group, population density during the colonial period, and an indicator for the presence of a city as at 1400, in the regressions. The model is estimated by two-stage least squeares (2SLS), and results are shown in Table 7. The top panel reports second-stage results, and results from first-sage regressions follow.

In column 1 where we only control for state fixed effects and individual variables, we find that an additional mission station increases schooling attainment by 4.8 years on average and this falls slightly to 3.8 years once we include household controls. Controlling for the effect of the slave trade in column 3, we find that the effect of missionary activity remains robust, with an additional mission station increasing average years of schooling by 3.5 years. In the fourth column, we include the full set of controls for ethnic-group characteristics and find that the number of mission stations increases years of schooling by 2.17 years.

Column 4 also shows that exposure to the slave is positively associated with years of schooling in Nigeria, after controlling for an ethnic group's population density and the presence of a city in the 1400's. The negative effect of having a city and a higher population density, in the pre-colonial era, on schooling provides more evidence of a reversal of fortunes between ethnic groups in Nigeria.

From the first-stage regressions, we briefly examine the relevance and strength of our instrument.

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[23]An example is provided by that of a Kanuri recaptive Wesleyan agent, W. Allakurah Sharpe, who desperately pleaded with the Wesleyan mission, in 1879, to send missionaries to the Kanuri in Northeastern Nigeria. However, the mission could not afford to do this as a result of a lack of adequately trained personnel (Ayandele, 1966, p.118).

**Table 7:** IV Estimation of Effect of Missions on Schooling

| | Second-Stage Regressions: Dependent Variable is Years of Schooling | | | |
| --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) |
| **Missions per 1000 $km^2$** | 4.800*** | 3.821*** | 3.547*** | 2.170*** |
| | [8.80] | [8.96] | [6.94] | [3.84] |
| **Slave Exports per Area** | | | 0.124 | 1.434*** |
| | | | [0.74] | [11.78] |
| **City in 1400's** | | | | -1.006** |
| | | | | [-2.72] |
| **Pop. Density** | | | | -2.601*** |
| | | | | [-6.30] |
| | | | | |
| **Observations** | 34620 | 34609 | 34609 | 31100 |
| **Adjusted R-squared** | 0.544 | 0.61 | 0.613 | 0.609 |
| | | | | |
| **Individual Controls** | Yes | Yes | Yes | Yes |
| **Household Controls** | No | Yes | Yes | Yes |
| **Ethnicity Controls** | No | No | No | Yes |
| **State Fixed Effects** | Yes | Yes | Yes | Yes |
| | First-Stage Regressions: Dependent Variable is Missions per 1000 $km^2$ | | | |
| | (1) | (2) | (3) | (4) |
| **Distance to sea** | -0.00103*** | -0.00103*** | -0.000790*** | -0.00144*** |
| | [-95.54] | [-95.26] | [-68.64] | [-123.23] |
| **Distance to Timbuktu** | 0.0656*** | 0.0656*** | 0.0614*** | 0.0949*** |
| | [86.50] | [86.30] | [83.17] | [140.35] |
| **Slave Exports per Area** | | | 0.117*** | -0.238*** |
| | | | [50.01] | [-87.48] |
| **City in 1400's** | | | | 0.392*** |
| | | | | [55.99] |
| **Pop. Density** | | | | 0.782*** |
| | | | | [287.60] |
| | | | | |
| **Observations** | 34647 | 34636 | 34636 | 31126 |
| **Adjusted R-squared** | 0.858 | 0.858 | 0.868 | 0.982 |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, sex, and 8 occupation dummies. Household controls include the household size, sex of the household head, and age of the household head. Distance to Timbuktu is calculated as the shortest distance from the ethnic group's centroid to the centre of Timbuktu, Mali. The measure of the number of slaves exported per area, and ethnicity controls that include an indicator for having a city in 1400, population density during the colonial period, and the hierarchical organization of the community in pre-colonial times, are taken from Nunn and Wantchekon (2011). State fixed effects include fixed effects for 36 states and the federal capital territory.

