The Effect of Colonial and Pre-Colonial Institutions on Contemporary Education in Africa

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Abstract

This paper argues that contrary to previous findings, present-day education outcomes in Africa cannot be independently attributed to colonial or pre-colonial ethnic institutions. We propose that it is instead the complementarity or contention between colonial and pre-colonial institutions that result in education outcomes we observe today. Using geolocated DHS literacy outcomes for Cameroon, Côte d'Ivoire, Ghana, and Nigeria, our findings suggest that the positive effect of British rule on contemporary literacy is diminished in centralised ethnic regions. This paper contributes to debates on colonial and pre-colonial ethnic influences on African development, moving beyond country-level analysis.

Keywords: Ethnic Institutions, Education, Africa
JEL: I25, N17, Z13

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1 Introduction

A growing literature examines the effects of historical institutions on contemporary development in Africa. Variation in present-day education outcomes have specifically been attributed to colonial rule, with British rule being considered more favourable (Benavot & Riddle, 1988; Brown, 2000; Garnier & Schafer, 2006; Grier, 1999). Similarly, pre-colonial ethnic institutions have been associated with contemporary development characteristics and increased public goods provision, including schooling (Angeles & Elizalde, 2017; Archibong, 2019; Gennaioli & Rainer, 2007; Michalopoulos & Papaioannou, 2013, 2014; Michalopoulos, Putterman, & Weil, 2019).

Given that colonial and pre-colonial institutions coexisted in Africa for approximately two generations, studying the economic effects of these two institutions in isolation may lead to distorted results. We propose that it is the complementarity or contention between colonial institutions 'inherited' by countries and pre-existing ethnic institutions that can explain differences in contemporary education outcomes. Understanding the interdependence between colonial rule and pre-colonial ethnic institutions is essential as their effects still determine outcomes even today (Brown, 2000; Cogneau & Moradi, 2014; Frankema, 2012; Gennaioli & Rainer, 2007). Therefore, the objective of the study is to analyse the effect of these institutions along with their interaction on contemporary literacy.

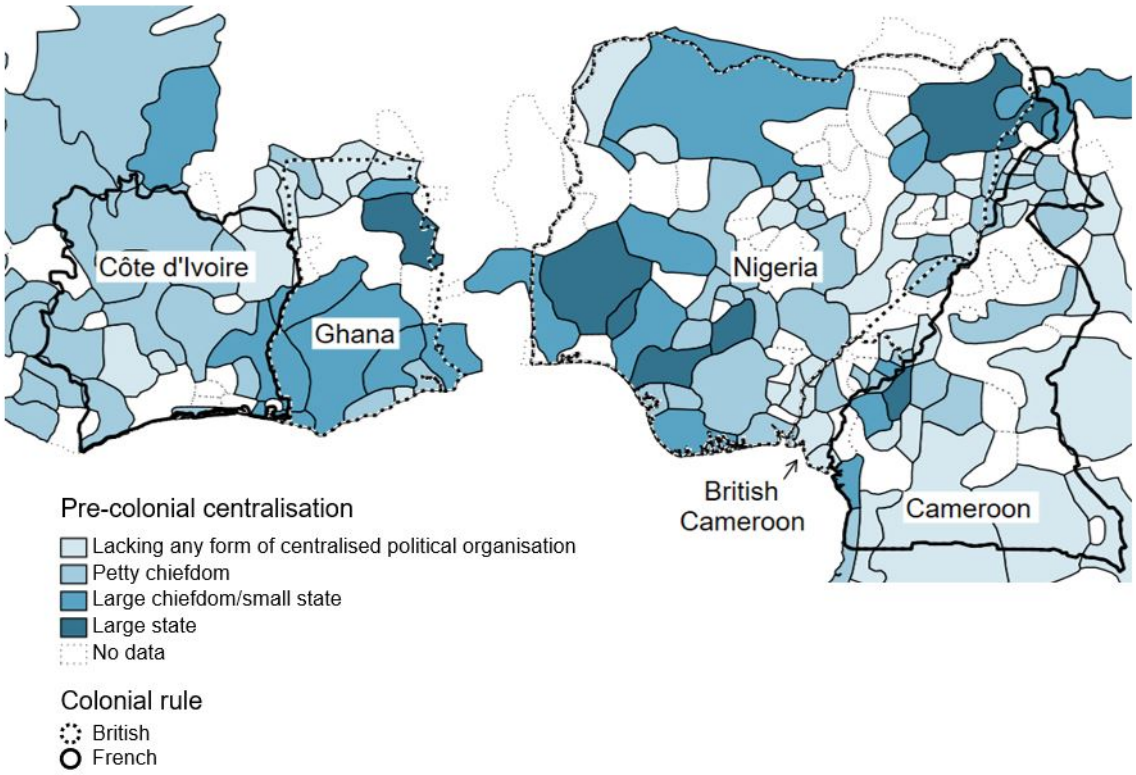
Education outcomes are associated with economic growth, development, quality of institutions and political participation (Acemoglu, Gallego, & Robinson, 2014; Barro, 2001; Glaeser, Ponzetto, & Shleifer, 2007; Lipset, 1959). Literacy not only improves the individual's economic prospects, but also that of society by increasing the human capital necessary for a well-functioning, productive and growing economy. Studying literacy is therefore a suitable point of departure to address the various development challenges faced by African countries, especially considering that a quarter of the global illiterate population resides in sub-Saharan Africa, whilst only having 17 per cent of the world's population (United Nations, 2019).

We use geolocated literacy data from the Demographic and Health Surveys (DHS) (ICF, 2017) and ethnic institution data from George Peter Murdock's Ethnographic Atlas (Murdock, 1969). To measure pre-colonial ethnic institutions we consider the degree of political centralisation, i.e. chiefly hierarchy and political complexity of ethnic regions (Gennaioli & Rainer, 2007).

Our analysis focuses on four Western African countries, Cameroon, Côte d'Ivoire, Ghana, and Nigeria. These countries provide a compelling case for our study: firstly, bordering countries were subject to different colonial institutions as illustrated in Figure 1. Ghana was colonised by the British in 1874 and borders Côte d'Ivoire, declared a French colony in 1842. Nigeria is a former British colony (1901) bordering Cameroon that was first colonised by Germany in 1884, known as German Kamerun. Following World War I in 1916 Kamerun was divided between British and French territories. In 1961 after independence, British Cameroon regions were allocated between Cameroon and Nigeria, with Southern regions voting to join present-day Cameroon and the Northern regions voting to join Nigeria.[1] Secondly, artificial borders imposed

[1] In 1957, Ghana was the first country in sub-Saharan Africa to gain independence, followed by Nigeria, Côte

Figure 1: Pre-colonial Ethnic Centralisation



Source:Murdock (1969) and GADM (2018)
Note: This map illustrates colonial rule borders, pre-colonial ethnic region boundaries and the ethnic region level of centralisation. Ethnic regions lacking any form of centralised political organisation and petty chiefdoms are classified as fragmented ethnic regions. Large chiefdoms and states are classified as centralised ethnic regions (Gennaioli & Rainer, 2007).

