Jihad over Centuries*

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July 16, 2025

Abstract

This paper examines the origins of Islamist insurgencies, commonly referred to as *jihad*, through the lens of past prosperity, decline, and cultural revival. In West Africa, ancient water access predicts the locations of core inland cities along the trans-Saharan caravan routes, which flourished under Islamic states until the 1800s. These cities became peripheral following the gradual shrinking of water bodies and European colonization. Employing an instrumental variable strategy, we show that these historically prosperous but now deserted cities have become contemporary hotspots of jihadist violence. We argue that military power asymmetries between Islamic states and colonizers during historical jihad shaped the persistence of jihadist ideology as a legacy of colonization, fueling today's resurgence. This mechanism is supported by individual-level surveys examining extreme religious ideologies, diverse qualitative evidence, and a dynamic model of conflict. Moreover, the concentration of jihadist violence in areas that experienced reversals of fortune mirrors a global phenomenon.

Keywords: Conflicts, Geography, Colonization, Ideologies, Islam, Persistence, Revival

*We are grateful to Andrew Foster and Stelios Michalopoulos for continuous guidance and support, and Shuhei Kitamura and Jared Rubin for invaluable discussions. For helpful comments, we thank Eren Arbatli, Alberto Bisin, Dan Björkegren, Gabriel Brown, Jon Denton-Schneider, Han Dorussen, John Friedman, Tomohiro Hara, Peter Hull, Taylor Jaworski, Donia Kamel, Erik Kimbrough, Murat Kirdar, Hisaki Kono, Motohiro Kumagai, Takashi Kurosaki, Etienne Le Rossignol, Sunghun Lim, Avital Livny, Sara Lowes, Masaru Nagashima, Mike Neubauer, Henrique Pita Barros, Steve Pfaff, Louis Putterman, Devesh Rustagi, Yu Sasaki, Sou Shinomoto, Bryce Steinberg, Yoshito Takasaki, Matt Turner, David Weil, Reed Wood, Junichi Yamasaki, Yanos Zylberberg, and audiences at ASREC 2023 (Harvard), BÆM Development Workshop (Bristol), Brown (Growth Lab, Development group, and Applied Micro Lunch), CERDI, Chapman (IRES workshop), CSAE 2024 (Oxford), Durham DEW 2025, Essex, Hitotsubashi Summer Institute 2023, the 4th JADE conference, Manchester (Lewis Lab Workshop), SEA 94th Annual Meeting, and WE-SPICE. We thank Stelios Michalopoulos for sharing the shape file of historical trade routes and Nick Drake for sharing the shape file of ancient water sources. Kubo acknowledges the Bravo Center Research Funding at Brown University. Tsuda acknowledges financial support from the Interdisciplinary Opportunity Dissertation Completion Fellowship at Brown University and funding from the Murata Science Foundation. All remaining errors are ours. First draft: November 9, 2022.

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1 Introduction

Islamic extremist conflict and violence, commonly referred to as *jihad*,[1] pose a global threat. It has drawn global attention since the September 11 attacks perpetrated by Al Qaeda. The recent rise of the Islamic State of Iraq and Syria (ISIS) has exacerbated this threat. This threat, however, is not uniform *within* the Islamic world, exhibiting substantial regional variation and expanding beyond the Middle East into regions such as Africa. Moreover, despite a notable rise in jihadist violence in recent years, jihad itself is not merely a contemporary phenomenon but has been cyclic over the centuries. Nonetheless, the roles that geography and history—particularly prehistoric nature, pre-colonial economy and culture, and colonial legacies—play in explaining this variation and persistence remain poorly understood.

We approach this question through the lens of past prosperity, decline, and cultural revival. Cultural revival refers to the reassertion of group identity through the recovery of traditions perceived as lost due to colonization, displacement, oppression, or modernization (Anderson 1983; Hobsbawm and Ranger 1983; Smith 1991). Revival movements have also occurred with violence across diverse contexts, such as "The Troubles" in Northern Ireland, the Khmer Rouge in Cambodia, and the January 6 United States Capitol Attack.[2] Jihadist movements can likewise be framed as radical forms of cultural revival against Westernization and secularization (Lewis 1990; Sounaye 2017; Yates 2007). While the phenomenon is widely studied in history, political science, and sociology, recent theoretical work in economics also offers valuable insights (Carvalho et al. 2024; Iyigun et al. 2021). Yet, the historical roots and long-run pathways leading to cultural revival and its political or ideological resurgence remain empirically underexplored.

In this paper, we examine the origins of Islamist insurgencies by focusing on the role of Islamic civilization's historical rise and fall. We begin by identifying the ancient roots of core cities along West Africa's inland trade routes—the trans-Saharan caravan routes—founded up to the 1800s, when camels served as the primary transport mode and Islamic states played significant economic roles prior to European colonization. These cities became peripheral following the gradual shrinking of water sources, colonization, and technological shifts in trade. Using an instrumental variable strategy, we estimate the persistent effects of historical Islamic states situated along these trade routes, specifically examining how these now-deserted loca-

[1] The literal meaning of "jihad" in Arabic is "striving or exerting oneself (with regard to one's religion)" (Cook 2015). Jihad also has a number of other meanings, such as "the effort to lead a good life, to make society more moral and just, and to spread Islam through preaching, teaching, or armed struggle" (Esposito 1999). See Cook (2015) for detailed discussions. Although there is controversy over whether the word's interpretation is exclusively spiritual or if it includes military action, this paper uses the terms "jihadist violence" and "jihad" interchangeably. We broadly define a jihadist organization as a non-state group that aims to topple a government or to govern a particular region to establish an Islamic caliphate based on a strict interpretation of Shariah law. See Appendix D for more detailed organization-specific ideologies and goals.

[2] More generally, various contexts illustrate political and cultural consequences following declines from (historical) prosperity across the globe. Notable examples include Europe (Colantone and Stanig 2018; Fouka and Voth 2023; Henn and Huff 2024; Narciso and Severgnini 2023; Ochsner and Roesel 2024), the United States (Autor et al. 2020; Baccini and Weymouth 2021), and Islamic contexts in the Middle East and Asia (Binzel and Carvalho 2017; Chen 2010).

tions influence contemporary jihadist violence, which escalated markedly in the 2010s. Finally, we propose a mechanism behind this persistence and revival, emphasizing the power relations between Islamic states and colonizers during the early colonial era. We also explore whether the observed spatial pattern of jihadist violence aligns with a broader, global phenomenon.

Both historical and contemporary factors help explain the spatial distribution of economic activities over the centuries in West Africa. Historically, inland West Africa experienced a stark reversal of fortune. In the pre-colonial era, economic activities concentrated in landlocked regions strongly influenced by Islamic states. These states controlled trade routes across the Sahara, facilitating extensive trade in goods and slaves.[3] However, once Europeans—such as missionaries, scholars, and merchants—arrived at coastal West Africa, economic activity gradually shifted from inland regions toward coastal areas, driven by European-led slave trading and public investments, along with the advent of modern trading technologies. Today, economic activity in many developing countries, including those in West Africa, tends to be concentrated in a few large cities, leaving other regions economically stagnant. In West Africa specifically, this spatial inequality is exacerbated by insurgent activities. Over the past decade, violent events involving jihadist groups have substantially increased, both in frequency and geographical scope.

Mapping our primary data highlights two key facts. First, there is a notable relationship between water sources and city formation over time. Figure 1 shows ancient and contemporary water sources (lakes and rivers), core trading points along the trans-Saharan caravan routes, and contemporary cities. Many pre-colonial, landlocked cities that have since declined were situated near ancient water sources, such as lakes or rivers. Yet, today we rarely observe populated cities around these ancient water sources.[4] Second, there is a clear connection between historical Islamic civilizations and contemporary jihad. Figure 2 shows historical states (circa 1520 and 1860), historical trade points, and contemporary jihadist violent events. We observe concentrated violence around several historically significant but now-declined inland trade points, along with spillovers into neighboring areas. Similarly, contemporary Islamic conflicts tend to cluster in regions formerly occupied by Islamic states, but not in areas historically governed by non-Islamic states. Moreover, contemporary conflicts concentrate in specific locations linked to particular historical Islamic states. These patterns highlight the importance of understanding the enduring influence of now-deserted historical cities and examining heterogeneity across different Islamic states legacies and contemporary factors.

Motivated by the historical background and facts, our empirical analysis has two objectives. First, we aim to identify the ancient origins (or lack thereof) of pre-colonial and contemporary city formation, focusing on initial natural geography (specifically, ancient lakes) and its evo-

[3]The link between pre-colonial state centralization and trade networks is well-documented not only in the trans-Saharan region but broadly across pre-colonial Africa (Fenske 2014). Pre-colonial state structures in Africa are also closely associated with contemporary economic development (Michalopoulos and Papaioannou 2013).

[4]Timbuktu in modern Mali (Figure A.1) is a notable example. It was a trade hub under the Songhai Empire in the 15th and 16th centuries and thus called the "golden city." However, this once golden city fell into the periphery; its economy remains underdeveloped (relative to the other major cities in Mali) in the modern era. For more details about the development of pre-colonial states and cities, see section 2.1.

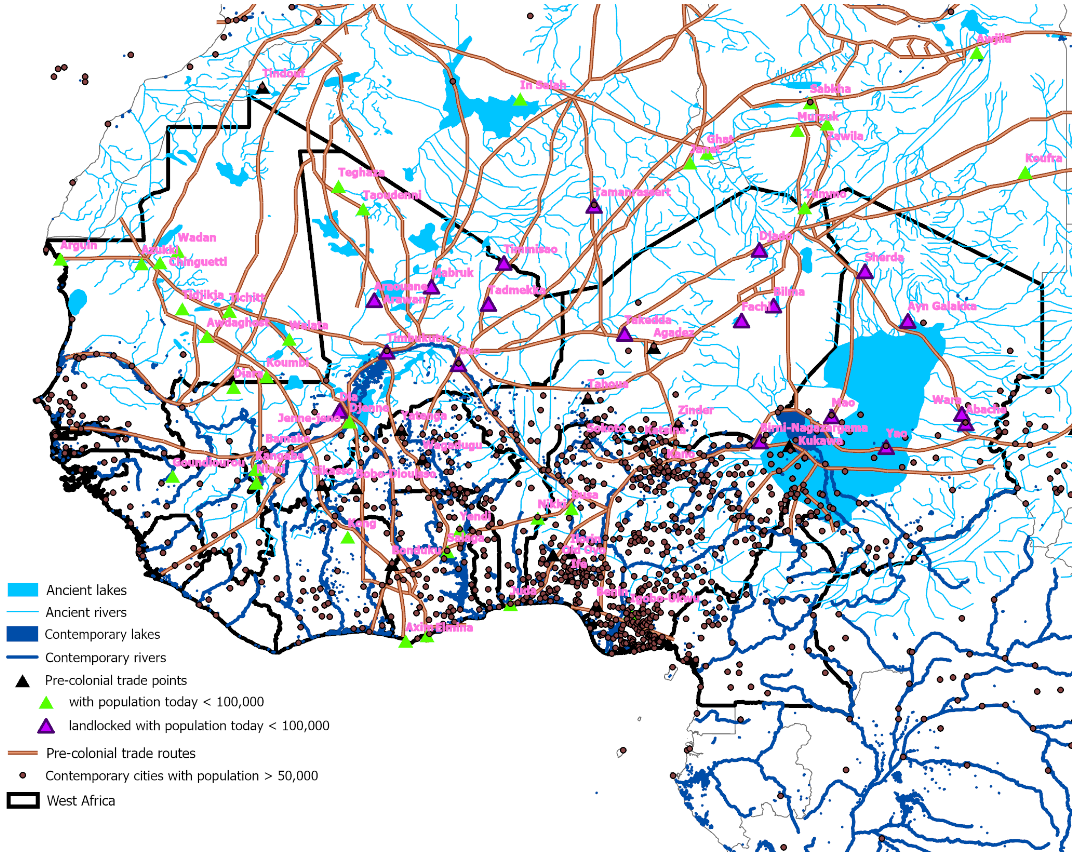

Figure 1: Water Sources and Cities—Past and Present

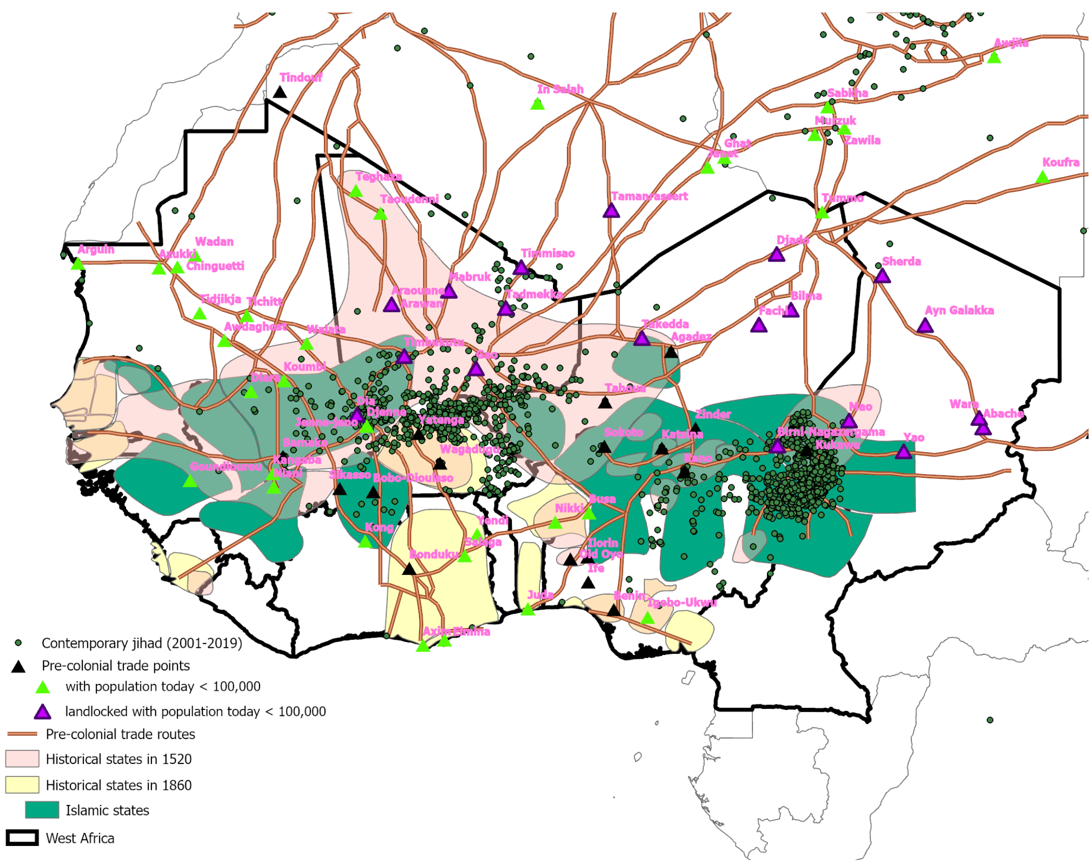

Figure 2: Pre-Colonial States, Trade Points, and Contemporary Jihad

lution over time (the gradual shrinking of water sources). Second, we estimate the persistent influence of core pre-colonial trading cities that flourished during the height of Islamic state power and have since declined on contemporary Islamist insurgencies. As a proxy for access to such cities, we focus on proximity to inland pre-colonial cities with small contemporary populations. To empirically address these questions, we construct artificial 0.5 × 0.5 degree (about 55km × 55km) grid cells covering the entirety of West Africa.