As we hypothesized, distance to sea is negatively associated with missionary activity, and distance to Timbuktu is positively associated with missionary activity. The point estimates for the both instruments remain stable as more controls are added to the regression. Furthermore, we find that

the adjusted $R^2$ of the first-stage regressions are all above .86, with a Shea (1997) partial $R^2$ of .44. These results show that our instruments are good predictors of the intensity of missionary activity. Lastly, we performed diagnostic the Sargan test for overidentification, and cannot reject that our instruments are exogenous at the 5% level. In summary, the use of an instrument reveals that an additional mission station increases years of schooling by about 2.17 years on average.

## 5.3    Mechanism: Missions and Education Infrastructure

This sections assess mechanisms through which missionary activity has generated sustained increases in schooling attainment. An important transmission mechanism we have already identified in previous sections are inter-generational effects. Household characteristics related to missionary activity, especially wealth, reduce the estimated impact of historic missionary activity.[24]

Given the results above, an important question is why the missionary impact remains substantial in Nigeria even after a hundred years, and three generations, within the same country? The historical discussion showed that missionaries increased the education infrastructure in the areas where they operated by constructing schools and providing teachers. They did this in order to attract children to their message, and to train individuals who could carry on the missionary work. The missionary impact on schooling was already being felt as early as 1914, when there were 37,500 primary schools in the South, but just 1,100 primary schools in the North where the colonial government had taken primary responsibility for schooling (Csapo, 1981).

Here, we provide evidence that the missionary impact on schooling has been sustained partly because of these early infrastructural gains. First, we show that individuals whose ancestors were exposed to more missionary activity also tend to live in districts with more schools, even controlling for factors that influence demand for education. Secondly, we show that, after controlling for household factors, the missionary impact on schooling is only robust at the primary level of education where missions focused their investment efforts.

### 5.3.1    Missions and Current Education Infrastructure

The DHS data we use does not provide direct information on education infrastructure, instead we use data from rounds 2, 3, and 3.5 of the *Afrobarometer Survey* conducted in Nigeria (ICSPR, 2003–2008) to test for historical missionary activity and current access to education. The *Afrobarometer Survey* records the presence of a school in the individual's district of residence and the individual's ethnicity. Given that most Nigerians still live within ethnic homelands (see Oyeniyi (2013)), we estimate the effect of historic missionary activity on the current probability that there is a school within the individual's district. We also include other controls that may determine demand for education in the district such as age, urban/rural residence, sex, occupation, living conditions, and

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[24]Below, we show that historical missionary activity is positively related to current household wealth, even after controlling for education.

level of education. The results are shown in Table 8 for linear and logistic probability models.

**Table 8:** Missionary Activity and Schooling Infrastructure

Dependent Variable is Probability of School in District

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Linear Probability** | | **Logit** | |
| **Missions per 1000 $km^2$** | 0.0443*** | 0.0316*** | 0.0510*** | 0.0370*** |
| | [5.58] | [3.91] | [4.90] | [3.60] |
| **Education Level Dummy** | No | Yes | No | Yes |
| **Observations** | 6243 | 6190 | 6226 | 6173 |
| **Adjusted/Pseudo $R^2$** | 0.021 | 0.029 | 0.034 | 0.045 |

**Notes:** Logit model reports average marginal effects. T-statistics for robust standard errors are reported in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls including age, age-squared, urban/rural residence, sex, and dummies for 5 living condition and 23 occupation categories. The education dummies indicate 10 different levels of education.

The results show that an additional mission station per 1000 $km^2$ of an individual's ethnic homeland makes it more likely that there is a school in the individual's district of residence. When we do not control for the individual's levels of education, we find that an extra mission station per per 1000 $km^2$ is associated with a 4.4 percentage-point increase in the probability of having a school in the district under the linear specification. The average marginal effect is slightly higher with an estimated increase of 5.1 percentage points in the logistic model. Controlling for individuals' levels of education reduces the average marginal effect to 3.1 and 3.7 percentage points, for the linear and logistic models respectively. Thus, after controlling for the demand of education (education levels), individuals historically exposed to greater missionaries activities are more likely to live in district with schools.