Table 1: DHS Survey Literacy Rates (%)

	British		*French*	
	Fragmented	Centralised	Fragmented	Centralised
Able to read parts	9.5	8.5	8.4	7.7
Able to read whole sentence	61.8	50.4	51.5	72.3
Cannot read	28.7	41.1	40.1	20.0

Note: Regions forming part of British colonial rule include Ghana, Nigeria and British Cameroon. Regions forming part of French colonial rule include Cameroon and Côte d'Ivoire.

by colonialists split ethnic groups along the borders such that the same ethnic groups were exposed to different colonial institutions (Alesina, Easterly, & Matuszeski, 2011; Michalopoulos & Papaioannou, 2016). For instance, the Assini ethnic group is split by the Ghana-Côte d'Ivoire border and was therefore subject to French rule in Côte d'Ivoire and British rule in Ghana. Finally, there is variation in ethnic institutions within and between countries.

Figure 1 also illustrates pre-colonial ethnic region boundaries and jurisdictional hierarchy levels beyond local community. Ethnic regions lacking political organisation and petty chiefdoms are classified as fragmented ethnic regions, whilst larger chiefdoms and states that are more

D'Ivoire and Cameroon in 1960.

politically complex are classified as centralised ethnic regions (Gennaioli & Rainer, 2007). Côte d'Ivoire is characterised by majority petty chiefdoms, whilst the level of centralisation in Nigeria vary considerably between ethnic regions.

Table 1 provides literacy rates amongst individuals from fragmented and centralised ethnic regions within the respective former colonies. In former British colonies, contemporary literacy is higher in fragmented relative to centralised ethnic regions. Contrary, in former French colonies, literacy is higher in centralised relative to fragmented ethnic regions. The aim of our study is therefore to analyse whether this variation can be explained by the interaction between colonial and pre-colonial institutions. As pointed out by Frankema (2012), we cannot understand the variation in human capital if we do not consider the role of African agency, which is the way in which native African citizens exercise influence within society and the economy.

Our findings suggest that British colonial rule and pre-colonial ethnic centralisation have heterogeneous effects on contemporary education depending on the interaction between these two institutions. British rule is positively associated with literacy, however, only in fragmented ethnic regions. In centralised ethnic regions this positive effect of British rule, that is often reported in literature, is mitigated. In politically complex ethnic regions with established hierarchies and political reach, indirect British rule did not encourage cooperation and education incentives to the same extent as French rule.

Our study contributes to the literature in the following respects. Firstly, it adds to insights regarding variation in education outcomes amongst former colonies, which have been attributed to the political, administrative and educational approaches implemented by colonial rulers (Bolt & Bezemer, 2009; Cogneau & Moradi, 2014; Dupraz, 2015; Frankema, 2012; Huillery, 2009). Secondly, our paper expands the literature relating contemporary economic outcomes to pre-colonial ethnic institutions moving beyond country-level analysis (Angeles & Elizalde, 2017; Bandyopadhyay & Green, 2016; Gennaioli & Rainer, 2007; Lowes, Nunn, Robinson, & Weigel, 2017; Michalopoulos & Papaioannou, 2013). Yet, studies neglect to take into account the interrelated effect of colonial rule and pre-existing indigenous institutions. Therefore, thirdly and most importantly, we contribute to the recent and limited literature that acknowledges the relationship between colonialists and ethnic indigenous societies (Archibong, 2019; Huillery, 2011; Müller-Crepon, 2020).

2 Colonial Rule and Pre-colonial Ethnic Centralisation

> Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights).
>
> - North (1991)

The focus of this study is the interaction between two institutions, colonial rule and pre-colonial ethnic institutions. Colonial rule is the enforcement of British or French institutions,

such as the implementation of different schooling and law systems for example. Our measure of pre-colonial ethnic region centralisation can be viewed as an index of indigenous institutional advancement that existed prior to colonialism. Present-day structures of societies were affected by the hostility or collaboration between foreign colonial and existing traditional systems, influencing development trajectories intentionally and unintentionally.

Initial colonialism by the British took place due to commercial motivations. As trading companies entered into African territories, the British would follow with the purpose of overseeing the administrative economy (Moradi, 2008). The French, on the other hand, envisioned African territories as part of the empire and moved into African regions with this in mind (Clignet & Foster, 1964; Cogneau & Moradi, 2014). Furthermore, the British adapted their approaches individually to each colony, whilst the French were more rigid and implemented common law. This was also true in their education systems.

Brown (2000) provides a concise comparison of British and French institutions with respect to education policies. The British customised education approaches to the characteristics of the different societies, whilst the French were less flexible in this regard. For example, the French enforced the French language on elementary school level. Contrary, in British colonies education took place in local dialects and English was introduced later.

Studies have argued that these differences in colonial rule are responsible for present-day education outcomes (Benavot & Riddle, 1988; Bolt & Bezemer, 2009; Brown, 2000; Garnier & Schafer, 2006; Grier, 1999; White, 1996).[2] Focusing on French and British territories in the partitioning of German Togoland, today Ghana and Togo, Cogneau and Moradi (2014) use data on recruits to the Ghana colonial army and conduct a border discontinuity analysis to study differences in literacy and religion at the borders. Findings show the positive effects of increased education spending and missionary support by the British in the Southern regions of Togo and Trans-Volta Togoland, however, in the North results are weak and do not show noteworthy differences. Cogneau and Moradi (2014) furthermore emphasise the persistence of colonial effects in education outcomes.

In German Kamerun, Dupraz (2015) finds British rule to be associated with higher school participation and primary school completion up to the 1930's, where after French rule is associated with higher education outcomes. Initial positive effects associated with British rule is possibly explained by higher expenditures on public schools and increased missionary activity in British colonies. Yet, increased investments in French education in the later colonial period negates these effects.