In the second stage, we employ ancient water access as an instrument for the proximity to declined landlocked cities. Importantly, as we control for contemporary water access, the instrument essentially captures the variation in access to ancient water sources that have since shrunk. In addition to the predetermined water access in ancient periods, we need the following identifying assumptions for causal inference. Water access in ancient periods affects contemporary outcomes only through its effect on shaping economic activities in historical states before colonization. Moreover, after controlling for observable geographical characteristics, the unobservable factors of contemporary Islamist insurgencies are uncorrelated with water access in ancient periods. Two arguments support these assumptions. First, most ancient lakes have now disappeared due to exogenous long-term climate and environmental changes. This implies that these lakes are unlikely to directly affect contemporary jihadist activities. Second, we empirically demonstrate that the ancient water accessibility is mostly uncorrelated with predetermined characteristics, including geographical conditions and pre-colonial variables of culture and institution.

Figure 3 summarizes three main results. First, proximity to ancient lakes strongly predicts only the locations of declined landlocked cities. This instrument has greater predictive power for identifying these specific cities compared to any other possible combinations of historical cities, implying that it captures both the historical prosperity and subsequent decline of landlocked cities. Second, initial geography does not exhibit persistent effects on contemporary urban formation or economic activities. Rather, these outcomes are better explained by changes in natural geography (the shift of primary water bodies) and colonial investments. Third, second-stage regression results confirm that grid cells closer to declined landlocked cities are more likely to be closer to jihadist violence and to experience its onset with higher intensity over the past decade. This effect is specific to jihad and does not apply to general conflicts. These results are robust even when restricting the analysis to predominantly Muslim areas, suggesting that results are not driven by the religious composition (between Christians and Muslims), and to alternative definitions of contemporary small cities, thus ruling out the simple explanation that jihadist violence merely targets populated locations.

We argue that the primary mechanism behind these empirical results is the persistence of jihadist ideology as a legacy of European colonization, coupled with a contemporary shock. Islamic state forces with better access to weapons adopted confrontation strategies and engaged in more intense fighting with European colonizers. As a result, the European forces militarily defeated such states. Consequently, these states ceased to exist, and the seeds of jihadist ideology within them were also diminished. In contrast, Islamic state forces with limited access to weapons did not engage as fiercely with European forces due to the stark asymmetry in military capacity. Under such circumstances, these states resorted to strategies of alliance, acquiescence, or submission to colonizers. While these states also ceased to exist, the seeds of jihadist ideology within them were *not* diminished, potentially fueling future jihadist conflicts. However, while the presence of jihadist ideology might be a necessary condition for contemporary jihadist activities, it is not sufficient on its own. This persistence, coupled with a contemporary shock that strengthens insurgent forces (e.g., the inflow of fighters and weapons from a neighboring country), could trigger a sudden surge in contemporary jihad. This mechanism aligns with the religious practice called *taqiyya*, prompting Muslims to outwardly adapt to situations they could not change while internally preparing to reassert Islamic purity. We rationalize this mechanism using a dynamic model of conflict between a colonizer and an Islamic state.

To further support this local mechanism, we show the cycle of jihad with distinct spatial distributions over the centuries, varying intensities of historical jihads across locations, historical records of the strategies adopted by Islamic states against colonization forces, and diverse qualitative evidence. Furthermore, we provide more direct quantitative evidence, drawn from individual-level survey data from Muslims, that religious ideology related to jihadism (such as excluding other religions, governing a country by religious law, and limiting female education) is concentrated in the locations of declined landlocked cities.

Furthermore, to investigate whether recruitment takes place near declined landlocked cities, we examine heterogeneity across contemporary jihadist organizations, focusing on their differential reliance on localized recruitment strategies. We document a clear contrast: the persistent influence of declined landlocked cities on violent events over time is stronger for Islamic State (IS) factions and Boko Haram than for Al Qaeda factions. We provide further supporting evidence that this pattern reflects greater reliance on localized recruitment, which reinforces the mechanism that the persistent jihadist ideology is driving contemporary jihadist violence.

Our empirical results imply that contemporary jihadist activities generally concentrate in locations characterized as "past-core-and-present-periphery." In other words, contemporary jihads occur primarily in regions that experienced reversals of fortune over the centuries. We argue that this spatial pattern holds globally, drawing on the global-level information on historical populations, overland trade routes, and contemporary Muslim populations and jihadist activities. The cases of Afghanistan, Pakistan, Iraq, and Syria, as well as historical trade routes connecting Asia and Europe, reinforce this interpretation.

Related literature. This paper contributes to four strands of literature. First, this paper contributes to the literature on the economics of conflicts, being closely connected to research on the historical origins of contemporary conflicts (Arbatlı et al. 2020; Boxell et al. 2019; Besley and Reynal-Querol 2014; Depetris-Chauvin 2015; Depetris-Chauvin and Özak 2020; Heldring 2021; Jha 2013; Michalopoulos and Papaioannou 2016; Moscona et al. 2020). In particular, Depetris-

Chauvin (2015) and Heldring (2021), which examine the relationship between historical states and contemporary conflicts, are most relevant to our work.[5] These papers focus on the historical presences of state-like institutions and look at the persistence of these institutions. Our study differs because we focus on a particular institution, Islam, among historical states. This paper is also related to theoretical arguments about cycles and the persistence of conflicts (Acemoglu et al. 2010; Acemoglu and Wolitzky 2014; Rohner et al. 2013). Empirical investigations are scarce, with the exception Besley and Reynal-Querol (2014), which documents the positive correlation between historical and post-colonial conflict. In addition to arguing that jihad is cyclical, this paper adds the new view that how conflicts end matters for future conflicts. In this respect, this paper also relates to the historical legacy of conflict and violence (e.g., Dincecco et al. 2019; Voigtländer and Voth 2012). Moreover, this paper also contributes to a deeper understanding of the root causes of conflict and violence involving jihadist organizations, given the limited research on violent Islamic extremism within the field of economics, apart from a few notable exceptions (e.g., Berman 2011).[6]

Second, this paper relates to the literature on the deep roots of economic development and the persistent effects of historical institutions in Africa (see Michalopoulos and Papaioannou 2020 for a review), especially regarding the legacy of colonization (Bauer et al. 2022; Canning et al. 2021; García Ponce and Wantchekon 2011; Heldring and Robinson 2018; Huillery 2011; Michalopoulos and Papaioannou 2013; Nunn and Puga 2012; Okoye et al. 2019). This paper contributes to this literature in three ways. First, it explores the dynamics of natural geography. Previous studies examining pre-modern human settlements relied on contemporary geographic data, implicitly assuming the fixed variation of natural geography (e.g., Michalopoulos 2012). This paper instead highlights the distinctive role of ancient lakes, as opposed to contemporary water sources, in shaping pre-modern settlements and economic activity. Second, this paper examines the persistence of jihadist ideology and the emergence of jihadist activities long after the colonial oppression. Previous studies have observed the backlash of physical and cultural oppression primarily in the short run (García Ponce and Wantchekon 2011; Fouka 2020), whereas we observe a more severe backlash, the eruption of jihadist violence, approximately 50 years after independence from colonial rule. This phenomenon reflects the long-term persistence of ideologies with deep historical roots, analogous to anti-Semitism in Nazi Germany (Voigtländer and Voth 2012) but through a different mechanism. Third, this paper exploits variation

[5] Depetris-Chauvin (2015) documents the negative relationship between the political centralization of historical states in 1000–1850 CE and contemporary civil conflicts. Heldring (2021) examines the effect of exposure to historical state institutions under centralized rule one century earlier on contemporary violence in Rwanda. He argues the culturally transmitted norm of obedience as the primary mechanism behind this result, supported by differential impacts interacted with contemporary government policies and by lab-in-the field experiments to measure rule-following behavior.

[6] Several studies have examined the contemporary determinants of jihadist violence, focusing on counterinsurgency forces and strategies (e.g., Berman et al. 2011; Fetzer et al. 2021) as well as various exogenous shocks, including climate change (McGuirk and Nunn 2022), election timing (Condra et al. 2018), marriage markets (Rexer 2021), mineral resources (Limodio 2021), and unemployment (Brockmeyer et al. 2022). While these factors can in theory be applied to insurgent violence more broadly, we offer a more targeted explanation for jihadist violence.

within the Islamic world, focusing on the pre-colonial trade circa 1800 and the power relations between Islamic states and colonization forces. By examining different strategies against colonizers and their consequences within the Islamic context, we provide deeper insights into the colonial legacy for contemporary economic and political outcomes.

Third, this paper connects to the long-standing literature about economic geography focusing on persistence and path dependence (Allen and Donaldson 2021 and the references therein). In particular, it is closely tied to recent research that empirically investigates the origins of cities and economic activities through geographical fundamentals and history (e.g., Alix-Garcia and Sellars 2020; Bakker et al. 2021; Bleakley and Lin 2012; Bosker and Buringh 2017; Brown and Cuberes 2020; Ellingsen 2021; Henderson et al. 2018; Jedwab et al. 2017; Maloney and Valencia Caicedo 2016; Michaels and Rauch 2018; Nagy 2023; Redding et al. 2011). Like these studies, we investigate both first- and second-nature forces (natural geography, especially water sources, and local historical shocks, especially colonization and technological change in trade) to understand the persistence and path dependence of economic activities. However, this paper is distinct from the previous literature in two ways. First, it exploits the effects of changing natural geography over a long horizon, while most previous research has only examined the changing effects of fixed natural geography over time, albeit with some recent exceptions (Allen et al. 2023; Jedwab et al. 2022; Seror 2020). Second, this paper finds not only a lack of persistence of initial geography (ancient water) on typical economic activities (modern city formation) but also its persistence on peculiar activities (jihadist activities).

Lastly, this paper contributes to the broader literature on the Islamic economy (see Iyer 2016 and Kuran 2018 for its review). Several studies investigated the historical, geographical, and institutional determinants of the spread (e.g., Bazzi et al. 2020; Michalopoulos et al. 2016, 2018), the politics (e.g., Chaney 2013; Chaney et al. 2012), and the economic performance (e.g., Alesina et al. 2020; Bosker et al. 2013; Campante and Yanagizawa-Drott 2015; Rubin 2017) of Islam. However, there is little research on the determinants of jihadist violence, without which it is challenging to fully characterize the state of the contemporary Islamic economy. Why do jihadist activities emerge in some places but not in others *within* the Islamic world? This paper fills this gap by tracing this question back to its ancient and pre-colonial origins and linking jihad to economic geography.

Roadmap. Section 2 describes the historical background of pre-colonial cities, Islamic states, and Western colonization in West Africa. Section 3 introduces data sources. Section 4 presents the empirical strategy and results. Section 5 documents the mechanism behind the empirical results. Section 6 provides further discussions. Section 7 concludes the paper.

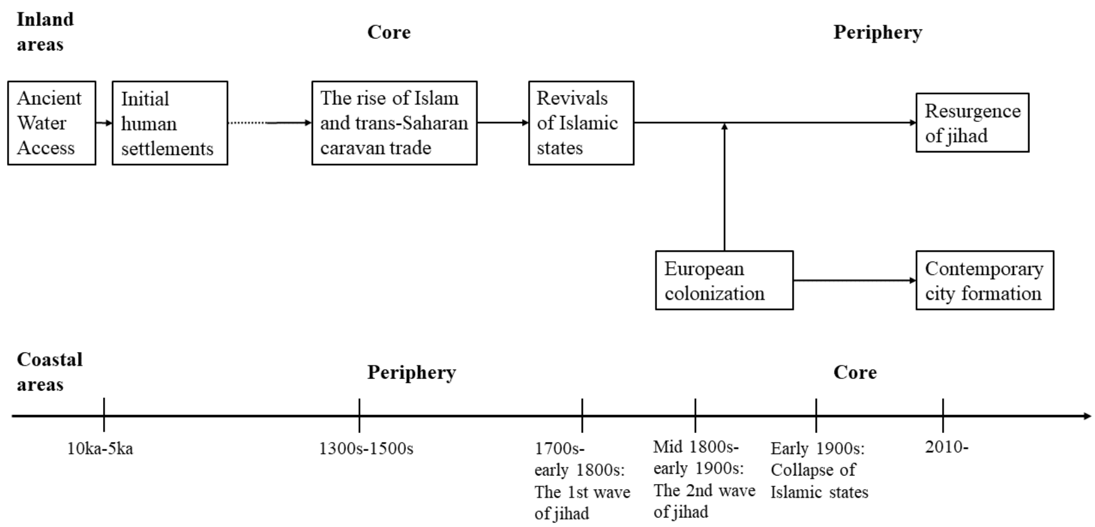

Figure 3: Summary of History, Geography, and Empirical Results

2 Historical Background

We provide the historical backgrounds of Islamic states from pre-colonial period to the independence period. First, we detail the spread of Islam and Islamic pre-colonial states and cities with historical anecdotes. Second, we describe how Islamic states in the 19th century emerged and their access to weapons. Finally, we summarize how Islamic states reacted against European colonization and about Muslims in the colonial and independence periods.

2.1 Pre-Colonial Cities and Islam in West Africa

Back to five thousands years ago, with the ample lakes and rivers, the Sahara was attractive to human settlements (Drake et al. 2011). After the African Humid Period (AHP), water sources in the Sahara became gradually depleted, which resulted in the Sahara Desert. Nevertheless, the Sahara Desert, "one of the world's greatest barriers to human movement" was bridged by trade, which led to the births of the core trading cities (Bovill 1968; Connah 1987, p.98).

At the first millennium AD, a primal position with natural resources such as gold and salt exchanged with the North African empires primarily brought the power and economic prosperity in the Ghana Empire (Trimingham 1962; Chu and Skinner 1965). After the collapse of the Ghana Empire in 1235, the Muslim king Sundiata founded the Mali Empire. The empire situated in full savanna, also well provided with natural resources, including control of gold-bearing area. With the trade contact with North Africa, the Mali Empire spread Islam, embracing large numbers of subject states of diverse populations (Trimingham 1962, p.61). In the 15th and the 16th centuries, as the Mali Empire became weakened, the Songhai Empire with the Muslim kings gained power and brought a brilliant civilization (Trimingham 1962; Ki-Zerbo et al. 1997).

Timbuktu, located in the modern West African country of Mali, is an exemplary example of the core trading cities governed by the Islamic states. It was the second capital of Songhai Empire and had experienced the “Golden Age” in the 15th and 16th centuries (Singleton 2004; Austen 2010, p.57) until it was invaded by Moroccans in 1590s. The shaded boundaries in Figure 2 represent historical states in the 16th century, including the Songhai Empire in the center. In the writing of al-Sa’di about Jenne (near Timbuktu) in 1655, “caravans flock to Timbuktu from all points of horizon” (translated by Connah 1987, p.97). Also, Timbuktu was not only the center of trade network but also a scholarly center (Kane 2017).

Near Timbuktu, Gao was also an important center of Saharan trade even before the Islamic era and became an early attraction for trans-Saharan commerce (Austen 2010, p.57). Sailing down the Niger river (he was calling it “Nile”) from Timbuktu (Tumbuktá), Ibn Battuta reached Gao (Gawgaw) in 1353 at the age of Mali Empire depicted in the top left map in Figure B.1. He describes the prosperity of Gao in Battuta (2004):

> “I went on from there to Gawgaw [Gogo], which is a large city on the Nile, and one of the finest towns in the Negrolands. It is also one of their biggest and best-provisioned towns, with rice in plenty, milk, and fish, and there is a species of cucumber there called *’inán* which has no equal. The buying and selling of its inhabitants is done with cowry-shells, and the same is the case at Mállí.”

Bilma and Taoudenni were also indispensable trading centers with salt production. Trans-Saharan caravans exchanged their Mediterranean goods for salt and passed through as a transit point to the Sudan (Austen 2010, p.38).

The core trading cities in the pre-colonial period has gradually declined as the European reached to the coastal trading posts. Austen (2010) writes “the beginning of the twentieth century clearly marks the end of trans-Saharan trade as a significant avenue of international commerce.” Since then, the economy in West Africa moved away from the desert toward the Atlantic Ocean (Austen 2010, p.119).