Overall, the estimates provide evidence that the infrastructural gains brought by missionary activity have been sustained into the present time. To further assess whether these infrastructural advantages explain the sustained educational advantages associated with historical missionary activity, we test the effect of missionary activity on the probability of completing different levels of education.

### 5.3.2 Missions and Level of Education Completed

It is well known that missionaries were primarily interested in "basic education," and primarily invested in basic education infrastructure. They widely shunned further levels of education as those served no further evangelistic purpose (Ayandele, 1966, p. 284–290, 293). The regular curriculum emphasized the four R's: religion, reading, writing, and arithmetic (Ajayi, 1965, p.139). While there were large differences in primary schools in 1928 Nigeria, there were very few secondary schools

(and no universities) in the country during this time period.[25] Thus if increased infrastructure is responsible for the sustained educational attainment associated with missionary activity, we expect to find that the impact of missionary activity is strongest at the basic education level.

To assess this implication, we examine the effect of missionary activity on the probability of completing different levels of education, conditional on having completed the preceding level (controlling for demand). We estimate separate linear and logistic probability models of schooling attainment at three different levels of education, and the results are shown in Table 9. In the models, we also allow the effect of historical missionary activity to vary by sex in order to capture any heterogeneity.[26]

**Table 9:** Missionary Activity and Probability of Completing Different Levels of Education

Dependent Variable is Probability of Completing Level of Education

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Linear Probability | | | Logit | | |
| | **Primary** | **Secondary** | **Higher** | **Primary** | **Secondary** | **Higher** |
| **Missions per 1000 $km^2$** | 0.120*** | 0.0436** | -0.00735 | 0.154*** | 0.0221 | -0.00567 |
| | [8.01] | [2.86] | [-0.72] | [3.93] | [1.47] | [-1.19] |
| Male | 0.228*** | 0.151*** | 0.0265*** | 0.187*** | 0.157*** | 0.0521*** |
| | [24.37] | [19.47] | [5.50] | [28.54] | [25.10] | [12.61] |
| **Missions*Male** | -0.148*** | -0.109*** | -0.00554 | | | |
| | [-15.08] | [-9.69] | [-0.73] | — | — | — |
| | | | | | | |
| **Individual Controls** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Household Controls** | Yes | Yes | Yes | Yes | Yes | Yes |
| **State Fixed Effects** | Yes | Yes | Yes | Yes | Yes | Yes |
| | | | | | | |
| Observations | 34104 | 34104 | 34104 | 34104 | 34104 | 34104 |
| **Adjusted $R^2$** | 0.57 | 0.581 | 0.336 | 0.55 | 0.488 | 0.418 |

**Notes:** Logit model reports average marginal effects, and is estimated with an interaction term which is negative and statistically significant at the 99.99% level. We cannot report a marginal effect for the interaction term because of technical reasons. T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, and 8 occupation dummies. Household controls include the household size, sex of the household head, age of the household head, and wealth of the household. State fixed effects include fixed effects for 36 states and the federal capital territory.

The estimates show that the impact of missionary activity is strongest at the primary level, and there is very little impact of missionary activity on the probability of completing secondary and higher levels of education (conditional on completing the preceding level). The average marginal effect of missionary activity on all levels of education is similar in both the linear and logistic models. From the linear probability model, we find that historical exposure to missionary activity

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[25]For the development of higher education in Africa see (Ajayi et al., 1996), where we find less than 30 secondary schools in Nigeria as at 1928.

[26]We fully investigate the differential effects of missionary activity by sex in subsequent sections.

increases the probability of completing primary schooling by 12%, the probability of completing secondary education is increased by 4.4%, and we find no effect on the probability of completing higher education. In the logistic model, we find a slightly stronger effect of missionary activity on the probability of completing primary education (15%), but there is no evidence that missionary activity increased the conditional probabilities of completing higher levels of education.

The result in Table 9 is not surprising, because missionaries emphasized basic education at the expense of education at higher levels, which was primarily left for the government. This reinforces our emphasis on the importance of changes in schooling infrastructure brought about by missionary activity in explaining the persistent effects of missions on educational attainment. The results above lead us to conclude that, controlling for household factors, the effect of missionary activity is primarily due to increasing the supply of schooling at the basic education level.