We argue that differences in present-day education outcomes are not only as a result of differences in colonial rule, but rather due to the relationship between the respective colonialists

[2]Colonial rule is also associated with other contemporary development outcomes. Angeles (2007) finds that colonialism is a determining factor of income inequality observed today. In areas where the percentage of European settlers were higher (yet still in minority), inequality increased due to exclusion of owning resources. Easterly and Levine (2016) find that countries with larger European settlements during the colonial period have higher contemporaneous economic development relative to countries with smaller European settlements. Anderson (2018) finds a strong association between colonial institutions and present-day HIV rates amongst females. Common law colonies are associated with weaker female martial property rights and therefore suffer from higher HIV rates.

and native ethnic leaders. The British employed traditional authorities as representatives and mediators for social and economic changes. Essentially, native chiefs had to become British government agents. This approach may have presented challenges in the introduction of formal education. Although the British attempted to minimise political interference by emphasising economic diffusion (Clignet & Foster, 1964), this approach influenced the mechanisms of the respective institutions. Through indirect rule, the British utilised and cooperated with traditional chiefs to enforce institutions, but also accommodating the ethnic and traditional institutions that were already in place (Lugard, 1929). Yet, in ethnic regions that lacked political unity, the British would become more involved in administration (Clignet & Foster, 1964).

In contrast, the French renounced local ethnic leaders of their roles and created new administrative units that negated traditional ethnic boundaries and systems. Assignment of chiefs to administrative units depended on their allegiance to the French government and education (Bolt & Bezemer, 2009; Crowder, 1964). This form of direct rule had little regard for existing ethnic institutions.

Gennaioli and Rainer (2007) suggests that ethnically centralised countries with established ethnic institutions and political authority have higher public goods provision due to increased accountability and coordination by local chiefs, which affected the ability to implement modernisation programmes.[3] In centralised ethnic regions where local ethnic leaders and citizens were likely more involved we expect increased engagement in policy implementation, affecting regional economic growth and the supply of schooling (Michalopoulos & Papaioannou, 2013).

Using the example of Uganda, Gennaioli and Rainer (2007) explains that in centralised ethnic regions, the British government incorporated and acknowledged the existing hierarchy of leaders. However, in fragmented regions, local chiefs were selected by the colonial government and had to report to the 'distant' Colonial Administration. In the latter case, it proved difficult for the colonial government to manage and coordinate with dispersed leaders whom often acted in self-interest. Contrary, in centralised ethnic regions the colonial government was able to encourage the introduction and implementation of colonial influences, including education policies, as leaders were subject to political authority and were held accountable.

Similarly, recent research by Müller-Crepon (2020) show that in centralised ethnic regions, the British implemented indirect rule more so than in fragmented ethnic regions. In these regions, budgets for native administration were larger, however, colonial rulers were less involved. In fragmented ethnic regions, the British adopted a more direct approach through increased administration and less reliance on ethic region authorities.

Pre-colonial ethnic centralisation, however, does not necessarily foster cooperation.[4] Centralised ethnic regions could have also engaged in organised resistance against colonial rule as posited by Frankema (2012). For example, Huillery (2011) shows that in French-speaking West Africa colonial investments were lower in regions where local citizens were hostile towards

[3]In contrast, Bandyopadhyay and Green (2016) do not find an association between pre-colonial ethnic centralisation and public goods provision of education and healthcare. Their findings rather point to centralised ethnic regions experiencing higher wealth, which can be classified as private goods.

[4]In the Kuba Kingdom, more developed pre-colonial institutions are also negatively associated with norms of rule and decreased likeliness to obey national laws (Lowes et al., 2017).

European settlement. Regions less hostile towards European settlers benefited from increased colonial investment. In this case, centralisation would be inversely associated with the provision of public goods such as education due to contention between colonial and ethnic institutions.

Studying the relationship between pre-colonial ethnic centralisation and public goods provision in Nigeria, Archibong (2019) finds that public services were provided as rewards for compliance between ethnic region leaders and colonial powers in centralised ethnic regions. When there was non-compliance and ethnic leaders failed to bargain with colonial powers, ethnic regions where 'punished' by withholding public goods.

Although local ethnic leaders were more accountable in centralised ethnic regions, non-compliance and hostility coupled with the absence of British colonial administrators as discussed by Müller-Crepon (2020) may alter the conventional narrative regarding the effect of colonial and pre-colonial ethnic institutions on education. We therefore hypothesise that in centralised ethnic regions, British rule is negatively associated with education outcomes. In fragmented ethnic regions, however, indirect rule and its more accommodative, yet involved policies is associated with positive outcomes.

3 Empirical Design

The main empirical specification is

$$literate_{iec} = \beta_1 British_{ec} + \beta_2 central_e + \beta_3 British_{ec} * central_e + \beta_4 X_{ec} + u_{iec} \tag{1}$$

where literacy, $literate_{iec}$, is a binary variable equal to 1 if individual (i), residing in ethnic region (e) and country (c), is able to read parts of or a whole sentence, 0 otherwise. We use literacy as a proxy for contemporary education, which measures contemporary quality of education that cannot be measured through school attendance and completion records. We obtain literacy statistics from the DHS for the respective countries in our study. The DHS are nationally representative household surveys conducted in various developing countries since the 1980s. We use data from the two latest geolocated surveys for Cameroon, Cote D'Ivoire, Ghana and Nigeria (ICF, 2017). Data is obtained from Phase 3 and 4 for Cote D'Ivoire, Phase 4 and 6 for Cameroon and Phase 5 and 6 for the remaining countries. A potential shortcoming is that respondents with secondary or higher education were not asked to read a sentence to test their literacy ability and were assumed literate. The estimates in these surveys may therefore be overestimated across all countries (Croft, Marshall, & Allen, 2018).[5]

The DHS clusters (enumeration areas within which individuals are interviewed) are georeferenced to the Murdock Ethnographic Atlas Codebook, from which we obtain pre-colonial ethnic centralisation data (Murdock, 1969). The specific ethnic region's pre-colonial centralisation is then attributed to individuals that fall within the pre-colonial ethnic group polygon.

We assume that the distribution of ethnic groups remain similar to the distribution captured

[5]Visually impaired individuals and those that did not have the appropriate language reading card available are coded as missing.

in Murdock's Ethnographic Map. According to Afrobarometer individual-level survey data in 2005, the location of respondents are 0.55 correlated to their historical ethnic region (Nunn & Wantchekon, 2011). Similarly, recent research by Anderson (2018) indicates that in eleven DHS surveys capturing ethnic information, 60 per cent of individuals reside in their historical ethnic region based on their reported ethnic group.