2.2 Islamic States in the 19th Century

From the 17th to the early 19th century, the first wave of jihad occurred throughout Africa, which mainly aimed for purification and extension of Islam and Islamic law (Curtin 1971; Walther and Miles 2017; Ruthven et al. 2004, p.74-75). According to Lovejoy (2016), “the idea of jihad was rooted in the confrontation of established political authority through the purification of Islamic practice and the imposition of governments that were forcefully committed to governance on the basis of Islamic law and tradition.” The green areas in Figure 2 represent pre-colonial Islamic states in the 19th century, some of which involved in jihad against the colonization forces.

The Futa Jallon jihad was done by the Muslim settlers with Fulani pastoralists against the dominant Jalonke landlords to whom they paid taxes on trade and cattle (Lapidus 2002, p.418).

The Futa Toro jihad was conducted by religious teachers who took Muslim leadership and itinerant beggars. They rebelled against the local dynasty in protest of fiscal oppression and lack of protection from Mauritanian raids (Lapidus 2002, p.419). Sokoto Califate was founded by Islamic scholar, 'Uthman Don Fodio, who conducted the jihad against the rulers of Gobir.

Among the Islamic states in the same period, Kong and Samori (Wassoulou) empires were established by Muslim merchants and traders. Rather than jihads, their aim was to control over trade without dependence on states. Hence, commercial considerations outweighed Islamic factors in the state formation process (Azarya 1980, p.428).

From the 15th century before colonization, the Atlantic slave trades intensified and fostered the spread of weapons in West Africa. Due to slave raids, individuals and communities obtained weapons, such as iron knives, spears, swords or firearms to defend themselves. These weapons could be obtained from Europeans in exchange for slaves. As a result, slave raids intensified and to protect oneself, individuals and communities seek for weapons. This vicious cycle has been named "gun-slave cycle" (e.g., Lovejoy 2011) or the "iron-slave cycle" (e.g., Hawthorne 2003) among historians. Not only local communities but also states engaged in slave raids to finance army purchases. They purchased firearms and horses which the European traders began to bring large quantities for sale (Law 1976, p.72). For example, Samori, the leader of the Wassoulou Empire, financed arms purchases from the exchange of slaves for horses in the Sahel and Mossi regions (Boahen 1985, p.123). Bornu actively engaged in slave raiding in order to finance trade with the Ottoman Empire in exchange for weapons and luxury goods (e.g., Lovejoy 2011, p.69 and Lapidus 2002, p.405).

2.3 Muslim Societies under Colonial Rule and after Independence

During the period 1880 to 1914, Europeans, mainly the French and the British, brought the whole of West Africa except Liberia under colonial rule. The French brought West Africa under control exclusively by military conquest rather than the treaties of protectorate as the British did (Boahen 1985 p.117) [7]. Africans resorted to three options against colonization: confrontation, alliance and acquiescence or submission (Boahen 1985 p.117).[8] The land of Islam falling into hands of non-Muslim and colonial powers caused confrontations between some Islamic states and colonial conquests, the second wave jihad (Walther and Miles 2017).

While some Muslim reactions against the French and the British invasion was militant, after the consolidation, there was little armed resistance. Nevertheless, Muslim opposition to the colonial rules persisted indirectly through schools, and reform movements (Lapidus 2002, p.737; Nyang 1984). For instance, in Ibadan (Nigeria), the Bamidele movement advocated for the preservation of Arabic language, Muslim attire, and reformed Islamic practices. Furthermore, Muslim ethnic groups such as the Hausas and Yorubas organized to safeguard their Muslim identity. These cultural and ideological resistance endured across generations, as Muslims

[7] There are discussions about how aggressive the French imperialists were (McGowan 1981, p.245).

[8] Appendix F provides historical evidence of strategies taken by Islamic states.

regarded colonial rule as a temporary setback (*fitna*) rather than a cause for cultural surrender (Nyang 1984). The continuity of Muslim identity during colonial times was also sustained through *taqiyya*, a practice which enabled them to accept outwardly colonial rules, while internally waiting patiently for the tides to turn (Hiskett 1994; Sanneh 2016; Umar 2006). "*Taqiyya* is based on the Qur'anic injunction about the obligation of remaining "faithful" and true to Islam in situations of danger and hostility, with dispensation for withholding the truth and hiding one's true intentions to ride out the challenge" (Qur'an 19:18; 49:13; Sanneh 2016, p.262).

On the other hand, the colonial powers regarded Muslims as culturally and educationally more advanced than non-Muslim Africans, and appointed Muslim chiefs and clerks as administrators in non-Muslim areas (Lapidus 2002, p.736). However, most Sudanic and West African peoples were and are ruled by narrow—often military—elites, in the name of interests and ideologies that do not, with some exceptions, reflect the values and identities of the masses. The new elites were commonly non-Muslims and were primarily concerned with political and economic modernization. They accepted Islam as a "personal religion" on a par with Christianity and not necessarily as relevant to the political order (Lapidus 2002, p.736).[9]

These colonial situations generated friction within the Muslim community. By the 1950s, attacks against Muslim leaders (*marabouts*) cooperating with the colonial administration began to surface (Loimeier 2003). In Nigeria, although the reintroduction of Shariah criminal law extended to twelve northern states in 2001, it ultimately functioned merely as a tool for political elites in their power struggles (Loimeier 2016). Amid growing disillusionment with the secular state and a desire for Islamic revival, radical movements emerged among young Salafists, ultimately paving the way for Boko Haram's campaign of terrorism (Brigaglia 2012). This phenomenon was not limited to Nigeria; rather, such resistance to secularization and Westernization—processes advanced under colonial rule—contributed to the rise of reformist movements and Salafism across West Africa, which advocated for the purity and revival of Islam (Sounaye 2017).

3 Data

The main data and their sources are as follows. Appendix C describes other data.

Pre-Colonial Islamic states. Cultures of West Africa creates the maps that show spatial locations of historical states before colonization as well as modern countries after independence by using multiple sources of references.[10] We digitize maps of historical states over the centuries from pre-colonial periods to the colonial era (Figure B.1 and Figure B.2). In Appendix B, we describe how to identify Islamic states in detail.

Pre-colonial trade routes and points. We rely on three sources: O'Brien (1999), Kennedy

[9]The Muslim community gradually became larger with significant conversions to Islam among pagan peoples. The Muslim population of West Africa approximately doubled between 1900 and 1960, and continues to grow substantially in later periods (Lapidus 2002, p.736).

[10]The references and maps are available in the website.

(2002), and Bossard (2014). They provide us with historical trade routes, trade points and ancient cities in pre-colonial period. Regarding the trade routes, we use the mapped ones before 1800 in Kennedy (2002) supplemented by O'Brien (1999). They were digitized by Michalopoulos et al. (2018).[11] To identify cities that have been declined or obsolete nowadays, we make use of Bossard (2014) (Map 1.15 p. 39) that shows ancient cities and present day cities on the pre-colonial routes based on multiple sources. Also, we utilize O'Brien (1999) and Kennedy (2002) for information of those cities by using current population information.

History of Sahara. We use the map of ancient lakes and rivers (more than 5 thousand years ago) constructed by Drake et al. (2011).[12] They assess and map the paleohydrology of the entire Sahara. In particular, they use a digital elevation model (DEM) and Landsat satellite imageries to identify ancient river channels and lake shorelines. Ancient lake areas were then basically estimated from the shorelines identified by the DEM. As a complement, remote sensing is also being used to map lake sediment outcrops, which are readily distinguished from other materials observed in the satellite imageries. For more technical details, see Drake and Bristow (2006) and the Supporting Information of Drake et al. (2011).

Contemporary cities. We have two sets of contemporary cities. As the first contemporary city data, we use Urban Centre database UCDB R2019A. This database identifies the cities with over 50,000 population in 2015 all over the world and provides their geolocations. We also construct the contemporary city data with over 10,000 population the countries covering the Sahara (i.e., Chad, Niger, Mali and Mauritania) by using Wikipedia (Figure A.2). For the population information, we assign the information on Wikipedia which is mainly based on the available census between 2005 and 2013.

Night lights. We rely on the two data source. One of which comes from the Defense Meteorological Satellite Program'(DMSP) s Operational Linescan System, which covers from 1992 to 2013. The other data comes from the Visible Infrared Imaging Radiometer Suite (VIIRS), which covers from 2012 to 2020.[13]

Jihadist groups in the contemporary world. The main data source for contemporary conflict events and actors involved in conflicts is Armed Conflict Location and Event Data (ACLED, Raleigh et al. 2010). Each actor appeared in ACLED is classified into an Islamist group or not by hand. Information about violent Islamist groups causing contemporary conflicts is drawn from several sources. Information sources include ACLED reports, Africa Center for Strategic Studies (ACSS), Mapping Millitants Project (MMP), the Foundations of Rebel Group Emergence (FORGE) Dataset, and Walther and Miles (2017). Appendix D lists major jihadist groups and their stated ideologies and goals.

[11] We appreciate the authors for their generosities to share the digitized data.

[12] During the "African Humid Period" from around 10,000 years ago, the Sahara enjoyed climatic and environmental conditions favourable for human habitation and cattle raising and it has been referred as the "Green Sahara" (e.g., deMenocal et al. 2000; Dunne et al. 2012). We rely on the map of ancient water sources depicted by a cartographer, Carl Churchill. It is available here.

[13] The detailed explanations and discussions about the night light luminosity data can be found in Chen and Nordhaus (2015), Elvidge et al. (2021), Gibson et al. (2020), and Gibson et al. (2021)

Contemporary conflict events involving jihadist groups. We restrict our event-level observations from ACLED in the following manner to pick jihadist violence. First, we focus on violent events involving jihadist groups, defined above, categorized as either rebel groups or political militias between 2001 and 2019 (from the year of 9/11 to the year before the COVID-19 pandemic).[14] Second, we select the following two types of violent events involving the Islamic groups. The first type is violence against state forces in a broad sense. In this type, opponents include both government actors in the country where each event is observed and external/other forces (international organizations, state forces active outside their main country of operation, private security firms and their armed employees, and hired mercenaries acting independently). This event type contains both battles and explosions/remote violence in terms of the classification by ACLED. The second type is violence against civilians. In terms of the classification by ACLED, this event type contains both violence against civilians and explosions/remote violence if civilians are targeted. Note that there is no fatality minimum necessary for inclusions in these events.[15] We exclude violent interactions between Islamic groups and other non-state actors. Indeed, the selected two types of violent events comprise more than 90 percent of the total violent events involving Islamist groups. Figure A.3 shows violent events involving jihadist groups from 2001 to 2019 in West Africa.

Conflict events versus European conquests. Our source of data on the incidence of conflict against European conquests is Brecke (1999).[16] This database records conflicts with at least 32 deaths between 1400 and 2000. According to Brecke (2012), the conflicts include interstate war, rebellions, and domestic political conflicts. For each conflict, it provides us with name of actors, start and end year and region of its onset. The actors are political entities possessing effective sovereignty over different territories (e.g., state, kingdom, sub-national groups). We use information of conflicts where the actors are historical states and European countries in West Africa. Table E.1 lists all the colonial conflicts involving historical states in West Africa. In total, the database records 42 conflict events while 15 conflict events involve Islamic states.

4 Empirical Analysis

In order to achieve the ultimate goal of understanding the roles of geography and history in jihad over the centuries, our empirical analysis has two sub-goals. First, we aim to identify the

[14]See the codebook ACLED (2019) for detailed classifications of conflict actors. Rebel groups are defined as "political organizations whose goal is to counter an established national governing regime by violent acts." Political militias are defined as "a more diverse set of violent actors, who are often created for a specific purpose or during a specific time period and for the furtherance of a political purpose by violence."

[15]According to ACLED (2019), a battle is defined as "a violent interaction between two politically organized armed groups at a particular time and location." Explosions/Remote violence are defined as "one-sided violent events in which the tool for engaging in conflict creates asymmetry by taking away the ability of the target to respond." Violence against civilians is defined as "violent events where an organized armed group deliberately inflicts violence upon unarmed non-combatants."

[16]Raw data is available in this website. Previous research (e.g., Besley and Reynal-Querol 2014; Fenske and Kala 2017) also made use of Brecke's database.

origins of pre-colonial and contemporary city formations. Second, we examine the persistent influence of core trading cities that flourished under pre-colonial Islamic states but have since declined on contemporary Islamist insurgencies. To examine these questions empirically, we construct artificial 0.5×0.5 degree (about 55km × 55km) grid cells covering the entirety of West Africa. Unless otherwise noted, each grid cell is our unit of analysis throughout the empirical analysis and we report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km.[17]

First, we hypothesize that water access in ancient periods predicts the locations of core pre-colonial cities along the trans-Saharan caravan routes, which thrived during the height of Islamic state power until the 1800s but declined subsequently. The following logic first rationalizes the argument that ancient lakes influenced *initial* human settlements. The transportation cost of inland trade across the Sahara is arguably high, given that camels were the primary mode of transport. In the presence of high transportation costs, places with a high capacity to feed humans are attractive as locations for city formation. Locations close to lakes and rivers are thus attractive. Humans can directly benefit from the water from these sources for various purposes, such as drinking and agriculture. Humans can also indirectly benefit from the water through its impact on animals. One benefit is through feeding livestock. In particular, camels, which humans use as their major transport mode, depend on water sources. Another benefit is through fishing and hunting. Fishing is obvious. Terrestrial animals also tend to gather places where water is available for their drinking purpose. Therefore, the human's search cost for hunting animals would be lower around locations close to water sources. Bosker (2021), a recent review article in regional science and urban economics, also points out the availability of a reliable water source as the primary *city seed* when transportation costs are high. Moreover, Drake et al. (2011) also empirically support these arguments. Collecting records of refuges, sightings, fossils, and rock art sites, they show that the estimated spatial distributions of various faunal species (such as fish, molluscs, and savannah mammals) significantly overlap with the ancient water sources. Collecting records of barbed bones, whose only usage was for hunting large water-dependent animals, they also show that the estimated spatial distribution of humans significantly overlaps with the ancient water sources.[18] Subsequent evolution of cities, thrived in particular under historical Islamic states, would then be based on the initial human settlements directly affected by the initial water sources, as long as transportation costs had been kept high before European colonization. At the same time, locations that had ancient lakes also experienced the decline of water resources until today. Therefore, the lost comparative advantage due to the shrinking of water, along with the invention of modern trading technologies concentrated in coastal areas, can also predict the decline of core inland cities.

[17] With this distance cutoff, the standard error is equivalent to be clustered by 3×3 grid cell squares (the own grid cell at center and surrounding eight grid cells). In a later section of robustness checks, we report standard errors with several higher distance cutoffs.

[18] See, again, the Supporting Information of Drake et al. (2011) for more technical details. See, for example, Dunne et al. (2012) and Sereno et al. (2008), for additional evidence of human settlements and animal use in the Sahara in the African Humid Period.

Next, we investigate the origins of contemporary cities, focusing on the following first- and second-nature forces, all of which could in theory be key determinants of city formation: the persistent effect of the ancient lakes, the effect of changing natural geography over time (i.e., constant shrinkage of water sources), and the opportunities for colonial investments by European countries.

Finally, we examine whether the historically prosperous but now deserted cities have persistent influences on contemporary Islamist insurgencies. Since the locations of these declined cities were unlikely to have been randomly determined, we use ancient water access as an instrumental variable, as it can in theory predict past prosperity and decline of the landlocked cities as explained above. As a proxy of the influence of declined cities, we use the log of one plus distance (km) to a landlocked city with contemporary populations less than 100,000 in our main specification. We confirm the robustness of our findings in section 6.1.