Note that if the persistence was driven by a simple change in tastes for schooling, we might expect to see the probability of completing all levels of education increasing with missionary activity which is not borne out by the evidence in Table 9. The linear probability model also shows that the effect of historical missionary activity runs through increasing basic education for females, with the marginal impact for males close to zero. The same is true for the logit model, where we find a statistically significant negative interaction term. This is consistent with the prediction of our model regarding the impact of increased education infrastructure on males and females in proposition 2 which we further investigate below.

## 5.4 Missions and Schooling: Heterogeneous Effects

### 5.4.1 Missionary Activity and Schooling by Sex

One of the implications of the model of education laid out earlier is that the marginal impact of missionary activity would be higher for women compared to men, because missionary activity reduced education costs by increasing education infrastructure (proposition 2). The intuition is that the marginal effect of increased schooling infrastructure on attainment would be stronger for women, because of the higher marginal benefit of schooling due to labour market discrimination.[27] We would expect the impact of missionary activity to be higher among women compared to men, if missionary activity primarily increased the supply of schooling infrastructure.

To test this prediction, we estimate equation (4) but now allow the effect of missionary to differ by sex. The results are presented in Table 10. The first column of the table shows that men in Nigeria have an average of 3 more years of schooling compared to women. However, an additional mission station increases years of schooling by 4.18 years for women and 2.3 years for men, on average. This suggests that missionary activity across ethnic groups had a stronger effect on female education. In the second column, we see that household factors (effect on earlier generation)

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[27]The lower educational attainment of women can be seen in Table 10, and the implied higher marginal returns to schooling for women in Nigeria is documented by Aromolaran (2006).

account for about half of the impact of missions, with the point estimate for women dropping from 4.18 years to 2.13 years of schooling for an additional mission station.

**Table 10:** Missionary Activity and Years of Schooling (Effect by Sex)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent Variable is Years of Schooling | | | | |
| | | | | Muslims Only |
| **Missions per 1000** $km^2$ | 4.184*** | 2.129*** | 1.113*** | 8.119*** |
| | [19.87] | [15.59] | [6.16] | [5.59] |
| **Male** | 3.017*** | 2.466*** | 2.738*** | 3.117*** |
| | [27.66] | [26.49] | [30.26] | [19.42] |
| **Missions*Male** | -1.841*** | -1.320*** | -1.605*** | -4.426*** |
| | [-12.63] | [-10.66] | [-12.46] | [-4.78] |
| | | | | |
| **Individual Controls** | Yes | Yes | Yes | Yes |
| **Household Controls** | No | Yes | Yes | Yes |
| **State Fixed Effects** | No | No | Yes | Yes |
| | | | | |
| **Observations** | 34187 | 34076 | 34076 | 18102 |
| **Adjusted** $R^2$ | 0.388 | 0.555 | 0.633 | 0.551 |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, and 8 occupation dummies. Household controls include the household size, sex of the household head, age of the household head, and wealth of the household. State fixed effects include fixed effects for 36 states and the federal capital territory.

Once we control for state fixed effects in the third column of Table 10, the only significant effect of missionary activity is almost exclusively on female education. An additional mission station increases female education by 1.11 years on average, but for males, the effect is actually slightly negative (but insignificant). Further, as shown in column 4 of Table 10, when the model is estimated on Muslims only, the effect on males is now positive but still substantially less than the effect on females. This is consistent with the stronger effect of missionary activities in Muslim areas predicted by proposition 3.

These results are consistent with our model in which increases in the supply of schooling infrastructure leads to a greater increase in enrollment for women compared to men. The results in Table 10 are, however, not fully consistent with a framework where the demand for education increases as a result of increases in "taste" for schooling. If benefits rose as a result of increases in tastes for schooling, we would not expect to see a differential impact on men and women if there is no labour market discrimination, and should predict a greater impact on men in the presence of discrimination.