We acknowledge that the Murdock Ethnographic Atlas has some shortcomings. Firstly, ethnic groups were sampled during different time periods over 1850 to 1950. Secondly, although we classify indigenous institutions as pre-colonial ethnic institutions, there were earlier European influences such as during the slave trades that occurred prior to data capturing in the 19th century (Gennaioli & Rainer, 2007). Giuliano and Nunn (2018), however, notes that as ethnic group characteristics are persistent and remain rather stable over time, Murdock's data is still of value. Finally, there are some missing observations in the Murdock Ethnographic Atlas as shown in Figure 1. We are therefore not able to attribute pre-colonial ethnic characteristics to individuals residing in these ethnic regions and these observations are dropped. Despite these weaknesses, Murdock's data remains a reliable and popular source of pre-colonial ethnic information in Africa (for example Gennaioli and Rainer (2007), Alesina, Giuliano, and Nunn (2013), Michalopoulos and Papaioannou (2013, 2014, 2016) and Angeles and Elizalde (2017)).

Ethnic region centralisation, $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was centralised, 0 if fragmented. Borrowing from Gennaioli and Rainer (2007), groups that do not have political authority beyond the local community or only a single level of jurisdictional hierarchy, such as petty chiefdoms, are classified as *fragmented*. These groups are smaller political entities that lack political integration above local community level. Groups that have more than two levels of jurisdictional hierarchy, such as larger chiefdoms (two) and states (three) are classified as *centralised*.

The influence of British colonisation, $British_{ec}$, is equal to 1 if the region within which the individual resides was part of a former British colony, 0 if French colony. Ethnic-country region level allows us to account for ethnic regions split by colonial country borders as well as the different colonial influences in present-day Cameroon.

We control for ethnic-country region demographic, location and geographic characteristics, X_{ec}, with data available from Michalopoulos and Papaioannou (2013). The log of population by ethnic regions in 1960, $population_{ec}$, has been used in various studies to measure development (Acemoglu, Johnson, & Robinson, 2002). Ethnic regions and countries with higher populations in 1960 and are likely to be more developed today, with higher levels of education.

The first location control is a binary variable, $capital_{ec}$, that is equal to 1 if the capital city of the country is located within the ethnic-country region in which the individual resides, and 0 otherwise. Firstly, capital cities tend to be have higher economic activity and be more developed relative to other regions. Secondly, colonial rule, which can be considered a national institution, may be more pronounced in ethnic region within which capital cities are located (Michalopoulos & Papaioannou, 2014). As regions closer to national borders have been associated with lower development outcomes, we control for distance to the national border, $borderdistance_{ec}$

(Michalopoulos & Papaioannou, 2016).

Geographic controls include measures for natural endowments, terrain and disease. Oil and gas are important natural resources in Cameroon, Ghana and specifically, Nigeria. We include a binary variable, $petroleum_{ec}$, equal to 1 if an ethnic-country region has an on-shore oil or gas deposit, 0 otherwise. The suitability of soil for agriculture, $soilquality_{ec}$ and average elevation of ethnic regions by country, $elevation_{ec}$, are also associated with economic development outcomes through the effect on technological diffusion, slave trade, colonial reach and public infrastructure provision (Frankema, 2012; Gennaioli, La Porta, Lopez De Silanes, & Shleifer, 2014; Michalopoulos, 2012; Nunn & Puga, 2012).

As a disease control, we include a malaria index, $malaria_{ec}$, which measures the mean climatic conditions favourable for malaria. Many studies have shown the negative effects of malaria on economic and socio-economic outcomes, historic mission settlements and education (Cagé & Rueda, 2016; Frankema, 2012; Gallup & Sachs, 2001; Jedwab, Selhausen, & Moradi, 2019). Higher incidence of contracting malaria in these climatic conditions will therefore be negatively associated with contemporary literacy outcomes.

We are able to map 146 954 individuals to 118 ethnic regions with ethnic centralisation data available. Summary statistics are provided in Table 2.

Table 2: Summary statistics

Variable	**N**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
$literate_{iec}$	146,954	0.639	0.480	0	1
$British_{c}$	148,093	0.740	0.439	0	1
$central_{e}$	148,093	0.473	0.499	0	1
$population_{ec}$	148,093	13.483	1.528	7.691	15.688
$capital_{ec}$	148,093	0.102	0.303	0	1
$borderdistance_{ec}$	148,093	4.670	0.811	-0.808	5.892
$elevation_{ec}$	148,093	0.298	0.254	0.006	1.376
$soilquality_{ec}$	148,093	0.434	0.140	0.158	0.772
$petroleum_{ec}$	148,093	0.253	0.435	0	1
$malaria_{ec}$	148,093	0.864	0.206	0.333	1
$primary_{iec}$	148,093	0.741	0.438	0	1
$secondary_{iec}$	117,340	0.488	0.500	0	1

The variable u_{iec} is an error term. We include country fixed effects to control for time-invariant factors specific to countries. Despite the inclusion of country fixed effects we need to account for potential spatial autocorrelation on country and ethnic region level. We therefore estimate a linear regression with multi-way clustered standard errors using methodology developed by Cameron, Gelbach, and Miller (2011). Clustering at both ethnic region and country level allows for valid inference in the instance that errors within both geographical units are correlated. Neglecting to control for clustering may result in underestimated standard errors.

4 Main Estimation Results

Table 3 columns 1 to 3 show results when considering British rule and pre-colonial ethnic centralisation independently. Results show that British rule relative to French is positively associated with literacy as is the conventional narrative (Brown, 2000; Garnier & Schafer, 2006; Grier, 1999). In line with Bandyopadhyay and Green (2016), we do not find a statistically significant and positive association between pre-colonial ethnic centralisation and literacy rates. As stated, considering these two forms of institutions separately may lead to the wrong conclusion regarding the true effect of colonial and pre-colonial institutions. Our specification allows us to analyse the effect of these institutions and their interaction.