4.1 Ancient Water Source as the Origin of Core Pre-Colonial Cities

4.1.1 Empirical Specification

We first test whether proximity to water resources in ancient periods (more than 5 thousand years ago) predicts the formation of core trading cities in the trans-Saharan caravan routes founded up to the 1800s when historical Islamic states played significant economic roles before European colonization. We estimate the following regression:

$$\log(\text{CityAccess}_o) = \gamma_0 + \gamma_1 \log(\text{AncientWaterAccess}_o) + \gamma_2 X_o + \phi_c + u_o \tag{1}$$

where o represents each grid cell, X_o is a vector of cell-level geographical controls[19] , ϕ_c is a contemporary country fixed effect, and u_o is an error term. The dependent variable, CityAccess_o, is the accessibility of a trading point in the trans-Saharan caravan routes. In our main specification, CityAccess_o takes the accessibility of a declined landlocked city, proxied by distance to an inland pre-colonial city that has contemporary populations less than 100,000. $\text{AncientWaterAccess}_o$, is the accessibility of an ancient water source. Although our ancient water source data contains both lakes and rivers, we use ancient lakes as our primary measure of ancient water source. We compute the following measures of CityAccess_o or $\text{AncientWaterAccess}_o$.

Straight-line distance. The first measure is the straight-line distance from the centroid of each grid cell to the nearest ancient lake or the nearest core trading city. Trading cities are points and measuring the distance is straightforward. We define the distance to an ancient lake as the distance from the centroid of a grid cell to the nearest border between land and the lake.

Weighted accessibility measure. Each grid cell has access to multiple trading cities or water

[19]Cell-level geographical controls include a landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, terrain ruggedness, and proximity to contemporary water sources.

sources. In order to take this effect into account, we construct the following weighted measures:

$$\begin{aligned} \text{CityAccess}_o &= \sum_s \frac{1}{(\text{Distance}_{os})^\delta} \\ \text{AncientWaterAccess}_o &= \sum_w \frac{\text{AncientLakeArea}_w}{(\text{Distance}_{ow})^\delta} \end{aligned}$$

where Distance_{os} is the distance from grid cell o to each city s in the trans-Saharan trade routes and Distance_{ow} is the distance from grid cell o to each ancient lake w (the nearest border between land and lake w from o), both of which are measured in either the straight-line distance or the cost distance defined above. If we follow the conventional market access measure, CityAccess_o might include population in city s in the numerator. However, the precise information of population in 1700-1800's is not available. In WaterAccess_o, we take into account each ancient lake size because larger lakes mean richer accessibility of water resource.

We capture walking distance in these measures for the following reasons. First, there were no modern roads in the ancient periods and the pre-colonization age. Second, there were no modern cars in these periods. Camels were the means of transportation for the trans-Saharan trade. Third, walking distance matters even today in insurgent activities. Rebel groups tend to move not only through roads but also through off-road (e.g., Tao et al. 2016).

For the remainder of our analysis, we use the straight-line distance measures for both CityAccess_o and WaterAccess_o because these measures are the simplest and most straightforward ones to capture walking distance without specific assumptions about travel costs. We nonetheless report empirical results with other accessibility measures as well in Appendix.

4.1.2 Results

Table 1 reports the estimation results of (1). Given the exogenous nature of the ancient lakes, the OLS regressions plausibly identify the causal estimates of proximity to the ancient lakes on the formation of core pre-colonial trading points. According to column (3) of panel (A), a 1% increase in proximity to an ancient lake from a grid cell increases proximity to a pre-colonial trade point by 0.07% at the 1% level of statistical significance. Panel (B) shows the result with our main outcome, proximity to a declined landlocked city. With our preferred specification in column (3), a 1% increase in proximity to an ancient lake increases proximity to the declined landlocked city by 0.13% at the 1% level of statistical significance. The coefficient size in panel (B) is almost twice as large as that in panel (A). These empirical results, together with Table A.4 highlight that the ancient water access strongly predicts the locations of declined landlocked cities and that it explains both past prosperity and decline of these cities. Comparing panels (C) and (D) for proximity to a trade route also leads to similar conclusions.

Alternatively, in column (4) through (9), we use proximity to an ancient river and proximity to an ancient water source (a lake or a river) as the accessibility of an ancient water source. The results show that proximity to an ancient lake has the highest power to predict proximity to a core trade city. Recall from Figure 1 that some pre-colonial cities that are far from ancient lakes are located very close to the ancient river lines. However, we observe the overall weak result of the ancient river effects. This would be because overall there is a wide range of areas where ancient rivers were covering but there are no pre-colonial cities overall.

Notably, we control for proximity to a contemporary water source in Table 1. The results show that proximity to a contemporary water source has no explanatory power for proximity to a core trade city. The coefficients on a contemporary water source are statistically insignificant in most specifications and their sizes are also significantly smaller than those on proximity to an ancient water source. These results imply that locations of the core trade cities reflect the initial geography from ancient periods rather than pre-modern water sources.

4.2 Shifting Natural Geography, Colonial Investments, and City Formation

Table 2 shows the relationship between contemporary economic development and water sources over time with the same other controls of the specification (1). In panel (A), we use the log of one plus distance (km) to the nearest city with contemporary population over 50,000 as an dependent variable. In panel (B), restricting the grid cells in the countries covering the Sahara (i.e., Chad, Niger, Mali and Mauritania), we use the log of one plus distance (km) to the nearest city with contemporary population over 10,000 as an dependent variable, given that these landlocked countries have much smaller population densities than other West African countries many of which face coasts. In panel (C), we use satellite light density at night to proxy for local economic activity since there does not exist national geocoded high-resolution statistics of economic development across West Africa. We rely on the Visible Infrared Imaging Radiometer Suite (VIIRS), which is superior in capturing local economic activity. As a dependent variable, we use the log of one plus total night light luminosity in 2015.

From panels (A) and (B), the effects of proximity to an ancient lake is statistically insignificant with small coefficient sizes, which implies the lack of persistent effects of initial geography on contemporary city formations. From panel (C), we find the negative effect of proximity to an ancient lake on the night light luminocity. In contrast, we find significant (both statistically and economically) positive effects of proximity to a contemporary water source on contemporary city formation and night lights. These results emphasize the importance of examining the effect of changing first-nature geography over time, illustrated by the constant shrinking of water sources and the increase in the relative importance of the Niger river.

However, the changing natural geography would not be the only factor explaining modern cities. We presume that most ancient lakes had shrunk even before the European colonization. Combining these results with the ones from the previous section emphasizes the importance of persistence and path-dependence in shaping economic activities. The results in the previous section confirms the persistent effect of initial geography even though its substance role diminished. The results in this section points to the path-dependence in response to the large historical shocks (European colonization and the invention of modern trading technologies).

Table 3 reports the effects of water sources on colonial activities. We use three variables that capture colonial activities. In panel (A), the dependent variable is proximity to a colonial railway which is one of the direct measure of colonial investment. In panel (B), the dependent variable is proximity to a Christian missionary activity. Christian missionary activities are well-known entities which fostered education and built health facilities in colonial Africa (e.g., Nunn et al. 2014; Cagé and Rueda 2020). In panel (C), we use the Atlantic slave exports.[20] The European colonizers built ports and engaged in colonial trade along the coast. The number of Atlantic slave exports proxy for the intensity of colonial trading activities. As a dependent variable, we use the log of one plus the number of the Atlantic slave exports.

The results show that the relationship with water sources is heterogeneous across different colonial activities, while all the three activities were engaged in closer to coastal areas. Proximity to ancient water sources has an insignificant influence on the missionary activity (both statistically and economically), while it is located closer to contemporary water sources. Importantly, there are more colonial railways and slave exports in locations further from the ancient lakes. The coefficients are statistically significant at the 1% level and also economically significant. According to column (3), a 1% increase in proximity to an ancient lake increases the slave exports by about 0.2%. The role of the slave trade involving colonization forces will be discussed again in a later section when we investigate the local mechanism behind the persistent effect of pre-colonial cities on jihadist violence. In contrast, the relationship between the slave-related activities and contemporary water sources is insignificant.

Table A.1 reports the correlations between variables related to colonial investments and contemporary development, measured by proximity to a large city and the night light luminosity. According to column (1), proximity to a pre-colonial trade point, including both coastal and landlocked, is weakly correlated with contemporary development. According to columns (2) through (4), proximity to coast, colonial railways, and missionary activities are significantly correlated with the both development outcomes, which implies that accessibility for many European colonizers who sailed to West Africa had an important role in contemporary cities and economic activities. These results are consistent with the finding of Ricart-Huguet (2021), which stresses the importance of coastal pre-colonial trade point. According to column (5) of panel (B), a grid cell located in an ethnic homeland with a higher number of Atlantic slave exports is also positively correlated with the night light luminosity though its coefficient size is small.

Finally, in order to look at the effect of a change in trade technology, we are also going to focus on aviation technology. In the early 1900s, the technology was still for the military purpose in WWI and WWII, but the technology gradually was used for trade before the independence in West Africa. Since the airports reflect both colonial investment and a place adopting the technology, we are collecting the locations of airports in West Africa (the data is

[20]The Atlantic slave exports data come from Nunn (2008). We assign each grid cell to ethnic homeland by Arc GIS. In panel (C), this is grid-cell level analysis although variation of the dependent variable (the logarithm of one plus the number of Atlantic slave exports in the 1800s) comes from ethnic homeland level. Since the data has missing values for the uninhabited areas, the number of observations decreases to 2489.

under construction).

4.3 Persistent Effects of the Declined Cities on Contemporary Jihad

4.3.1 Empirical Specification

Given the endogeneity of the locations of pre-colonial cities that flourished under pre-colonial Islamic states but have since declined, we instrument CityDecline_o (proxied by the log of one plus distance to an inland pre-colonial city that has contemporary populations less than 100,000) by proximity to an ancient lake. Notably, by controlling for contemporary water access, the instrument essentially captures variation in access to ancient lakes that have since shrunk. We thus use the predicted proximity to a declined landlocked city from the first stage to estimate the following two-stage least squares:

$$Y_o = \beta_0 + \beta_1 \text{CityDecline}_o + \beta_2 X_o + \phi_c + \epsilon_o \tag{2}$$

where Y_o is an outcome of interest regarding insurgent activities by violent Islamist organizations and β_1 is the coefficient of interest. In addition to the same geographical controls as in (1), X_o also contains contemporary populations. That is, we conceptually compare same-sized cities but with different past prosperities to examine the persistent effects of historical state presence.[21] Table A.3 reports the corresponding first-stage regression results, which are equivalent to those in Table 1 except for additionally controlling for contemporary populations.[22]

In addition to the predetermined water access in ancient periods, we need the following identifying assumptions for causal inference. The exclusion restriction is that water access in ancient periods influences contemporary outcomes only through its effect on shaping economic activities in historical states before colonization. The independence assumption is that, after controlling for cell-level geographical characteristics, the unobservable factors of contemporary Islamist insurgencies are uncorrelated with the ancient water access.

There is no direct way to test these assumptions, but the following two arguments support them. First, most lakes in ancient periods have now disappeared because of exogenous long-term climate and environmental changes. We presume that the direct effect of lakes is present as long as lakes exist. Our logic is that ancient lakes directly affected human settlements and economic activities when humans and animals depended heavily on these water sources. Subsequent evolution of historical states would then be based on the initial human settlements affected by ancient water sources. Therefore, ancient lakes are not likely to have a

[21] Table A.2 reports positive correlations between jihadist events and proximity to contemporaries cities with various sizes.

[22] Indeed, the IV has the highest power for predicting the set of cities captured in CityDecline_o among possible combinations of pre-colonial cities. In order to show the validity of the IV, we conduct placebo tests, in which we run the same specification with proximity to a currently-populated inland city and a contemporary small coastal city as a dependent variable respectively. Table A.4 reports that proximity to an ancient lake does not predict any of these cities better. Insignificant results with other combinations of cities are also available upon request.

direct influence on contemporary Islamist insurgencies.

Second, we check the correlation between ancient water access and a set of pre-determined charasteristics, including geographical conditions and pre-colonial variables of culture and institutions, after controlling for the baseline geographical controls and contemporary country fixed effects. Geographical variables include ecological diversity, temperature, precipitation, caloric suitability, and pastoralism suitability. Pre-colonial variables include jurisdictional hierarchy of local community, polygamy as a marital composition, irrigation potential, degree of class stratification, and rules of political succession of local headman, drawing from the *Ethnographic Atlas*. Table 4 reports that the accessibility of ancient water sources is mostly uncorrelated with these pre-determined characteristics.[23]

In our baseline estimations, Y_o takes the following three variables: (i) log (distance from the nearest point of violent event by a jihadist organization between 2010 and 2019 from the centroid of cell o); (ii) a dummy which takes 1 if cell o has at least one violent event by a jihadist organization in ACLED from 2010-2019; (iii) log (number of violent events by jihadist organizations from 2010-2019 in cell o).

4.3.2 Results

Figure 4 visually illustrates the strong correlation between pre-colonial cities and contemporary jihad. This map overlays two residuals—the red scheme represents residuals from regressing the jihad dummy on the full controls used in the main IV specification; the blue scheme represents negative residuals from regressing log distance to a pre-colonial core inland trade point on the full controls. The color of cells where high residuals overlap turns purple (a mix of red and blue). Around several pre-colonial inland trade points, we observe dark purple cells.

Table 5 reports the IV estimates of the effects of the declined landlocked cities on contemporary jihad (2001-2019). According to column (1) of all the panels, a 1% increase in proximity to a declined landlocked city from a grid cell increases the average proximity to a jihadist event from the cell by 1.2%, the probability of experiencing a jihadist event in the cell by 0.3%, and the average number of jihadist events in the cell by 1.2% during 2001-2019. All of these estimates are statistically significant at the 1% level in our preferred specification. These effects are mostly concentrated in 2010-2019, during which the intensity of jihadist events have significantly risen. The mean of log intensity of jihadist events is 0.245 in 2010-2019 and 0.011 in 2001-2009. From column (2) of all the panels, we observe statistically insignificant effects of the declined landlocked cities during 2001-2010 and their coefficient sizes are also significantly smaller. In column (3) of all the panels, point estimates of the effects of the declined landlocked cities during 2010-2019 and their level of statistical significance are similar to those in column (1). These results indicate that the jihadist events during 2010-2019 are closely linked to the historical Islamic places, the core trade cities tracing back to more than 200 years ago.

[23] We see significant correlations with precipitation and caloric suitability. However, most variations of these variables are concentrated in coastal countries and the high correlations pick these effects.

We also use the same specification but with the explanatory variable being proximity to the trade route network up to 1800CE constructed by Michalopoulos et al. (2018). We pick the inland trade route network and calculate the distance to the nearest trade route from each grid cell. Columns (4), (5) and (6) in Table 5 show the results for the alternative measure. We find the qualitatively same results as in columns (1), (2) and (3). Importantly, the coefficient size of proximity to a trade route network is smaller than proximity to a core trading city. These results imply that proximity to a core trading *city* matters more than proximity to a trade *route*.