While the evidence discussed above rules out a gender-neutral change in tastes for education, we cannot rule out gender-specific changes in tastes for education. A related interpretation of this finding is that it may be due to changes in gender values brought about by the Protestant ethic of missionaries. First, this is somewhat at odds with the finding that even among Muslims,

the impact of missionary activity on female education remains greater than the impact on male education. Secondly, while some historical sources provide evidence that missionaries encouraged the education of women and children who were perceived as less "valuable," there is also evidence that education was biased towards men for economic reasons. For example, in the Niger Delta areas, more boys were sent to schools compared to girls because the Chiefs felt that, unlike girls, the boys could grow up to participate in trade. The Chiefs of Bonny, for example, asked "what profit is there to us for girls?" They felt that it was not prudent to send girls to school, because "they cannot trade on board ships when they grow up only live in the house" (Tasie, 1978, as quoted in p.34). This is, of course, additional evidence of the existence of labour market discrimination against women.

### 5.4.2  Role of Religion

How important is religion for the impact of missionary activity on schooling? To answer this question, we restrict the sample to Muslims and Christians, and estimate equations (4) and (5). The results are shown in Table 11.

Using the ethnicity level measure of missionary activity, and including state fixed effects, we find that an additional mission station increases years of schooling by almost 7 years, on average, for Muslims. Also, looking at the cross-state measure with ethnic group fixed effects, we find a smaller estimate of 3 years with no state-level controls. When we control for state-level features, the point estimate drops to .78, which is still larger than the point estimate of .21 in the sample as a whole. Under both measures, we find the estimated effect of missionary activity on schooling to be larger among Muslims compared to Christians. These results imply that missionary activity did not increase schooling simply because of Christianity

The results are consistent with proposition 3 of our model, because compared to Christians, the increase in the supply of school infrastructure as a result of missionary activity was less in Muslim areas. In our data, we find the average number of mission stations per area of the individual's ethnic homeland is .68 if the individual is a Christian today, but only .05 for current Muslims. This implies that the the marginal impact of missionary activity should be higher among Muslims, because average schooling infrastructure (mission stations) is lower in Muslim areas.

Historical sources also document the effect of missionary activity on schooling even among non-converts, primarily because of the demonstrable material benefits of schooling. In Lagos, for example, Yoruba Muslims who had initially resisted sending their children to mission schools out of fear of Christian influences, began to change their stance by 1900 and started to enroll in large numbers (Ayandele, 1966, p.300). Muslims in Northern Nigeria, on the other hand, did not have this option as a result of the prohibition of missionary activity in these areas. This effectively meant that the variation in the historical supply of missionary activity (schooling) is larger between Muslims compared to the variation between Christians.[28] This is reflected to the estimated larger

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[28]In our data, the estimated coefficient of variation in historical missionary activity among Muslims is

**Table 11:** Missionary Activity and Schooling Among Muslims

Dependent Variable is Years of Schooling

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Ethnicity-Level Measure** | | **State-Level Measure** | |
| **Missions per 1000 $km^2$** | 11.42*** | 6.749*** | 3.036*** | 0.803* |
| | [11.14] | [5.05] | [7.44] | [2.07] |
| | | | | |
| **Individual Controls** | Yes | Yes | Yes | Yes |
| **Household Controls** | Yes | Yes | Yes | Yes |
| **State Controls** | | | No | **Yes** |
| **State Fixed Effects** | No | Yes | | |
| **Ethnicity Fixed Effects** | | | Yes | Yes |
| | | | | |
| **Observations** | 18102 | 18102 | 22547 | 22470 |
| **Adjusted R-squared** | 0.534 | 0.549 | 0.492 | 0.525 |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Individual controls include age, age-squared, urban/rural residence, sex, and 8 occupation dummies. Household controls include the household size, sex of the household head, age of the household head, and wealth of the household. State level controls include the workability of land in the state, 4 terrain fixed effects, and fixed effects for the agricultural zone in which the state lies. Ethnicity fixed effects include fixed effects for 10 major ethnicities and a group including the other minor ethnic groups. State fixed effects include fixed effects for 36 states and the federal capital territory. The sample size increases for the state-level measure because individuals from other ethnicities are now included in the regression.

marginal impact of missionary activity among Muslims.