Table 3: Literacy Regression Results

	Dependent Variable: $literate_{iec}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$British_{ec}$	0.051***		0.029***	0.085***	0.109***	0.183***	0.267***	0.156***	0.107**
	(0.002)		(0.010)	(0.013)	(0.024)	(0.032)	(0.013)	(0.031)	(0.042)
$central_e$		-0.036	-0.036	0.131***	0.123***	0.170***	0.169***	0.135***	0.089***
		(0.054)	(0.054)	(0.042)	(0.029)	(0.027)	(0.020)	(0.018)	(0.032)
$British_{ec} * central_e$				-0.212***	-0.234***	-0.259***	-0.228***	-0.161***	-0.136***
				(0.042)	(0.039)	(0.013)	(0.034)	(0.027)	(0.041)
$population_{ec}$					0.033	0.013***	0.027	0.015	0.024
					(0.026)	(0.005)	(0.024)	(0.021)	(0.018)
$capital_{ec}$						0.095	0.124	0.182**	0.198**
						(0.101)	(0.078)	(0.082)	(0.078)
$borderdistance_{ec}$						0.115***	0.089**	0.070*	0.050
						(0.020)	(0.042)	(0.038)	(0.030)
$elevation_{ec}$							-0.329**	-0.128	-0.134
							(0.153)	(0.188)	(0.181)
$soilquality_{ec}$							0.417	0.277	0.326
							(0.469)	(0.443)	(0.396)
$petroleum_{ec}$								0.188***	0.159***
								(0.052)	(0.049)
$malaria_{ec}$									-0.226***
									(0.057)
Observations	182,036	146,954	146,954	146,954	146,954	146,954	146,954	146,954	146,954
R-squared	0.028	0.037	0.037	0.045	0.052	0.092	0.127	0.137	0.142
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1
$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if French colony. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.

Columns 4 to 9 of Table 3 present results from equation 1 and we progressively add controls across columns to which regression coefficients remain stable. The statistically significant interaction term (β_3) suggests that the effect of pre-colonial ethnic centralisation and British colonial rule on present-day literacy also depends on the combination of these two forms of institutions.

Interpreting the full model specification results in column 9, we can say that neither British rule nor ethnic centralisation can be confidently associated with overall positive education outcomes as suggested in previous literature. Relative to French rule, British rule is associated with

an increase in literacy of approximately 11 per cent in fragmented ethnic regions (β_1). Yet, in centralised ethnic regions, British rule is associated with a decrease in literacy of approximately 3 per cent relative to French rule ($\beta_1 + \beta_3$). Similarly, ethnic centralisation relative to fragmentation in former French colonies is associated with an increase in literacy of 9 per cent (β_2), however, in British colonies centralisation is associated with a decrease in literacy of 5 per cent ($\beta_2 + \beta_3$).[6]

As a robustness test we conduct a birth cohort analysis to test whether results persist over time. We additionally specify a logistic regression and also check whether our results hold for alternative outcome variables. Across these robustness checks, the interaction term remains statistically significant and negative supporting findings from Table 3. Results are reported and discussed in Appendix A.1.

In summary, our results suggests that the favourable effect of 'inherited' British institutions as often reported in the literature is reduced in centralised ethnic regions. The enforcement of indirect British rule through traditional authority was likely opposed in politically complex ethnic regions with strong established hierarchies (Archibong, 2019; Clignet & Foster, 1964; Gennaioli & Rainer, 2007). Accompanied with the decreased presence of British administrators as noted by Müller-Crepon (2020) in centralised ethnic regions, the potential positive effects of British colonial rule is mitigated.

5 Robustness Checks

5.1 Liberia Reference Case

In Table 4 we conduct an additional analysis to test results that British rule is positively associated with literacy outcomes in fragmented ethnic regions. We include Liberia to our sample of countries. Located next to Côte d'Ivoire, Liberia was not colonised by either the British or the French and comprise only petty chiefdom i.e. fragmented ethnic regions. Liberia was officially founded in 1824, on land that was home to slaves freed from the United States.

We test the effect of colonial rule and ethnic centralisation on literacy outcomes relative to fragmented ethnic regions not subject to colonial rule. The empirical specification is

$$literate_{iec} = \beta_1 British_{ec} + \beta_2 French_{ec} + \beta_3 British_{ec} * central_e + \beta_4 French_{ec} * central_e + \beta_5 X_{ec} + u_{iec} \quad (2)$$

where β_3 and β_4 capture the interaction between British rule and centralisation, and French rule and centralisation relative to no colonial rule and fragmented ethnic regions.[7]

Interpreting column 6 regression results, relative to no colonial rule, British rule in fragmented ethnic regions is associated with an increase in literacy of approximately 9 per cent

[6] The reference group is individuals in fragmented ethnic regions subject to French rule. The differential in literacy between individuals from centralised ethnic regions subject to British rule and individuals from fragmented ethnic regions subject to French rule is therefore 6 per cent (obtained by adding β_1, β_2 and β_3 coefficient estimates together).

[7] $central_e$ is not estimated separately as Liberia only has fragmented ethnic regions.

Table 4: Reference Case Regression Results

	Dependent Variable: $literate_{iec}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$British_{ec}$	0.056***	0.078***	0.146***	0.235***	0.132***	0.087**
	(0.007)	(0.019)	(0.030)	(0.011)	(0.031)	(0.039)
$French_{ec}$	-0.214***	-0.145**	-0.066*	0.079	0.037	-0.015
	(0.011)	(0.057)	(0.036)	(0.059)	(0.054)	(0.066)
$British_{ec} * central_e$	-0.081***	-0.113***	-0.091***	-0.063***	-0.028**	-0.045***
	(0.016)	(0.017)	(0.023)	(0.020)	(0.012)	(0.014)
$French_{ec} * central_e$	0.119***	0.111***	0.154***	0.170***	0.136***	0.096***
	(0.032)	(0.021)	(0.023)	(0.020)	(0.022)	(0.032)
Observations	159,344	159,344	159,344	159,344	159,344	159,344
R-squared	0.052	0.059	0.093	0.126	0.136	0.140
Population		Yes	Yes	Yes	Yes	Yes
Location Controls			Yes	Yes	Yes	Yes
Geographic Controls				Yes	Yes	Yes
Petroleum					Yes	Yes
Malaria						Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1
$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if otherwise. $French_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former French colony, 0 if otherwise. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.

(β_1). This positive effect is however mitigated in centralised ethnic regions, where the combined effect of ethnic centralisation and British rule on literacy is only 4 per cent ($\beta_1 + \beta_3$). On the other hand, ethnic centralisation and French rule is associated with an increase in literacy of approximately 10 per cent relative to fragmented ethnic regions in Liberia ($\beta_2 + \beta_4$).

In pre-colonial ethnic centralised regions, French rule is associated with a more favourable effect on literacy than British rule. As noted by (Bolt & Bezemer, 2009) and in earlier work (Crowder, 1964), appointment of chiefs to colonial administrative units was contingent on the relationship with colonial rulers. It can therefore be conjectured that local leaders in centralised ethnic regions subject to French rule would have been more cooperative to maintain social standing.