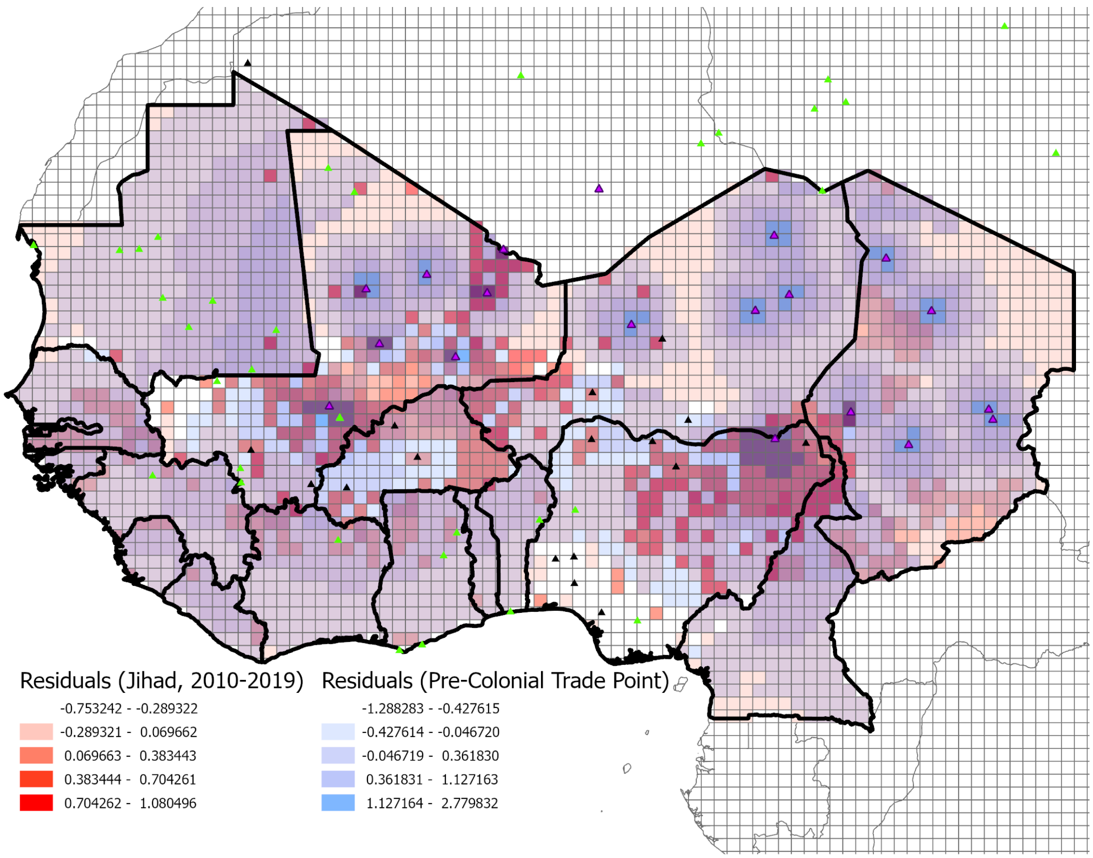

Figure 4: Overlay of Residuals for Jihadist Violence and Pre-Colonial Trade Points

Notes: This figure overlays two residuals—the red scheme represents residuals from the regression of a dummy variable of jihad (2010-2019) on all the control variables; the blue scheme represents negative residuals from the regression of log distance to a pre-colonial inland trade point with less than 100,000 population today on the full controls. The full controls include landlocked dummy, malaria suitability, caloric suitability in post 1500, elevation, ruggedness, and country fixed effects. The purple triangles indicate pre-colonial inland trade points with less than 100,000 population today, the yellow green triangles indicate pre-colonial coastal trade points with less than 100,000 population today, and the black triangles indicate the other pre-colonial trade points. The color of cells where high residuals overlap turns purple (a mix of red and blue).

Furthermore, in order to examine the (lack of) persistent effect of the declined landlocked cities on the contemporary economic activity, we use the night light luminosity relying on two data sources as in Section 3. We calculate total luminosity in each grid cell in 2005, 2010, and

2013 from DMSP and in 2013, 2015 and 2019 from VIIRS.[24] Table A.5 reports IV estimates of the persistent effect of the declined landlocked cities on the night light luminosity today (without contemporary population in the controls). The estimated coefficients suggest that the regions closer to the locations of the declined landlocked cities tend to be less developed in the 2000s.

5 Persistence of Jihadist Ideology as a Legacy of Colonization

We argue that the persistence of jihadist ideology as a legacy of European colonization serves as the primary local mechanism underlying the empirical results above. We support this mechanism in five ways. First, we emphasize that jihad has been cyclic, with distinct spatial distributions over the centuries. Second, we provide qualitative historical evidence on responses to colonization forces—partly shaped by a prevalent religious practice—contributing to the persistence of jihadist ideology. Third, we rationalize the mechanism and the observed patterns using a stylized multi-period model of conflict between a colonizer and an Islamic state. Fourth, we offer consistent quantitative evidence using individual-level survey data on religious ideologies associated with jihadism. Finally, we highlight heterogeneity across contemporary jihadist organizations, documenting differences in their reliance on localized recruitment strategies, which further reinforce the proposed mechanism.

5.1 Cycle of Jihad with Distinct Spatial Distributions over the Centuries

From Figure 2, there are two observations about the relationship between historical state presence before colonization and contemporary Islamist insurgency. First, contemporary conflict events involving Islamist organizations are concentrated in locations of historical Islamic states, but not in locations of historical non-Islamic states. In other words, given that jihads against European colonizers in the 19th century occurred around locations of historical Islamic states, jihad is cyclic over time in similar areas to some extent. Second, there is also a high variation in the contemporary conflicts involving Islamist organizations across different locations of historical Islamic states. Contemporary conflict events are not concentrated in all areas of historical Islamic states, but concentrated in a specific set of locations of historical Islamic states. For example, contemporary jihads are concentrated in the areas of Sokoto Caliphate in modern Nigeria and Tukulor Empire in modern Mali. Back in the conquest period, Sokoto Caliphate had limited to access to the purchase of the European weapons, which ended up in "no tactics, no personal gallantry and no resistance" against the European conquest (Crowder 1971, p.294). On the other hand, we observe very little contemporary jihadist violence in the area of Wassoulou Empire in modern Mali.

In order to further investigate the spatial distributions of jihads over time, Figure 5 shows both historical and contemporary jihads with the ancient lakes and historical trade cities. The

[24] The correlation between these two night lights data in 2013 in our study region is over 0.9.

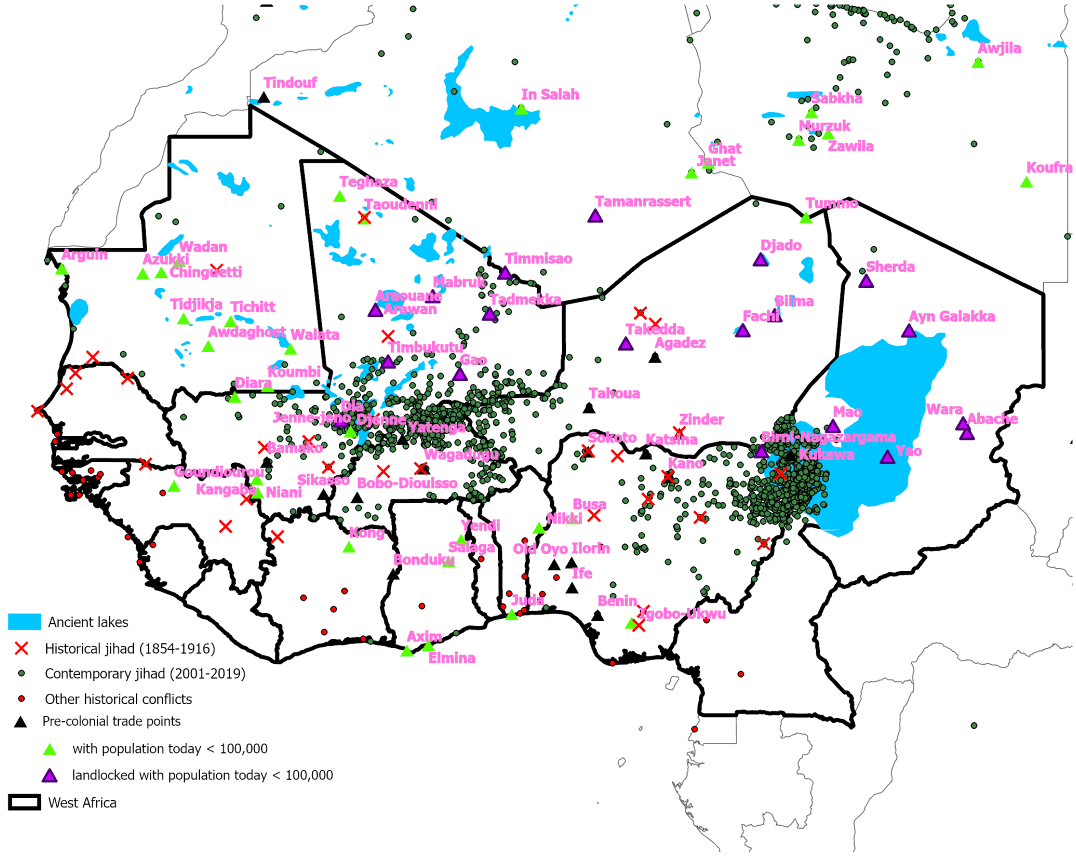

Figure 5: Historical and Contemporary Jihad

historical jihad information is based on Brecke (1999). This map implies the following two observations. First, locations of historical jihads against colonization forces are distant from both ancient lakes and core cities in the historical trade routes. In other words, historical jihads are distributed more in the periphery of the historical trade routes and in the coastal areas. Second, most historical jihads are distant from areas where contemporary jihads are concentrated.

Table 6 reports results of regressing historical jihads on the ancient water access. That is, the regression specification is identical to our first-stage one except for changing the dependent variable from historical trade points to the historical jihads. According to columns (4) through (6), the locations of ancient lakes have statistically insignificant effects on historical jihads against colonization forces and their coefficient sizes are also small.

Table 7 reports results of the IV regression with the same specification as the main empirical analysis except for changing the dependent variable to the historical jihads. According to columns (3) and (4), the core cities in the historical trade routes also have statistically insignificant effects on historical jihads against colonization forces and their coefficient sizes are smaller than those on contemporary jihads reported in Table 5.

In order to study the link between locations of contemporary jihad (2010-2019), historical jihad and core cities, we estimate the IV regression with the same specification as the main empirical analysis except for the dependent variable. Since neither historical nor contemporary conflict occurred in approximately 85% of the grid cells spanning in West Africa, in order to capture the meaningful variations, we use the relative locations of contemporary jihad to the historical jihad as the dependent variable. Specifically, we calculate the (logarithm of one plus) distance to the nearest contemporary jihad divided by the (logarithm of one plus) distance to the nearest historical jihad. Table 8 reports the results of the IV estimates for the effects of proximity to the core cities. The results show that contemporary jihad occurred closer to a grid cell with more proximity to the core cities relative to locations of historical jihad.

Finally, in order to examine the link between locations of historical and contemporary jihad, we use the distance to the nearest contemporary jihad divided by the distance to the nearest historical jihad as in the above. Table 9 and Figure 5 report the correlations between historical and contemporary jihads. According to column (4) through (6), contemporary jihad occurred in further away from a grid cell with more prevalence of historical jihad in terms of onset, intensity and duration respectively. Since the results in column (1) through (3) indicate that the relative locations of contemporary jihad to historical jihad are significantly correlated with historical conflict including non-jihadistic events, the correlations between contemporary jihad and historical jihad can be simply driven by the common factors with historical conflict. To alleviate this concern, column (7) through (9) report the results of horse race regressions. In these columns, the significance of the estimated coefficients of historical conflicts disappears and the size of the estimated coefficients shrinks towards zero, confirming our arguments about the significantly negative correlations between contemporary jihad and historical jihad.

5.2 Responses to Colonization Forces through Religious Practice

To understand the mechanisms behind distinct spatial distributions of jihads over time, we focus on strategies adopted by historical Islamic states against colonization forces. Appendix E and F summarize the confrontation against Europeans and strategies, obtained from several information sources. With Figure F.1, they imply that in locations where historical Islamic empires (e.g., Tukulor Empire) did not adopt hard confrontation as a strategy against European colonization, there are more Islamic violence today. This relationship between these different types of strategies and contemporary Islamic conflicts is consistent with the distinct spatial patterns of conflict events over time that we observed above. Investigations into intensities of historical conflicts also support the previous argument about the strategies against colonization forces. Results reported in column (6) and (9) of Table 9, where we use the total duration years of historical jihads against European countries in the conflict catalogue data, are consistent with the strategies adopted by the Islamic states.

How conflicts end matters for future conflicts through the persistence of jihadist ideology

The interpretation most consistent with the set of our empirical findings is as follows, pertaining to the power balance between Islamic states and European military forces during the colonial era.

Islamic state forces with reasonable access to coastal areas could directly obtain arms and ammunition from European traders (Smith 1989). For instance, Samori had access to weapons from traders and imported more modern arms from Sierra Leone to combat the French (Crowder 1971). Like Samori, Islamic states with better access to weapons adopted confrontation strategies, including guerilla tactics, and engaged in more intense fighting with European colonizers. As a result, European military forces militarily defeated such states. Consequently, these states ceased to exist, and the seeds of jihadist ideology within them were also diminished.

In contrast, Islamic state forces with limited access to weapons did not engage as fiercely with European forces due to the stark asymmetry in military capacity. For example, Crowder (1971) notes, "the reasons for the ineffectiveness of Tukulor military resistance are fairly obvious," further describing them as "hopelessly outgunned" by the French military, which resulted in no military resistance for most of the conquest period. Under such circumstances, these states resorted to strategies of alliance, acquiescence, or submission to European powers. While these states also ceased to exist, the seeds of jihadist ideology within them were *not* diminished, potentially fueling future jihadist conflicts.[25]

However, while the presence of jihadist ideology might be a necessary condition for contemporary jihadist activities, it is not sufficient on its own. This persistence cannot solely explain why significant effects on contemporary jihad were observed only during 2010–2019 and not in the earlier period of 2001–2009. The persistence of jihadist ideology, coupled with a contemporary shock that strengthens insurgent forces—such as the inflow of fighters and weapons from Libya following its security collapse (Shaw 2013)—could trigger a sudden surge in contemporary jihad. Indeed, it has been well-documented that the influx of weapons from Libya since 2011 has contributed to a widespread violent conflict in West Africa (e.g., Marsh 2017; Mangan and Nowak 2019). In the next section, we rationalize this story using a dynamic model of territorial conflict between a colonizer and an Islamic state, focusing on military asymmetries.

The Religious Practice of *Taqiyya*

These arguments also align with the historical accounts detailed in Section 2.3. The persistence of ideology can be interpreted as being sustained through the religious practice of *taqiyya*, which allowed Muslims to outwardly adapt to situations they could not change while internally preparing to reassert Islamic purity. This ideology was also reinforced through educational

[25] As noted in section 2.2, weapons could be acquired from Europeans in exchange for slaves. Table 3 shows that slave exports were prevalent in areas distant from ancient lakes, which strongly predict contemporary jihad. Reasonably assuming higher weapon access in regions with significant slave exports, this observation also aligns with the distinct spatial distributions of historical and contemporary jihads.

institutions and reformist movements. As Hiskett (1994) states, "Taqiyya enables the Muslim outwardly to accept a situation he is powerless to change, while inwardly waiting for the tide to turn. It condones dissimulation. It allows Muslims to cooperate with an infidel authority when there is no alternative, while reserving the moral right to restore Islam to its proper position of dominance when the time is ripe" (p.115). Campbell (2005) and Shultz Jr and Beitler (2004) document the prevalent practice of taqiyya in the context of contemporary jihadist activities as well. According to Campbell (2005), jihadists practicing taqiyya are "super sleepers" committed to becoming embedded in target societies, and they are "permitted" to drink alcohol, live together, pray together, eat during Ramadan, dress in Western style and socialise with women, to avoid suspicion or detection.

5.3 The Dynamic Model of Conflict

To rationalize the proposed mechanism, we present a two-period model of conflict between an European colonizer and an Islamic state, built on Baliga and Sjöström (2020). We simulate the model to replicate the nature of historical and contemporary jihad that we observed.

The Model Setup

There are two players, a colonization force (F) and an Islamic state (M), who are competing over a divisible territory. There are two periods ($t = 1, 2$), with no discounting of future payoffs. The total amount of the territory is normalized to 1, and the allocation at the beginning of period t is given by ω_{Ft} and ω_{Mt} for players F and M, respectively, where $\omega_{Ft} + \omega_{Mt} = 1$. We assume that player F, a colonizer, has a smaller amount of initial territory at the beginning of the game, thereby $\omega_{F1} < \omega_{M1}$. The relative military strength of player $i \in \{F, M\}$ is denoted by λ_i where $\lambda_F + \lambda_M = 1$. We assume that player F is military stronger, thereby $\lambda_F > \lambda_M$. The analysis will demonstrate that the degree of this asymmetric power relations matters to explain both the historical and contemporary jihads. The cost of conflict for player i is denoted by ϕ_i.