Once again, we cannot completely rule out the importance of Protestant values, because Muslims living in close proximity to mission stations may acquire similar ethics, even if they do not convert. However, we can rule out the nominal role of religion. Thus, these gains in schooling could have been accomplished without mass conversions to Christianity. This somewhat justifies the colonial administration's policy of non-interference by missions, but also indicts the administration for failing to adequately provide schooling alternatives.

## 5.5 Effect on Wealth: Reversal of Fortunes

Lastly, we assess the extent to which historic missionary activity has contributed to prosperity in modern Nigeria. To this end, we regress household wealth on intensity of missionary activity and other individual, household, and ethnic group, controls. The model is estimated by OLS and 2SLS, using distance to the sea and distance to Timbuktu as instruments for the intensity of missionary activity. The results of this exercise are shown in Table 12.

We find that historic exposure of an individual's ethnic group to missionary activity is positively associated with the individual living in a wealthier household today. Examining the OLS results, we

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181.446, which is larger than the coefficient of variation of 81.9 among Christians.

see from Column 1 of Table 12 that, after controlling for individual and household characteristics, and including state fixed effects, an additional mission station in an individual's ethnic homeland is associated with a .24 increase in the wealth index of the household in which the individual lives. This is a substantial rise, because the wealth index ranges from 1 to 5. In standardized terms, the estimate implies that a 1-standard deviation rise in the number of mission stations per 1000 $km^2$ is associated with a .15-standard deviations increase in the wealth index. The 2SLS estimates yield a much larger impact of schooling on wealth, with an additional mission station increasing the wealth index of the individual's household by .68.

The effect of missionary activity on wealth is consistent with a human capital model. In the second column, we find that some of the effect of missionaries on wealth is accounted for by the higher years of schooling induced by missionary activity. Introducing schooling into the regression decreases the estimated impact of missionary activity on wealth to .16, and the 2SLS estimates also falls to .24. However, the effect historical missionary activity remains positive and significant, which suggests that not all of the effects of missionary activity on wealth can be attributed to higher levels of schooling attainment.

In the next set of columns (3–5), we assess the role of missionary activity in the "reversal of fortunes" between Nigerian ethnic groups by including measures correlated with pre-colonial prosperity. Specifically, we control for slave exports per area of ethnic homeland, an indicator for having a city in 1400, population density during the colonial period, and the hierarchical organization of the community in pre-colonial times. In column 3, we find that ethnic groups with cities in the 15th century have less wealth today, and score .45 less on the wealth index. The same is true for ethnic groups with a higher population density in the colonial area, who score .43 points less on the wealth index (which ranges from 1–5).

An interesting finding from columns 3–5 is that individuals from ethnic groups more intensively exposed to the slave trade have higher levels of wealth today. In column 4, we find that some of the positive effect of the slave trade on wealth is attributable to higher levels of schooling as a result of missionary activity. This is most clearly seen from column 4 of the the 2SLS estimates where we see that, controlling for schooling, the positive effect of the slave trade falls by about half and the positive effect of missions on wealth becomes insignificant. Put differently, once we control for the positive correlation between missionary activity, schooling, and the slave trade, as in a 2SLS regression, missionary activity has a small effect on wealth.

From the 2SLS estimates in column 4, we also see that most of the reversal of fortunes is accounted for by the lower levels of missionary activity, and thus schooling, among ethnic groups who were more prosperous before missionary contact. In fact, once we control for years of schooling, the negative effects of the presence of a city and population density become weak and insignificant at conventional levels. This is important because it suggests another mechanism through which ethnic groups who were once prosperous in precolonial times now lag behind. While some of this reversal is due to institutional changes at the national level, as in Acemoglu et al. (2002), the results