The positive association between literacy and British rule is more pronounced in fragmented ethnic regions. This association can be attributed to the adoptive approach and increased participation by British rule in fragmented ethnic regions as noted by Clignet and Foster (1964), Archibong (2019) and Müller-Crepon (2020). As fragmented ethnic regions were potentially more receptive to colonial enforcements, the cooperative relationship brought about increased literacy effects that is still evident today.

5.2 Reach of Institutions

The effect of colonial and pre-colonial ethnic institutions on present-day literacy may differ based on distance to the capital. As highlighted by Michalopoulos and Papaioannou (2014), the effect of national institutions, which in our case can be considered as colonial rule, is diminished in remote ethnic regions further away from capitals, whilst pre-colonial characteristics are found to be more important in determining regional development outcomes.

To test whether the effect of institutions differ based on the distance to the capital, we augment our estimation equation 1 with the distance to the capital. The empirical specification is

$$\begin{aligned} literate_{iec} = \beta_1 British_{ec} + \beta_2 central_e + \beta_3 British_{ec} * central_e + \beta_4 capitaldistance_{ec} \\ + \beta_5 British_{ec} * capitaldistance_{ec} + \beta_6 central_e * capitaldistance_{ec} \\ + \beta_7 British_{ec} * central_e * capitaldistance_{ec} + \beta_8 X_{ec} + u_{iec} \end{aligned} \tag{3}$$

where $capitaldistance_{ec}$ is the distance of the centroid of ethnic region e in country c from the country's capital. The various interactions allow us to determine whether the effect of colonial

Table 5: Distance to Capital Regression Results

	Dependent Variable: $literate_{iec}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$British_{ec}$	0.343***	0.338***	0.351***	0.523***	0.359***	0.308***
	(0.063)	(0.060)	(0.067)	(0.100)	(0.095)	(0.094)
$central_e$	-0.177***	-0.174***	0.197	0.246***	0.172***	0.167***
	(0.015)	(0.017)	(0.168)	(0.037)	(0.018)	(0.027)
$British_{ec} * central_e$	0.086	0.082	-0.299***	-0.330***	-0.195*	-0.211**
	(0.069)	(0.071)	(0.102)	(0.052)	(0.104)	(0.082)
$capitaldistance_{ec}$	-0.221***	-0.213***	-0.155***	-0.222***	-0.234***	-0.241***
	(0.033)	(0.031)	(0.051)	(0.063)	(0.061)	(0.047)
$British_{ec} * capitaldistance_{ec}$	0.146***	0.139***	0.132***	0.201***	0.175***	0.177***
	(0.035)	(0.033)	(0.043)	(0.072)	(0.065)	(0.050)
$central_e * capitaldistance_{ec}$	-0.201***	-0.198***	0.031	0.059***	0.047*	0.076***
	(0.017)	(0.019)	(0.101)	(0.015)	(0.024)	(0.024)
$British_{ec} * central_e * capitaldistance_{ec}$	0.178**	0.181**	-0.045**	-0.088	-0.051	-0.078
	(0.089)	(0.090)	(0.019)	(0.083)	(0.116)	(0.092)
Observations	146,954	146,954	146,954	146,954	146,954	146,954
R-squared	0.086	0.087	0.101	0.145	0.154	0.160
Population		Yes	Yes	Yes	Yes	Yes
Location Controls			Yes	Yes	Yes	Yes
Geographic Controls				Yes	Yes	Yes
Petroleum					Yes	Yes
Malaria						Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1

$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if French colony. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise. $capitaldistance_{ec}$ is the log of the distance to the capital in 1 000 km.

and pre-colonial institutions along with the interaction changes based on the distance to the capital.

Table 5 column 6 results firstly show that even when controlling for the reach of institutions, colonial rule, pre-colonial ethnic centralisation along with the interaction is statistically significant in determining contemporary literacy outcomes as reported in Table 3. Secondly, contrary to previous literature, the effect of British rule relative to French rule is more pronounced in ethnic regions located further away from the capital. This can be explained by the increased administrative effort by the British in fragmented and remote ethnic regions as highlighted by Müller-Crepon (2020). Thirdly, as expected, the effect of pre-colonial centralisation is more pronounced in regions located further away from the capital. Results, however, do not suggest that the distance to the capital has a statistically significant effect on the combined effect of British rule and pre-colonial ethnic centralisation.

As an additional robustness test we re-estimate our main equation 1 and restrict the sample to ethnic regions partitioned and not partitioned by colonial borders. In partitioned ethnic regions, British rule remains statistically significant in determining contemporary literacy, however, the interaction between colonial and ethnic institutions is not statistically significant. In ethnic regions not partitioned by colonial borders, the positive effect of British rule in centralised ethnic regions is mitigated, supporting our findings as reported. Results are further discussed in Appendix A.1.2.

6 Alternative Channel

To explore alternative explanations for variations in present-day literacy outcomes, we study the effect of missionary stations together with colonial rule in pre-colonial ethnic centralised and fragmented regions respectively. As highlighted by Frankema (2012) and Cogneau and Moradi (2014), the positive effect of British rule is potentially as a result of mission stations. Moreover, Jedwab et al. (2019) show that the importance of missionary activity in overall present-day development is also frequently overstated. Hence, considering the interaction between missions and British rule in the context of pre-colonial ethnic centralisation is necessary.

Missionary education was already in place prior to official colonisation of countries (Cowan, O'Connell, & Scanlon, 1965). Bolt and Bezemer (2009) note that during the initial years of colonisation, missionaries remained in control of education policy in British colonies, as the British were concerned primarily with law and order in the colonies. The British were also concerned with the costs involved in taking responsibility for education and therefore education was primarily provided by missionaries in the British colonies (Crowder, 1964; Lugard, 1929). Cogneau and Moradi (2014) find that higher literacy rates in former British colonies can mainly be attributed to missionary activities.

British colonies allowed all denominations of missionaries, Catholic and Protestant, to participate in conversion and education activities. In British colonies, missions were therefore able to compete with respect to schooling provision, which some have noted as the reason for improved education in former British colonies (Frankema, 2012; Gallego & Woodberry, 2010;

Jedwab et al., 2019; Woodberry, 2012).