In each period, the bargaining game has two stages. In Stage 1, Player $i \in \{F, M\}$ can either "challenge" by making a claim σ_{it} where $\omega_{it} < \sigma_{it} \leq 1$, or make no claim. If neither challenges, both players will keep controlling a share $\sigma_{it} = \omega_{it}$. The cost of making a challenge for player i is c_i, which is private information and drawn from distribution $F(c)$. Stage 2 is reached if only one play makes a claim and the other player does not make a claim. The other player decides whether to concedes to the claim. In other words, if the both players make claims or if neither claims, then the second stage is not reached and the game ends.

A winner of conflict will take the full territory (i.e., $\sigma_{it} = 1$ if i wins), where conflicts occur in the following two cases. The first case is where only one player makes a claim in Stage 1 and the other player does not concede to it in Stage 2. Suppose F is the only player who makes a claim. Then, F's winning probability is $\lambda_F + \theta$ while M's winning probability becomes $1 - (\lambda_F + \theta) = \lambda_M - \theta$, where θ is a parameter governing the first-mover advantage. We assume

$0 \leq \lambda_i - \theta$ and $\lambda_i + \theta \geq 1$ for all i to be able to define the probabilities. The second case is where both players make claims in Stage 1. In this case, the winning probability of player i is λ_i as the both players are simultaneously challenging.

Player i's instantaneous utility from controlling a share σ_{it} in period t is given by $u_i(\sigma_{it})$, where u_i is an increasing, strictly concave, and differentiable function on $[0, 1]$. Without loss of generality, we normalize the function such that $u_i(1) = 1$ and $u_i(0) = 0$.

The Two-Period Game

The dynamic game proceeds as follows. If conflict has occurred in $t = 1$, then the game ends and both players continue to get utilities from the obtained (or lost) territory in $t = 2$. If territorial transfer from one player to the other due to concession has occurred in $t = 1$, then the territory after the transfer becomes the new status quo territory at the beginning of $t = 2$ $(\omega_{F2}, \omega_{M2})$. If neither player challanges in $t = 1$, then the status quo territory remains the same in $t = 2$ $(\omega_{i2} = \omega_{i1})$. We solve the dynamic game by backward induction.

Optimal Strategies in $t = 2$ as in the One-Shot Game

Given the new status quo territory $(\omega_{F2}, \omega_{M2})$ realized after $t = 1$ (in the scenario where conflict has not occurred in $t = 1$), we solve for optimal strategies in $t = 2$ as in the one-shot game.

We begin with deriving the optimal amount of the claim. Suppose j makes a claim σ_{j2} in Stage 1 and i is the second mover. Then, player i concedes if:

$$u_i(1 - \sigma_{j2}) \geq (\lambda_j + \theta) \cdot u_i(0) + (1 - (\lambda_j + \theta)) \cdot u_i(1) - \phi_i = \lambda_i - \theta - \phi_i$$

When $\sigma_{j2} = 1$, this condition becomes $\phi_i \geq \lambda_i - \theta$. If this condition is violated, player j's optimal challenge is $\sigma_{j2} = 1 - \eta_{i2}$ such that $u_i(\eta_{i2}) = \lambda_i - \theta - \phi_i$. To sum, the optimal challenge by j in $t = 2$ is $\sigma_{j2} = 1 - \eta_{i2}$ where:

$$\eta_{i2} = \begin{cases} u^{-1}[\lambda_i - \theta - \phi_i] & \text{if } \phi_i < \lambda_i - \theta \\ 0 & \text{if } \phi_i \geq \lambda_i - \theta \end{cases}$$

Then, in any perfect Bayesian equilibrium, each player i either make the optimal claim $\sigma_i = 1 - \eta_j$ or no challenge. This game can thus be expressed as a game in which both players simultaneously decide whether to challenge with the optimal amount of claim or not challenge. Labelling the optimal challenge Hawk (H) and no challenge Dove (D), the payoff matrix for the row player, i, becomes as follows:

	H	D
H	$\lambda_i - \phi_i - c_i$	$u_i(1 - \eta_{j2}) - c_i$
D	$u_i(\eta_{i2})$	$u_i(\omega_{i2})$

From this payoff matrix, the difference in player i's net gains from choosing H over D between when j chooses H and when j chooses D is as follows, denoting player i's instantaneous payoff in period t when i chooses A_i and j chooses A_j where $A_i, A_j \in \{H, D\}$ by $\pi_{it}(A_i, A_j)$:

$$\begin{aligned}\Omega_i(\omega_{i2}) &\equiv [\pi_{i2}(H,H) - \pi_{i2}(H,D)] - [\pi_{i2}(D,H) - \pi_{i2}(D,D)] \\ &= \lambda_i - \phi_i - u(\eta_{i2}) - u(1-\eta_{j2}) + u(\omega_{i2})\end{aligned}$$

Using this function, we can define that actions are strategic complements for player i if $\Omega_i(\omega_{i2}) > 0$ and strategic substitutes for player i if $\Omega_i(\omega_{i2}) < 0$.

Player i's strategy is $s_i : [\underline{c}, \bar{c}] \to \{H, D\}$. Suppose player i thinks player j will choose H with probability p_j. The expected payoffs from choosing H and D in the one-shot game, and their difference are:

$$\begin{aligned}E[\pi_{i2}(H)] &= p_j\pi_{i2}(H,H) + (1-p_j)\pi_{i2}(H,D) = p_j(\lambda_i - \phi_i) + (1-p_j)u_i(1-\eta_{j2}) - c_i \\ E[\pi_{i2}(D)] &= p_j\pi_{i2}(H,H) + (1-p_j)\pi_{i2}(H,D) = p_j u(\eta_{i2}) + (1-p_j)u(\omega_{i2}) \\ E[\pi_{i2}(H)] - E[\pi_{i2}(D)] &= \underbrace{p_j[\lambda_i - \phi_i - u_i(\eta_{i2})] + (1-p_j)[u_i(1-\eta_{j2}) - u_i(\omega_{i2})]}_{\equiv x_{i2}} - c_i\end{aligned}$$

Therefore, $s_i(c_i) = H$ if $c_i \leq x_{i2}$, so that the probability of playing H is $p_i = F(x_{i2})$. Hence, the best response function is given by:

$$x_{i2} = \Gamma_i(x_{j2}) \equiv F(x_{j2})[\lambda_i - \phi_i - u_i(\eta_{i2})] + (1 - F(x_{j2}))[u(1-\eta_{j2}) - u(\omega_{i2})]$$

In equilibrium, we have $\hat{x}_{i2} = \Gamma_i(\hat{x}_{j2})$ for $i, j \in \{F, M\}$. Baliga and Sjöström (2020) confirm the existence and uniqueness of the Bayesian Nash equilibrium. Solving the system by assuming that c_i is uniformly distributed on [0, 1], we get:

$$\hat{x}_{i2}(\omega_{i2}) = \frac{u_i(1-\eta_{j2}) - u_i(\omega_{i2}) + \Omega_i(\omega_{i2})[u_j(1-\eta_{i2}) - u_j(\omega_{j2})]}{1 - \Omega_i(\omega_{i2})\Omega_j(\omega_{j2})}$$

Optimal Strategies in t = 1 under the Shadow of the Future

Denote the optimal challenge and equilibrium cutoff in $t = 1$ for plaeyer i by $1 - \eta_{j1}$ and $\hat{x}_{i1}$. We first derive (η_{F1}, η_{M1}) and then obtain $(\hat{x}_{F1}, \hat{x}_{M1})$.

When player i makes its decision in $t = 1$, it takes into account the "shadow of the future". In particular, player i takes into account the expected payoff in $t = 2$, depending on a potential new status quo $(\omega_{F2}, \omega_{M2})$, before the challenge cost c_i is realized: Under the assumption that

c_i uniformly distributed over [0,1], this expected payoff becomes:

$$
\begin{aligned}
E\pi_{i2}(\omega_{i2}) = {} & F(\hat{x}_{i2})F(\hat{x}_{j2})[\lambda_i - \phi_i - E\{c_i : c_i \leq \hat{x}_{i2}\}] + F(\hat{x}_{i2})(1 - F(\hat{x}_{j2}))[u_i(1 - \eta_{j2}) - E\{c_i : c_i \leq \hat{x}_{i2}\}] \\
& + (1 - F(\hat{x}_{i2}))F(\hat{x}_{j2})u_i(\eta_{i2}) + (1 - F(\hat{x}_{i2}))(1 - F(\hat{x}_{j2}))u_i(\omega_{i2}) \\
= {} & \hat{x}_{i2}\hat{x}_{j2}[\lambda_i - \phi_i - \frac{\hat{x}_{i2}}{2}] + \hat{x}_{i2}(1 - \hat{x}_{j2})[u_i(1 - \eta_{j2}) - \frac{\hat{x}_{i2}}{2}] \\
& + (1 - \hat{x}_{i2})\hat{x}_{j2}u_i(\eta_{i2}) + (1 - \hat{x}_{i2})(1 - \hat{x}_{j2})u_i(\omega_{i2})
\end{aligned}
$$

where $\hat{x}_{i2} = \hat{x}_{i2}(\omega_{i2})$ and $\hat{x}_{j2} = \hat{x}_{j2}(\omega_{j2})$. That is, the new territory allocation in $t = 2$, which depends on players' actions in $t = 1$, can determine the equilibrium cutoffs in $t = 2$, from which the expected payoff is calculated. Then, the value functions for player i are as follows:

$$
\begin{aligned}
V_i(H, H) &= \pi_{i1}(H, H) + \lambda_i u_i(1) + (1 - \lambda_i)u_i(0) = 2\lambda_i - \phi_i - c_i \\
V_i(H, D) &= \pi_{i1}(H, D) + E\pi_{i2}(\hat{\omega}_{i2}) = u_i(1 - \eta_{j1}) - c_i + E\pi_{i2}(1 - \eta_{j1}) \\
V_i(D, H) &= \pi_{i1}(D, H) + E\pi_{i2}(\hat{\omega}_{i2}) = u_i(\eta_{i1}) + E\pi_{i2}(\eta_{i1}) \\
V_i(D, D) &= \pi_{i1}(D, D) + E\pi_{i2}(\omega_{i1}) = u_i(\omega_{i1}) + E\pi_{i2}(\omega_{i1})
\end{aligned}
$$

To derive η_{M1}, suppose player M is the second mover. If M concedes to F, M's value function is $V_M(D, H)$. If M does not concede to F, M's value function is:

$$V_M(\text{not } D, H) = 2[1 - (\lambda_F + \theta)] - \phi_M = 2(\lambda_M - \theta) - \phi_M$$

Hence, M concedes to F if $V_M(D, H) \geq V_M(\text{not } D, H)$. For $\sigma_{F1} = 1$, M concedes if $\pi_{M2}(\omega_{M2} = 0) \geq V_M(\text{not } D, H)$. If this holds, $\eta_{M1} = 0$. If not, the optimal challenge by F, $1 - \eta_{M1}$, satisfies:

$$u_M(\eta_{M1}) + E\pi_{M2}(\eta_{M1}) = V_M(\text{not } D, H)$$

We can derive the similar conditions for η_{F1} as well. We can numerically solve for (η_{F1}, η_{M1}).

Next, given the obtained optimal challenges (η_{F1}, η_{M1}), we obtain the equilibrium cutoff strategies in $t = 1$. Suppose player i thinks j will choose H in $t = 1$ with probability p_j. The expected values that i gains from choosing H and D, and their difference are:

$$
\begin{aligned}
E[V_i(H)] &= -c_i + p_j[2\lambda_i - \phi_i] + (1 - p_M)[u_i(1 - \eta_{j1}) + E\pi_{i2}(1 - \eta_{j1})] \\
E[V_i(D)] &= p_j[u_i(\eta_{i1}) + \pi_{i2}(\eta_{i1})] + (1 - p_j)[u_i(\omega_{i1}) + E\pi_{i2}(\omega_{i1})] \\
E[V_i(H)] - E[V_i(D)] &= -c_i + p_j[2\lambda_i - \phi_i - u_i(\eta_{i1}) - E\pi_{i2}(\eta_{i1})] \\
&\quad + (1 - p_j)[u_i(1 - \eta_{j1}) + \pi_{i2}(1 - \eta_{j1}) - u_i(\omega_{i1}) - E\pi_{i2}(\omega_{i1})]
\end{aligned}
$$

Hence, the best response function for player i $t = 1$ is given by:

$$x_{i2} = \tilde{\Gamma}_i(x_{j1}) \equiv F(x_{j1})[2\lambda_i - \phi_i - u_i(\eta_{i1}) - E\pi_{i2}(\eta_{i1})] + (1 - F(x_{j1}))[u_i(1 - \eta_{j1}) + \pi_{i2}(1 - \eta_{j1}) - u_i(\omega_{i1}) - E\pi_{i2}(\omega_{i1})]$$

In equilibrium, whose existence we numerically verify under reasonable ranges of parameter values, we have $\hat{x}_{i1} = \tilde{\Gamma}_i(\hat{x}_{j1})$ for $i, i \in \{F, M\}$. Solving this, we get:

$$\hat{x}_{i1} = \frac{u_i(1-\eta_{j1}) + E\pi_{i2}(1-\eta_{j1}) - u_i(\omega_{i1}) - E\pi_{i2}(\omega_{i1}) + \tilde{\Omega}_i(\eta_{i1})[u_j(1-\eta_{i1}) + E\pi_{j2}(1-\eta_{i1}) - u_j(\omega_{j1}) - E\pi_{j2}(\omega_{j1})]}{1 - \tilde{\Omega}_i(\eta_{i1})\tilde{\Omega}_j(\eta_{j1})}$$

where

$$\tilde{\Omega}_i(\eta_{i1}) \equiv 2\lambda_i - \phi_i - u_i(\eta_{i1}) - E\pi_{i2}(\eta_{i1}) - u_i(1-\eta_{j1}) - E\pi_{i2}(1-\eta_{j1}) + u_i(\omega_{i1}) + E\pi_{i2}(\omega_{i1})$$

Simulating Equilibrium Probabilities of Conflict and Concession

The equilibrium probability of conflict in $t = 1$ is $F(\hat{x}_{F1}) \cdot F(\hat{x}_{M1})$, the equilibrium probability that player F challenges and player M concedes in $t = 1$ is $F(\hat{x}_{F1}) \cdot (1 - F(\hat{x}_{M1}))$, and the equilibrium probability of conflict in $t = 2$ conditional on that F had challenged and M had conceded in $t = 1$ is $F(\hat{x}_{F2}(1-\eta_{M1})) \cdot F(\hat{x}_{M2}(\eta_{M1}))$.

Figure 6 plots the simulated equilibrium probabilities of conflict and concession by setting $\theta = 0.2$, $\omega_F = 0.3$, $\phi_i = 0.2$, $v_i = 1.5$, $g_i = 0.5$, $u_i(\sigma_{it}) = \sigma_{it}^{0.6}$, and that c_i is uniformly distributed on [0, 1] for all i. The left panel illustrates that relative military strength has a non-monotonic effect on the conflict probability in $t = 1$. As the military strength of the "rising power" (F) increase from below to moderately above that of the "status quo power" (M), the conflict probability in $t = 1$ rises. However, once F becomes significantly stronger and the asymmetry becomes sufficiently large, the conflict probability in $t = 1$ drops sharply. The right panel shows that the probability that player F invades and player M concedes increases monotonically with the rising power's military strength. Additionally, the left graph demonstrates that, after M has conceded to F in $t = 1$, the conflict probability in $t = 2$ is substantially higher under high military asymmetry than under moderate asymmetry. Notably, this outcome arises even without a positive shock to player M's military capacity. Incorporating such a shock would further reinforce this relationship.