**Table 12:** Missionary Activity, Household Wealth, and Reversal of Fortunes

Dependent Variable is Household Wealth

**OLS Estimates**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Missions per 1000 $km^2$ | 0.239*** | 0.155** | 0.326** | 0.333*** | -0.0607 |
| | [3.64] | [3.09] | [3.00] | [3.49] | [-0.37] |
| Years of Schooling | | 0.0923*** | | 0.0956*** | 0.0853*** |
| | | [22.09] | | [20.29] | [20.88] |
| Slave Exports per Area | | | 0.502*** | 0.274*** | 0.142** |
| | | | [13.71] | [8.09] | [3.19] |
| City in 1400's | | | -0.454*** | -0.0701 | 0.0256 |
| | | | [-4.41] | [-0.78] | [0.21] |
| Pop. Density | | | -0.428*** | -0.233*** | 0.133 |
| | | | [-5.39] | [-3.60] | [1.06] |
| | | | | | |
| Observations | 34636 | 34609 | 31126 | 31100 | 31100 |
| Adjusted R-squared | 0.592 | 0.646 | 0.526 | 0.593 | 0.627 |

**2SLS Estimates**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Missions per 1000 $km^2$ | 0.675*** | 0.236* | 0.456* | 0.128 | -0.198 |
| | [4.44] | [1.97] | [2.27] | [0.73] | [-0.86] |
| Years of Schooling | | 0.0920*** | | 0.0956*** | 0.0852*** |
| | | [22.35] | | [20.24] | [20.83] |
| Slave Exports per Area | | | 0.490*** | 0.293*** | 0.147** |
| | | | [12.07] | [7.69] | [3.28] |
| City in 1400's | | | -0.375* | -0.196 | -0.0554 |
| | | | [-2.46] | [-1.54] | [-0.35] |
| Pop. Density | | | -0.483*** | -0.146 | 0.213 |
| | | | [-4.74] | [-1.75] | [1.40] |
| | | | | | |
| Observations | 34636 | 34609 | 31126 | 31100 | 31100 |
| Adjusted R-squared | 0.587 | 0.645 | 0.526 | 0.592 | 0.627 |
| | | | | | |
| Individual Controls | Yes | Yes | Yes | Yes | Yes |
| Household Controls | Yes | Yes | Yes | Yes | Yes |
| Ethnicity Controls | No | No | Yes | Yes | Yes |
| State Fixed Effects | Yes | Yes | No | No | Yes |

**Notes:** T-statistics for clustered standard errors in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Instruments for missionary activity are an ethnic group's distance to the sea, and an ethnic group's distance to Timbuktu. Individual controls include age, age-squared, urban/rural residence, sex, and 8 occupation dummies. Household controls include the household size, sex of the household head, and age of the household head. Ethnicity controls include measures of slave exports per area of ethnic homeland, an indicator for having a city in 1400, population density during the colonial period, and the hierarchical organization of the community in pre-colonial times, taken from Nunn and Wantchekon (2011). State fixed effects include fixed effects for 36 states and the federal capital territory.

here show that schooling investments by missionaries has played an important role in Nigeria. The relative degrees to which resource endowments and institutional changes have transformed African

economies, upon European contact, remains an important topic for future research.

# 6 Conclusion

In this paper, we have shown that early investments in education infrastructure by missionaries is still positively related to schooling attainment in Nigeria. This result holds for ethnic groups living in the same state, and individuals of the same ethnic group living in different states. Using an ethnic group's distance to sea and Timbuktu as instruments for the intensity of missionary activity, we find that an additional mission station per 1000 $km^2$ of an individual's ethnic homeland increases years of schooling by 3 years, on average. The effect of missionary activity on schooling is also seen among Muslims which rules out the link between religion and education as the primary mechanism. From the estimates, we find that the persistence of the relationship between missionary activity and schooling is partly explained by the inter-generational transmission of human capital, because early exposure to missionary activity is positively related to current household wealth in Nigeria.

We also find that the key to understanding the relationship between historical missionary activity and schooling lies in basic education, and the basic education of females. The importance of basic education is not surprising given that missionaries primarily invested in basic schooling. Regarding female education, we argue that labour market discrimination in Nigeria means that female education is not as profitable as male education. However, an increase in schooling infrastructure lowers the marginal cost of female education, and this explains the larger effect of missionary activity on education attainment for females. Finally, we briefly show that exposure to missionary activity has led to increased wealth even after controlling for years of schooling.