French colonies restricted missionary entry to Protestant missions with the separate state and church system in mind, where the state provided financing to missionaries on the condition that missionary schools adhere to the French rigid and assimilated education policy (Bolt & Bezemer, 2009). This limited the reach of missionary education and the potential persistent effect on contemporary literacy outcomes.

We consider missionary locations as reported by Roome (1925) and digitised by Nunn (2010). The majority studies on missionary activity in Africa use Roome (1925) (Jedwab et al., 2019). We georeference missionary stations into the different ethnic regions according to the Murdock Ethographic Atlas.

The empirical specification is

$$literate_{iec} = \beta_1 Britishmissions_{ec} + \beta_2 central_e + \beta_3 Britishmissions_{ec} * central_e + \beta_4 X_{ec} + u_{iec} \quad (4)$$

where $Britishmissions_{ec}$ is the log number of missionary stations by 1000 km^2 of land area by ethnic group in former British colonies, and 0 in former French colonies. We code the variable as such because missionaries were not independent in French colonies and can be considered merely as an extension of French rule. This specification allows us to measure the effect of missionaries in British colonies as a potential explanation of the often reported positive effects

Table 6: Missions Regression Results

	Dependent Variable: $literate_{iec}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Britishmissions_{ec}$	0.103***	0.087	0.070	0.051	0.049	0.048
	(0.039)	(0.055)	(0.062)	(0.047)	(0.034)	(0.030)
$central_e$	0.186**	0.190**	0.167***	0.143***	0.159***	0.139***
	(0.079)	(0.088)	(0.049)	(0.019)	(0.044)	(0.045)
$Britishmissions_{ec} * central_e$	0.137***	0.161***	0.145***	0.129***	0.120***	0.112***
	(0.049)	(0.044)	(0.024)	(0.029)	(0.015)	(0.005)
Observations	146,954	146,954	146,954	146,954	146,954	146,954
R-squared	0.111	0.114	0.137	0.142	0.154	0.158
Population		Yes	Yes	Yes	Yes	Yes
Location Controls			Yes	Yes	Yes	Yes
Geographic Controls				Yes	Yes	Yes
Petroleum					Yes	Yes
Malaria						Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1

$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $Britishmissions_{ec}$ is the log number of missionary stations by 1000 km^2 of land area by ethnic group in former British colonies. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.

resulting from British rule.

Table 6 column 6 results indicate that missionaries in former British colonies are associated with increased literacy in centralised ethnic regions. Results speak to the *Africanisation* of missionary activity. Research often neglects the role of local citizens in missionary education and the expansion thereof. Local African citizens were essential in the implementation and continuation of missionary activities, perhaps more so than European missionaries themselves. Local converts also contributed financially to missionary stations and activities, either directly, or through taxes collected by colonial governments (Frankema, 2012).

In centralised ethnic regions with higher leader accountability, we would expect leaders to participate and support the *Africanisation* of missionary education. These leaders would have encouraged citizen involvement in and financial support of missionary activities. Whereas fragmented ethnic regions, with lower colonial administration budgets and leaders with less political reach as reported by Müller-Crepon (2020) and Gennaioli and Rainer (2007) would not have supported missionaries to such an extent.

7 Concluding Remark

Contrary to the general view in literature, contemporary education in Africa cannot be attributed to British rule or pre-colonial ethnic centralisation independently, it is instead the complementary between these two institutions that determine these outcomes.

Using geolocated DHS data to measure present-day literacy in Cameroon, Côte d'Ivoire (former French colonies), Ghana and Nigeria (former British colonies), our results suggest that the effect of British rule on contemporary literacy depends on the pre-colonial centralisation of the ethnic region. In fragmented ethnic regions, British rule is associated with favourable effects on literacy. In centralised ethnic regions, these positive effects are mitigated. The reported positive effect of British rule is rather explained by missionary activity (Cogneau & Moradi, 2014; Frankema, 2012). In this case, missionary activity specifically in centralised ethnic regions is positively associated with literacy outcomes.

Findings from this study highlight the need for improved education policy formulation on a sub-national, ethnic region level. Sustainable Development Goal 4 Target 4.6 sets out to ensure that all youth and most adults are literate by 2030. To mitigate education challenges, traditional ethnic leaders with political influence in societies and knowledge of local ethnic institutions should be involved in policy making and decisions. Development and implementation of policies on a country level is not necessarily enough to address variations in literacy rates within countries.

Future studies can expand on our findings in two respects. Firstly, although we analyse the reach of institutions by controlling for distance to the capital (Michalopoulos & Papaioannou, 2014), it is necessary to conduct more in depth analysis regarding the diffusion of colonial institutions within the respective countries. Secondly, our results do not identify the specific supply and demand mechanisms behind the observed effects. There is therefore room for further analysis in this regard.

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A Appendix

A.1 Robustness Checks

A.1.1 Birth Cohort Analysis

To test whether results persist over time we conduct a birth cohort analysis in Table A.1. In columns 1 and 2 we restrict the sample to individuals born between 1960 and 1979. Columns 3 and 4 report results with respect to individuals born between 1980 to 1999. The interaction term (β_3) remains statistically significant and negative across all birth cohorts. Results indicate that individuals in centralised ethnic regions subject to British rule are associated with decreased literacy rates.

Our findings are in line with that of Frankema (2012) and Cogneau and Moradi (2014) that historical effects are persistent. We show that the effect of British rule on contemporary education outcomes depend on the centralisation of ethnic region for individuals born and schooled after independence. Results with respect to the youngest birth cohort of individuals born between 1990 and 1999 also imply that there is an interrelated effect between colonial rule and political complexity of ethnic regions.

Table A.1: Cohort Literacy Regression Results

	Dependent Variable: $literate_{iec}$			
	1960−1979		1980−1999	
	(1)	(2)	(3)	(4)
$British_{ec}$	0.066***	0.124***	0.103***	0.104**
	(0.015)	(0.038)	(0.010)	(0.047)
$central_e$	0.152***	0.119***	0.119***	0.081**
	(0.050)	(0.032)	(0.033)	(0.038)
$British_{ec} * central_e$	-0.214***	-0.142***	-0.208***	-0.135***
	(0.050)	(0.038)	(0.034)	(0.046)
Observations	57,290	57,290	95,140	95,140
R-squared	0.056	0.146	0.050	0.148
Control variables	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1
$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if French colony. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.