Finally, recall that in the context of jihad in West Africa, player F corresponds to an colonizer and M corresponds to an Islamic state. Conflict in $t = 1$ reflects historical jihad against the colonizer, while conflict in $t = 2$ reflects contemporary jihad (broadly understood as resistance to Westernization, including European military forces). Empirically, we observed more historical jihad and less contemporary jihad in regions with moderate military asymmetry at the time of colonization. We also observed less historical jihad and more contemporary jihad in regions with higher military asymmetry at the time of colonization. We also observed more contemporary jihad in regions with higher military asymmetry at the time of colonization, particularly where historical Islamic states did not intensely fight with colonization forces. These simulation results illustrate that such empirical patterns can be rationalized within a simple multi-period model of bargaining and conflict.

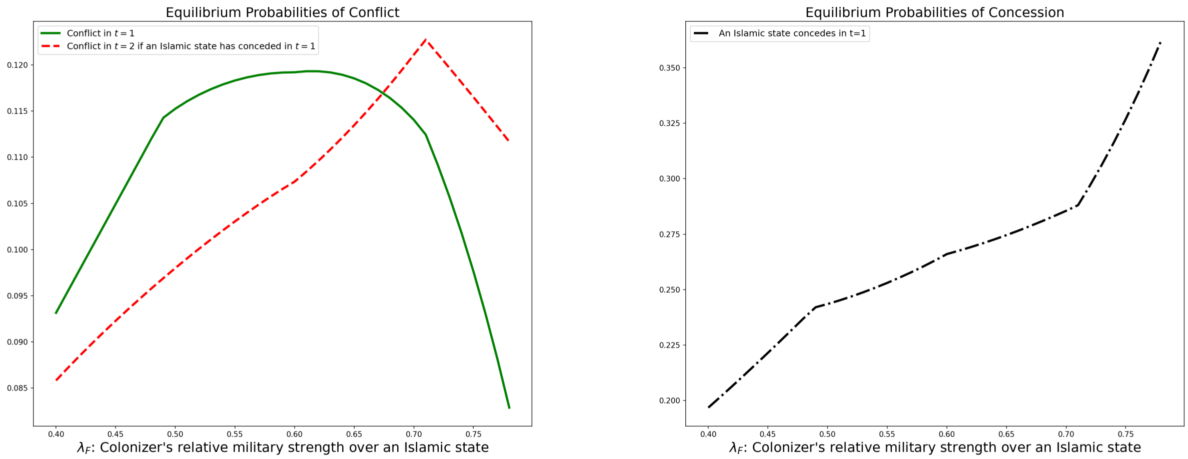

Figure 6: Simulated Equilibrium Probabilities of Conflict and Concession

5.4 Religious Ideologies from Individual-level Surveys

We leverage the Afrobarometer survey to provide supportive evidence of the persistence of jihadist ideology. The Afrobarometer comprises nationally representative, individual-level surveys conducted across several African countries, with geo-coded information available in each enumeration area (EA). We focus on two waves (rounds 6 and 7), implemented between 2014 and 2018, which include relevant variables for this study.

Although there are no direct questions on jihadist ideology or violent extremism, we use variables that capture religious ideologies broadly related to jihadism. This approach aligns with the widely held perspective that jihadist ideology seeks to preserve the purity of Islam against the secularization and Westernization of culture and institutions, as exemplified by movements such as Salafi jihadism (Sounaye 2017). These include views on excluding other religions, governance by religious law (particularly the Shariah law), and restrictions on female education. Notably, these three variables are the only ones we found in the Afrobarometer that closely relate to jihadism, despite the presence of many variables on religious practices.

We estimate the following IV regression:

$$Y_{rei} = \beta_0 + \beta_1 \text{CityDecline}_e + \beta_2 X_{rei} + \beta_3 X_e + \phi_c + \phi_r + \epsilon_{rei} \tag{3}$$

where the unit of analysis is individual i who resides in enumeration area e and participated in the survey at round r. Y_{rei} is one of the three outcome variables introduced above. CityDecline_e is the log of one plus distance to a declined landlocked city from enumeration area e and we instrument it by the ancient water access from e. X_i is a vector of individual-level controls and X_e is a vector of enumeration area-level geographical controls.[26] We additionally control for

[26]Individual-level controls include age, age squared, female dummy, nine categorical indicators of education,

the round fixed effects ϕ_r when an outcome variable is available in the both rounds. We report standard errors clustered at the country level in this specification. To capture variations within the Muslim population, rather than across different religious groups, we restrict the sample for analysis to Muslim respondents.

Table 10 reports results of the IV regression using the three dependent variables.[27] The dependent variables are ordered and standardized. The empirical results show that as a respondent's EA is closer to a declined landlocked city, he or she is more likely to dislike people of a different religion as neighbors (panel A), agree with governing a country by religious law rather than secular law (panel B), and disagrees with girls and boys having equal opportunities to education (panel C). All of these three effects are statistically significant at the 1% level. Hence, these empirical results, coupled with the qualitative evidence above, support that the persistence of jihadist ideology is the primary mechanism behind the main results.

5.5 Heterogeneity across Jihadist Organizations and Localized Recruitment

As shown above, we observe persistent jihadist ideology near declined landlocked cities. But does this imply that recruitment is actively taking place in these areas, thereby leading to increased jihadist violence? To investigate this, we examine heterogeneity across contemporary jihadist organizations over time and provide supporting evidence for localized recruitment.

First, to examine the heterogeneity across jihadist groups, we focus on the three largest factions—Al Qaeda, the Islamic State (IS), and Boko Haram—and assign each jihadist group to each of these factions or none of them based on multiple information sources. Recall that Figure A.3 shows violent events involving each of major jihadist groups in West Africa. Table D.1 categorizes the jihadist groups affiliated with Al Qaeda and the Islamic State.

Most jihadist groups in the world are networked. The two cores are Al Qaeda and the Islamic State, which are rivalries after their split in 2014 due to a difference in their ideologies (Hamming 2017; Novenario 2016; Zelin 2014).[28] Although it is rare that rival jihadist groups militarily fight, these groups compete for supremacy of the global jihadist movement.

Motivated by the organizational evolution and shifting dynamics of these groups, we further divide the contemporary time periods into the following three periods: 2001-2009, 2010-2015, and 2016-2019. The period 2010-2015 corresponds to the initial stage period of IS-linked groups, given that the split of the Islamic extremist groups into Al Qaeda and Islamic States as two

and four categorical indicators of living condition. Enumeration area-level geographical controls include the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, and average elevation. Since the Afrobarometer survey provides us with point data about each enumeration, we create a buffer with 50km radii around the locations of enumeration points when we calculate average malaria suitability, average caloric suitability in post 1500, and average elevation.

[27] See Appendix C for detailed sources and definitions of the variables that we use in this analysis. The Afrobarometer data is available in most African countries. Chad is an exceptional country where we observe jihadist events but the data is not available.

[28] Note that the relationship between Boko Haram and Al Qaeda is complicated and time-variant. See Cummings (2017) and Zenn (2020) for details. Note also that Islamic State in West Africa was established in 2015 after splitting from Boko Haram (Bohm 2020).

competing factions occurred in February 2014. In the later period 2016-2019, violent events by IS-linked groups became more prevalent compared to the earlier period until 2015.

Figure D.1 maps the overlay of residuals in the same way as Figure 4 but separately for the IS-linked and Al-Qaeda-linked groups over 2010-2019. While we observe similar areas of dark purple cells in these maps, locations of red cells (i.e., the spatial spillovers beyond the declined landlocked cities) look highly heterogeneous both across organizations and across time.

In order to formally investigate this heterogeneity, Table D.2, Table D.3, and Table D.4 report results of the main empirical IV specification for Al Qaeda-linked groups, IS-linked groups, and Boko Haram, respectively. Observing the three signs of coefficients (distance, onset, and intensity) in the tables, the results for all the three factions during 2010-2015 are consistent with the main result (Table 5). However, the explanatory power of declined landlocked cities is highly heterogeneous across time within the Al Qaeda faction. For the Al Qaeda-linked groups, in the initial stage periods (2001-2009), all the three signs are opposite to those in 2010-15. Moreover, declined landlocked cities explain less for their evolution over time (2016-19) as well. For the IS-linked groups and Boko Haram, declined landlocked cities explain well both their emergence (2010-2015) and evolution over time (2016-19), consistent with the main results.

Supportive evidence of localized recruitment

Al Qaeda-affiliated groups depend less on the locations of declined landlocked cities compared to IS-affiliated ones or Boko Haram, as evidenced by the comparison of results between factions during 2016-2019. While uncovering the precise causal mechanism behind this across-group heterogeneity is beyond the scope of this paper, one plausible interpretation can be put forward from the perspective of organizational structures and operation strategies. If Al Qaeda-linked groups have a core set of members to move around especially in their evolutional stages and the other groups depend more on local recruitment at any given time, and if local recruitment is facilitated in areas with a stronger persistence of jihadist ideology, then this across-faction heterogeneity is reasonably explainable. Consistent with this interpretation, it has been documented that, in contrast to Al-Qaeda's lesser reliance on the local constituency and limited ability to recruit local populations, Boko Haram and IS have adopted more localized recruitment strategies, relying on existing community networks to expand their support base (Bloom 2017; Botha et al. 2017)

Finally, we provide quantitative evidence highlighting the different recruitment strategies by Al Qaeda-affiliated groups, IS-affiliated groups, and Boko Haram. Simply assuming that jihadist groups attack both Muslim and non-Muslim (mostly Christian in West Africa) populations and that operating members of jihadist groups are Muslim, we define two concepts of the "insurgent's (market) access" measures. Insurgent's "target access" (ITA) in district o is approximately defined as:

$$ITA_o \approx \sum_d \frac{\text{population}_d}{\text{distance}_{od}}$$

and insurgent's "labor market access" (ILMA) in district o is approximately defined as:

$$ILMA_o \approx \sum_d \frac{\text{Muslim population}_d}{\text{distance}_{od}}$$

where populations are measured using the WorldPop datasets and the World Religion Database (WRD), both of which are introduced in Appendix C. Note that the unit of analysis for this exercise is a second-level subnational administrative division (not a grid cell), given the measurability of Muslim populations. Figure D.2 shows these units, contemporary Muslim population shares, and violent events by Al Qaeda- and IS-linked groups in 2016-19.

Table D.5 reports the regression results to show the correlation between violent events by each faction and ILMA, the key accessibility measure to the potential pool of insurgent's labor market. The coefficient sign of log (ILMA) is surprisingly negative only for Al Qaeda-linked groups while it is positive for IS-linked groups and Boko Haram. This contrast is consistent with the contrast in the previous heterogeneity results in Table D.2 through Table D.4, as well as with qualitative evidence on the differential reliance on localized recruitment strategies.

6 Discussions

6.1 Robustness and Placebo

We check the robustness and placebo of our main empirical results in several distinct ways.

Among only countries covering the Sahara (Mauritania; Mali; Niger; Chad)

There are two motivations behind this robustness check. The first motivation is to check if the main results are not being driven by the Christian-Muslim difference of local populations. There are several areas relatively close to the coast where we observe a lot of jihads and there is a mix of Christian and Muslim populations (e.g., Nigeria and Burkina Faso). In contrast, the Muslim population share is almost 100% in Mauritania, Mali, Niger, and Chad (recall Figure D.2). The second motivation is to check if the main results are not solely being driven by the large ancient Chad Lake and the extreme concentration of jihad events by Boko Haram and the Islamic State in West Africa around north eastern Nigeria. Table A.6 and A.7 confirm the robustness of main results with this restricted sample. Since the significant persistent effects on contemporary jihad concentrate in 2010-2019, we report results in 2010-2019, 2010-2015, and 2016-2019 in the first three robustness checks that change geographical coverage of the sample or the treatment variable.

The persistent effects of pre-colonial cities that have populations smaller than 50,000 today

The motivation behind this robustness check is to defend against the caveat that contemporary jihads happen just around currently-populated locations. Although we confirmed the very weak correlations between contemporary cities and jihads in section 4.3.2, this additional test further strengthens our argument. Table A.8 and A.9 confirm the robustness of main results with this strict definition of the small contemporary cities.

Combination of the above two

By combining the above two restrictions, we can check the persistent effect of pre-colonial cities with smaller contemporary populations only within the sphere of Muslim-dominated areas. Notably, with this condition, we exclude not only the "Chad Lake effect" in Nigeria but also the "Timbuktu effect" in Mali. Table A.10 and A.11 nevertheless confirm the strong robustness of our main results.

Alternative measures of the accessibility of ancient water sources

Table A.12 (for the ancient origin of city formation) and Table A.13 (for the persistent effects on jihad) present the robust empirical results using the second measure of $\text{AncientWaterAccess}_o$ that incorporates areas of lakes around grid cells weighted by distances, as defined in section 4.1.1.

Standard errors adjusting for spatial auto-correlations with different distance cutoffs

Table A.14 reports standard errors allowing for spatial correlation with higher distance cutoffs (200km, 300km, 400km, 500km, and 1000km) for the main IV estimation results. The size of standard error is non-monotonic in the size of distance cutoff. The main results in terms of statistical significance are robust to different cutoffs. At the largest standard errors, the coefficients from the three main outcomes (distance, onset, and intensity) are statistically significant at 5% levels.

Uppsala Conflict Data Program Georeferenced Event Dataset (UCDP-GED)

We use the UCDP-GED, an alternative conflict event dataset, to check robustness of the main results where we used the ACLED. There are two key differences between these two datasets. First, the UCDP-GED contains conflict and violent events that caused at least 1 fatality with the pair of actors (including the one-sided violence, in which case "civilians" is another side of actors) involved in the conflict that caused at least 25 fatalities in at least one calendar year. Given that the ACLED contains events regardless of the number of fatalities, we check the robustness of our results with relatively severe events. Second, the UCDP-GED contains conflict events in the entire world from 1989-2020 (though we pick events from 2001-2019). That is the reason why we used this dataset in our previous discussion of the global scale.

Table A.15 confirms the robustness of main results. Surprisingly, restricting to the relatively severe events by construction of this data, we also find statistically significant effects of the historical trade points on contemporary jihad (1% for the distance and 5% for the other two measures) during 2001-2009, unlike the main results from the ACLED. Note also that the coefficient size for the distance is similar between 2001-2009 and 2010-2019 and that the coefficient sizes for the onset and intensity in 2001-2009 are smaller than those in 2010-2019.

Insignificant "persistent effects" on non-jihadist violence

One potential concern is that the IV regression result may not be due to the persistent effect of declined landlocked cities but due possibly to other unobserved structural factors that drive conflicts and violence around these locations. If this were the dominant mechanism, then we would also expect similar IV estimates for non-jihad conflict events. In order to address this concern, Table A.16 reports the result of IV regression with the same specification as the main empirical analysis except for changing the dependent variable to violent events involving non-state and non-jihadist organizations. For this test, we again select the countries covering the Sahara, not only to focus on Muslim-dominated areas for the same reason as above, but also to exclude coastal areas where clearly different types of conflicts (e.g., conflict in the Niger Delta) are taking place. That is, the sample grid cells correspond to those in Table A.7. This test works as another placebo test. For all of the three outcome variables (distance, onset, and intensity) in Table A.16, the coefficients are statistically insignificant and their sizes are also significantly smaller than those in the corresponding results with jihadist events reported in Table A.7.

Note that this contrast between jihadist and non-jihadist events does not mean that typical localized and contemporary factors underlying insurgency, such as economic and political factors, are not important for jihad. For example, as Decet and Marcucci (2023) also argue in detail, proximity to contemporary water sources has similar effects (both statistically and economically) on jihadist events (column (3) in Table A.7) and non-jihadist events (column (3) Table A.16) during 2010-2019. As another example, Dowd (2015) and Dowd and Raleigh (2013) point out that not only the global jihadist ideology but also domestic contexts, such as political marginalization and grievances, are important factors driving jihadist movements in West Africa. Benjaminsen and Ba (2019), through anecdotes and interviews taken in multiple cities in Mali, argue that local land-use conflicts lead pastoral groups to support or join jihadist groups. McGuirk and Nunn (2022) quantitatively show that droughts in Africa, through the mechanism that they disrupt the arrangement between transhumant pastoralists and sedentary agriculturalists, impact both jihadist and non-jihadist events similarly. Combining our findings with these research, it is apparent that both jihad-specific and general factors underlying insurgency matter to explain contemporary jihad. Quantifying relative importance of these factors and understanding local dynamics of jihad are important future research agendas.