Our study shows that exposure to missionary activity is an important determinant of the relative prosperity of different societies upon European contact. This goes beyond the well known influences of colonial governments and European traders. While this paper has focused on the missionary impact on human capital in modern Nigeria, we also recognize that missionaries may have also influenced cultural values and institutions. The complete effects of missionary activity on income and wealth is left for future research.

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Table 13: Full Summary Statistics

| Ethnicity | Ekoi | Fulani | Hausa | Ibibio | Igala | Igbo | Ijaw | Kanuri | Tiv | Yoruba | Others | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Individual Characteristics** | | | | | | | | | | | | |
| Mean Age | 29.2 | 30 | 30 | 29.2 | 28.5 | 29.9 | 29 | 30.1 | 27.9 | 30.1 | 29.3 | 29.7 |
| Percent Male | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Percent Urban | 0.2 | 0.1 | 0.3 | 0.3 | 0.3 | 0.5 | 0.2 | 0.4 | 0.2 | 0.6 | 0.3 | 0.4 |
| Percent Muslim | 0 | 1 | 1 | 0 | 0.5 | 0 | 0 | 1 | 0 | 0.4 | 0.3 | 0.4 |
| Percent South | 1 | 0 | 0 | 1 | 0.1 | 1 | 1 | 0 | 0 | 0.9 | 0.4 | 0.5 |
| Mean Schooling Years | 8.9 | 1.1 | 2.8 | 9.2 | 7.7 | 9.7 | 9.2 | 1.5 | 6.3 | 9.7 | 7.1 | 6.7 |
| Percent Completed Primary | 0.9 | 0.1 | 0.3 | 1 | 0.8 | 1 | 0.9 | 0.2 | 0.8 | 0.9 | 0.8 | 0.7 |
| Percent Completed Secondary | 0.7 | 0.1 | 0.2 | 0.7 | 0.6 | 0.7 | 0.7 | 0.1 | 0.4 | 0.7 | 0.5 | 0.5 |
| Percent Completed University | 0.1 | 0 | 0 | 0.2 | 0.1 | 0.2 | 0.1 | 0 | 0.1 | 0.2 | 0.1 | 0.1 |
| **Household Characteristics** | | | | | | | | | | | | |
| Mean Size | 5.7 | 6.8 | 7 | 5.4 | 6.1 | 5.1 | 4.8 | 6.4 | 7 | 5 | 6.5 | 6 |
| Percent Male Head | 0.8 | 1 | 0.9 | 0.8 | 0.8 | 0.8 | 0.7 | 1 | 0.8 | 0.8 | 0.9 | 0.9 |
| Mean Age of Head | 44 | 41.3 | 43.3 | 43.5 | 42.9 | 47 | 41.9 | 40.7 | 42.9 | 45.3 | 43.8 | 44.1 |
| Mean Schooling Head | 8.4 | 1.2 | 3 | 9.1 | 7.6 | 9.2 | 9.3 | 1.5 | 6.5 | 9.5 | 7.2 | 6.7 |
| Mean Wealth | 3 | 1.6 | 2.4 | 3.9 | 3.2 | 3.9 | 3.3 | 2 | 2.1 | 4.1 | 3.1 | 3.1 |
| Mean Missions per $1000km^2$ | 0.1 | 0 | 0 | 2 | 0.2 | 1.1 | 0.2 | 0 | 0.2 | 0.2 | | 0.4 |
| Mean Slave Exports | 0.2 | 0 | 0.7 | 1.9 | 0 | 2.5 | 1 | 0 | 0 | 2.7 | | 1.5 |
| Mean State Missions per $1000km^2$ | 0.5 | 0.1 | 0.1 | 1.7 | 0.3 | 1 | 0.3 | 0 | 0.2 | 0.5 | 0.3 | 0.4 |
| Percent of Data | 1.6 | 5.9 | 22.5 | 2.5 | 1.5 | 15.7 | 3.8 | 2 | 2.4 | 18 | 24.2 | 100 |