A.1.2 Ethnic Region Partitioning

Partitioning of ethnic regions by colonial borders is associated with decreased education outcomes, decreased access to public goods and increased incidence and periods of political violence

(Michalopoulos & Papaioannou, 2016). In Table A.2 we restrict the sample to individuals in ethnic regions that were partitioned by colonial borders (column 1 and 2) and to individuals in ethnic regions that were not partitioned by colonial borders (column 3 and 4). Findings from column 2 show that in partitioned ethnic regions, British rule and pre-colonial ethnic centralisation is positively associated with an increase in literacy. The interaction between colonial and ethnic institutions, however, is not statistically significant. Considering individuals in ethnic regions not partitioned by colonial borders, reported in column 4, the positive effect of British rule in centralised ethnic regions is again mitigated and associated with a decrease in literacy of 0.8 per cent relative to French rule.

Table A.2: Ethnic Region Partitioning Regression Results

	Dependent Variable: $literate_{iec}$			
	Partitioned		Not partitioned	
	(1)	(2)	(3)	(4)
$British_{ec}$	-0.070***	0.171***	0.213***	0.127***
	(0.011)	(0.019)	(0.005)	(0.036)
$central_e$	0.034	0.175**	0.310***	0.112
	(0.172)	(0.089)	(0.000)	(0.078)
$British_{ec} * central_e$	-0.144	-0.036	-0.301***	-0.135*
	(0.182)	(0.105)	(0.032)	(0.082)
Observations	59,292	59,292	87,662	87,662
R-squared	0.074	0.203	0.041	0.089
Control variables	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1
$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if French colony. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.

A.1.3 Alternative Specification

Since the outcome variable is a binary variable, we additionally estimate a logistic regression. Table A.3 reports results. Although the magnitudes of the coefficient estimates are not comparable to the linear probability (OLS) model estimated in Section 4, the interaction term β_3 from estimating regression (1) remains statistically significant and negative.

Table A.3: Logistic Regression Results

Dependent Variable: $literate_{iec}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$British_{ec}$	0.434	0.541	0.865***	1.650***	1.021**	0.619
	(0.473)	(0.390)	(0.233)	(0.521)	(0.500)	(0.435)
$central_e$	0.692	0.668	1.037***	1.070***	0.911***	0.759***
	(0.457)	(0.425)	(0.272)	(0.312)	(0.295)	(0.254)
$British_{ec} * central_e$	-1.038*	-1.156**	-1.445***	-1.355***	-1.012***	-0.935***
	(0.626)	(0.571)	(0.496)	(0.406)	(0.352)	(0.316)
Observations	146,954	146,954	146,954	146,954	146,954	146,954
Pseudo R-squared	0.0346	0.0405	0.0735	0.105	0.114	0.120
Population		Yes	Yes	Yes	Yes	Yes
Location Controls			Yes	Yes	Yes	Yes
Geographic Controls				Yes	Yes	Yes
Petroleum					Yes	Yes
Malaria						Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are clustered at ethnic level
*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses clustered by ethnic region. *** p<0.01, ** p<0.05, * p<0.1
$literate_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) is able to read parts of or a whole sentence, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if French colony. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.

A.1.4 Primary and Secondary Education Analysis

In Table A.4 we study the effect of British rule and pre-colonial ethnic centralisation, as well as the interaction of these two institutions on primary and secondary education. The estimating regression remains as specified and we simply determine alternative outcome variables. Primary school completion, $primary_{iec}$, is a binary variable equal to 1 if an individual completed primary school, 0 if not. Secondary school completion, $secondary_{iec}$, is a binary variable equal to 1 if an individual (above age 20) completed secondary school, 0 otherwise. We again report linear regression findings using the approach by Cameron et al. (2011) to account for spatial autocorrelation.

Results support findings reported in Table 3. Our analysis points out that the positive effect of British rule is negated in centralised ethnic regions, especially related to primary school completion. Based on column 5 results, British rule is associated with approximately 5 per cent decreased primary school completion in centralised ethnic regions. With respect to secondary school completion, the positive effect of British rule is also decreased in centralised ethnic regions. School completion as outcome variable does not capture the quality of education and we therefore prefer literacy as measure of contemporary education.

Table A.4: Primary and Secondary Education Regression Results

	Dependent Variable: $primary_{iec}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$British_{ec}$	0.154***	0.170***	0.229***	0.311***	0.171***	0.113**
	(0.012)	(0.021)	(0.027)	(0.023)	(0.041)	(0.051)
$central_e$	0.110***	0.105***	0.137***	0.141***	0.099***	0.043
	(0.033)	(0.025)	(0.037)	(0.026)	(0.029)	(0.053)
$British_{ec} * central_e$	-0.213***	-0.227***	-0.245***	-0.218***	-0.133**	-0.103
	(0.053)	(0.043)	(0.040)	(0.058)	(0.055)	(0.072)
Observations	148,093	148,093	148,093	148,093	148,093	148,093
R-squared	0.066	0.070	0.120	0.167	0.186	0.195
	Dependent Variable: $secondary_{iec}$					
	(7)	(8)	(9)	(10)	(11)	(12)
$British_{ec}$	-0.073***	-0.050*	0.033	0.134***	0.032***	-0.028
	(0.016)	(0.029)	(0.037)	(0.023)	(0.006)	(0.022)
$central_e$	0.116**	0.109***	0.167***	0.151***	0.121***	0.063*
	(0.051)	(0.039)	(0.028)	(0.029)	(0.022)	(0.036)
$British_{ec} * central_e$	-0.171***	-0.193***	-0.222***	-0.174***	-0.112***	-0.081
	(0.060)	(0.055)	(0.023)	(0.050)	(0.038)	(0.051)
Observations	117,340	117,340	117,340	117,340	117,340	117,340
R-squared	0.044	0.050	0.093	0.133	0.141	0.148
Population		Yes	Yes	Yes	Yes	Yes
Location Controls			Yes	Yes	Yes	Yes
Geographic Controls				Yes	Yes	Yes
Petroleum					Yes	Yes
Malaria						Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered by ethnic and country level (Cameron et al., 2011). *** p<0.01, ** p<0.05, * p<0.1

$primary_{iec}$ is a binary variable equal to 1 if an individual (i), residing in ethnic region (e) and country (c) completed primary school, 0 otherwise. $secondary_{iec}$ is a binary variable equal to 1 if an individual (aged 20 years and older) (i), residing in ethnic region (e) and country (c) completed secondary school, 0 otherwise. $British_{ec}$ is a binary variable equal to 1 if ethnic-country region was part of a former British colony, 0 if French colony. $central_e$ is a binary variable equal to 1 if the pre-colonial ethnic region was classified as a large chiefdom or state, 0 otherwise.