6.2 Global Perspective: Jihad in "Past-Core-and-Present-Periphery"

Why do jihadist activities take place in some places but not in other places *within* the Islamic world? While the previous sections have focused on a mechanism specific to the context of West Africa—highlighting the importance of understanding local mechanisms—in this section, we broaden our perspective to explore global patterns within the Islamic world. In order to approach this question, we first divide the world into the following four categories: (i) core in the past and core in the present; (ii) core in the past and periphery in the present; (iii) periphery in the past and core in the present; (iv) periphery in the past and periphery in the present.

From empirical analyses so far, we have leant that, in general, contemporary jihadist activities are concentrated around locations classified as (ii) core in the past and periphery in the present. In other words, contemporary jihads occur in areas that experienced reversals of fortune over the centuries. It is not surprising if contemporary jihadist activities are observed more in relatively underdeveloped societies within in the Islamic world, i.e., (ii) and (iv) in the above classification. However, it is not obvious why jihads are concentrated more in the "past-core-and-present-periphery" locations among underdeveloped Islam areas.

Does this pattern hold in the global scale? In order to approach this question, we draw on global-scale information about historical overland trade routes from Michalopoulos et al. (2018), worldwide populations over the centuries from the History database of the Global Environment (Hyde), and contemporary jihadist events (2001-2019) from the Uppsala Conflict Data Program Georeferenced Event Dataset (UCDP GED). Obviously, uncovering the causal relationship between past core locations (or present peripheral locations) and jihads in the global scale is beyond the scope of this paper, without exogenous time-variant natural geography to predict city formation, unlike in West Africa. It is nevertheless worth examining its correlation and case studies.

Figure 7 maps these information. We observe the highest concentrations of jihad events in Afghanistan, Pakistan, Syria, and Iraq.[29] While these countries today are relatively thought as peripheries after the invention of modern trading technologies, these locations were historically the cores of global overland trade networks. The following observations suggest that our findings from West Africa are consistent with the global phenomenon.

Afghanistan and Pakistan. Afghanistan is a landlocked, multi-ethnic country centered on the Hindu Kush mountain range. The region used to be the so-called "crossroads of civilization" connecting India with the east-west traffic routes of Eurasia. Afghanistan has also developed as an important hub along the Silk Road. However, it has been left behind by modernization because it has been less affected by European developments such as scientific and technological progress and the Industrial Revolution. The northern mountains in Pakistan, a

[29]The countries with the highest number of contemporary jihad events are, in descending order, as follows: Afghanistan, Syria, Iraq, Pakistan, Somalia, Nigeria, Algeria, Yemen, Philippines, and Mali.

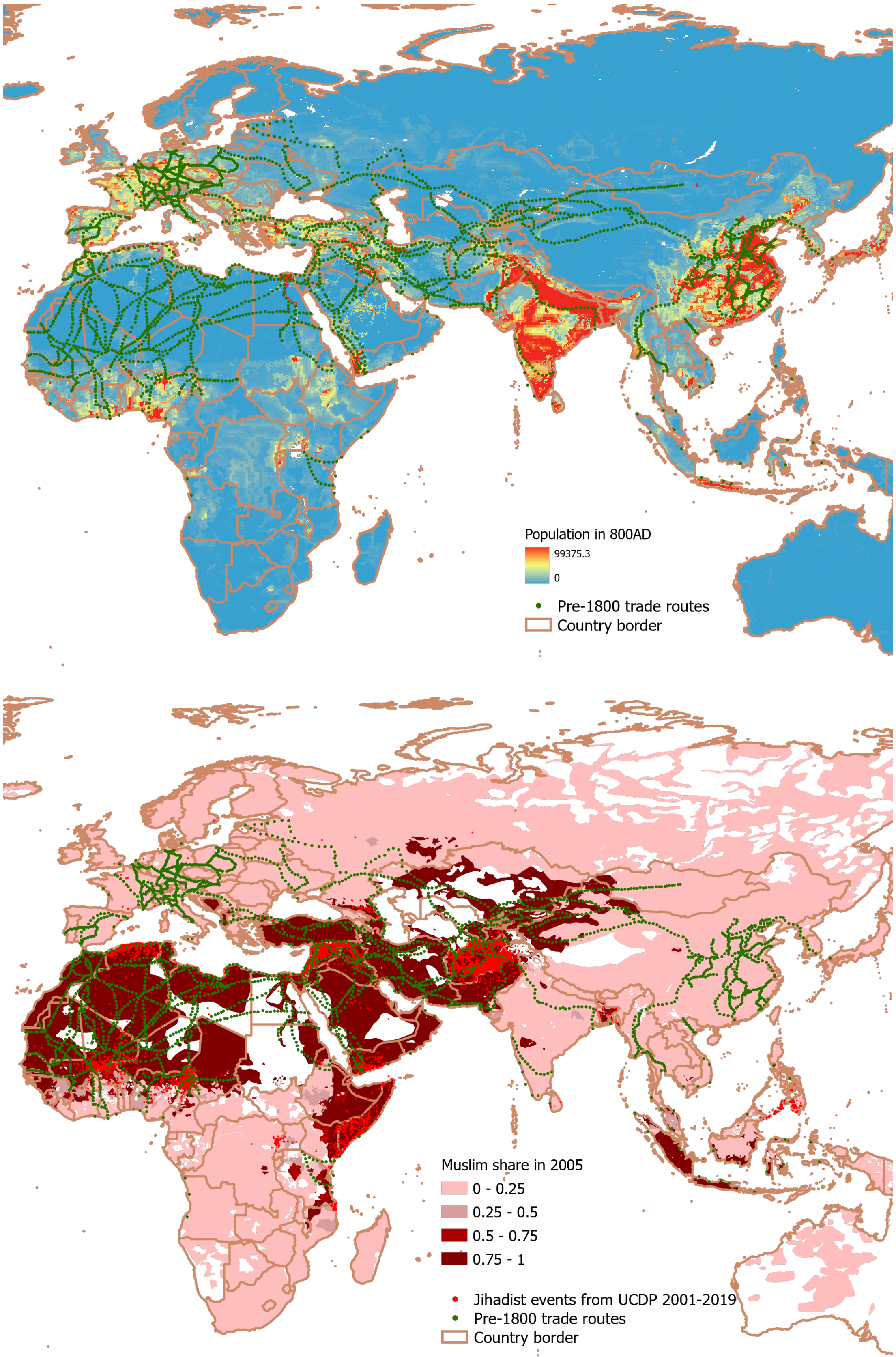

Figure 7: Historical Populations, Overland Trade, and Contemporary Islam and Jihad

neighboring country of Afghanistan, are part of the northern barrier of the Indian subcontinent, and since ancient times, traffic routes to China have passed through here. The Mintaka Pass crossing was one of the major routes. In addition, Balochistan Province, which encompasses several mountains and plateaus, is a major transportation hub for southern Afghanistan and Iran via the Bolan Pass.

Iraq and Syria. In the 8th century, the Abbasid dynasty emerged and Baghdad, the current capital of Iraq, became a center of trade and Islamic culture. Bosker et al. (2013) point out that "In 800, only four decades after its founding, Baghdad had become a metropolis of more than 300,000 inhabitants...it was the center of economic and political power in the Islam world." Syria, a neighboring country of Iraq, is located at the crossroads of West Asia, at the junction of the Turkish plateau in the north and the Arabian Peninsula in the south, and facing the Mediterranean Sea. It is a strategic point for East-West traffic. For this reason, various ethnic groups have arrived here and have created a diverse history. Around the 7th century, the Arabs, who were followers of Islam, quickly overran the whole of West Asia and established an Islamic empire. Damascus was chosen as the capital during the Umayyad dynasty, and prospered as a commercial and cultural city even after the capital was moved to Baghdad during the Abbasid dynasty. From around the 13th century, Damascus was invaded by the Crusaders from the west and the Mongols from the east, and from the 16th century it became a province of the Ottoman Empire, which ruled it for about 400 years.

7 Conclusion

This paper attempted to uncover the evolution of cities and Islamist insurgency, so called *jihad*, in the process of the reversal of fortune over the centuries, with focuses on ancient, pre-colonial, colonial, and contemporary periods.

In West Africa, water access in ancient periods predicts the core locations of inland trade routes—the trans-Saharan caravan routes—founded up to the 1800s, when camel was the major transport mode and historical Islamic states played significant roles in the economy before European colonization. In contrast, ancient water access does not have a persistent influence on contemporary city formation and economic activities. After European colonization and the invention of modern trading technologies, along with the constant shrinking of water sources, landlocked pre-colonial core cities contracted or became extinct.

Employing an instrumental variable strategy, we show that these deserted locations have today been replaced by battlefields for jihadist organizations. As a local mechanism behind this main result, we argue that the power relations of Islamic states and European military during the colonial era in the 19th century shaped the persistence of jihadist ideology, driving the backlash in the form of jihad long after the colonial oppression. Moreover, the concentration of jihadist violence in "past-core-and-present-periphery" areas in West Africa is also consistent with a global-scale phenomenon, which we argue by drawing on the historical overland trade routes leading from Asia to Europe. In other words, contemporary jihads occur in areas that experienced reversals of fortune over the centuries. Finally, the spillover of violent events beyond these stylized locations is partly explained by contemporary time trends and organizational heterogeneity among large factions (Al Qaeda; the Islamic State; Boko Haram) with a complicated competition and alliance structure. Future research is warranted to investigate the interaction between historical and contemporary factors.

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Table 1: Ancient Water Sources and Historical Landlocked Cities

(A)					**Log (Distance to a pre-colonial trade point)**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0371*	0.0377**	0.0679***						
	(0.0198)	(0.0188)	(0.0196)						
Log (Distance to an ancient river)				0.0613**	0.0466*	0.00563			
				(0.0267)	(0.0258)	(0.0209)			
Log (Distance to an ancient lake/river)							0.0476**	0.0354*	0.0414**
							(0.0221)	(0.0210)	(0.0175)
Log (Distance to a lake/river today)	-0.00600	-0.0168	0.0371	-0.0117	-0.0207	0.0327	-0.0114	-0.0205	0.0280
	(0.0293)	(0.0280)	(0.0241)	(0.0297)	(0.0286)	(0.0253)	(0.0295)	(0.0285)	(0.0249)
R^2	0.095	0.150	0.338	0.100	0.150	0.322	0.097	0.148	0.327
Adj-R^2	0.093	0.147	0.336	0.097	0.147	0.320	0.095	0.146	0.325
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	5.149	5.149	5.149	5.149	5.149	5.149	5.149	5.149	5.149
SD (Dep. Var.)	0.726	0.726	0.726	0.726	0.726	0.726	0.726	0.726	0.726
(B)					**Log (Distance to a landlocked trade point ($<$ 100,000))**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.105***	0.106***	0.127***						
	(0.0162)	(0.0163)	(0.0179)						
Log (Distance to an ancient river)				0.0526***	0.0488***	0.0184			
				(0.0160)	(0.0160)	(0.0172)			
Log (Distance to an ancient lake/river)							0.0843***	0.0818***	0.0757***
							(0.0133)	(0.0133)	(0.0151)
Log (Distance to a lake/river today)	0.0148	0.0114	0.0313*	0.00908	0.00718	0.0217	0.00476	0.00293	0.0145
	(0.0224)	(0.0221)	(0.0190)	(0.0219)	(0.0216)	(0.0202)	(0.0220)	(0.0218)	(0.0198)
R^2	0.663	0.666	0.729	0.633	0.635	0.688	0.646	0.648	0.699
Adj-R^2	0.662	0.666	0.729	0.632	0.634	0.687	0.645	0.647	0.699
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	5.951	5.951	5.951	5.951	5.951	5.951	5.951	5.951	5.951
SD (Dep. Var.)	0.840	0.840	0.840	0.840	0.840	0.840	0.840	0.840	0.840
(C)					**Log (Distance to a trade route up to 1800)**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0464	0.0429	0.105***						
	(0.0340)	(0.0338)	(0.0282)						
Log (Distance to an ancient river)				0.115***	0.0999***	0.00481			
				(0.0315)	(0.0308)	(0.0258)			
Log (Distance to an ancient lake/river)							0.0733**	0.0597*	0.0770***
							(0.0316)	(0.0310)	(0.0269)
Log (Distance to a lake/river today)	-0.0333	-0.0416	0.0230	-0.0437	-0.0498	0.0169	-0.0415	-0.0477	0.00711
	(0.0369)	(0.0362)	(0.0314)	(0.0379)	(0.0374)	(0.0342)	(0.0374)	(0.0369)	(0.0332)
R^2	0.121	0.149	0.379	0.136	0.160	0.358	0.127	0.152	0.367
Adj-R^2	0.119	0.147	0.377	0.134	0.158	0.356	0.124	0.150	0.365
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	4.462	4.462	4.462	4.462	4.462	4.462	4.462	4.462	4.462
SD (Dep. Var.)	0.984	0.984	0.984	0.984	0.984	0.984	0.984	0.984	0.984
(D)					**Log (Distance to a landlocked trade route up to 1800)**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0886**	0.0872**	0.170***						
	(0.0347)	(0.0350)	(0.0287)						
Log (Distance to an ancient river)				0.0806***	0.0753***	-0.000969			
				(0.0237)	(0.0241)	(0.0241)			
Log (Distance to an ancient lake/river)							0.0859***	0.0814***	0.112***
							(0.0264)	(0.0265)	(0.0255)
Log (Distance to a lake/river today)	-0.0183	-0.0209	0.0288	-0.0262	-0.0272	0.0204	-0.0283	-0.0292	0.00480
	(0.0363)	(0.0363)	(0.0272)	(0.0383)	(0.0381)	(0.0324)	(0.0377)	(0.0376)	(0.0313)
R^2	0.533	0.535	0.703	0.527	0.529	0.665	0.530	0.532	0.678
Adj-R^2	0.531	0.534	0.702	0.525	0.528	0.664	0.529	0.531	0.677
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	5.587	5.587	5.587	5.587	5.587	5.587	5.587	5.587	5.587
SD (Dep. Var.)	1.175	1.175	1.175	1.175	1.175	1.175	1.175	1.175	1.175
Colonizer FE	No	Yes	No	No	Yes	No	No	Yes	No
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest pre-colonial trade point, (B) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000, (C) the logarithm of one plus distance (km) to the nearest pre-colonial trade route up to 1800, (D) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Water Sources and Contemporary Cities

(A) The entire West Africa	**Log (Distance to a city (> 50,000))**	
	(1)	(2)
Log (Distance to an ancient lake)	-0.0259	-0.00935
	(0.0212)	(0.0179)
Log (Distance to a lake/river today)	0.346***	0.315***
	(0.0254)	(0.0243)
R^2	0.660	0.730
Adj-R^2	0.659	0.729
Observations	2616	2616
Mean (Dep. Var.)	4.497	4.497
SD (Dep. Var.)	1.167	1.167
(B) Countries with the Sahara	**Log (Distance to a city (> 10,000))**	
	(1)	(2)
Log (Distance to an ancient lake)	-0.00809	-0.0149
	(0.0203)	(0.0207)
Log (Distance to a lake/river today)	0.420***	0.411***
	(0.0412)	(0.0403)
R^2	0.557	0.573
Adj-R^2	0.556	0.571
Observations	1616	1616
Mean (Dep. Var.)	4.780	4.426
SD (Dep. Var.)	0.919	0.931
(C) The entire West Africa	**Night light luminosity in 2015**	
	(1)	(2)
Log (Distance to an ancient lake)	0.252***	0.140***
	(0.0402)	(0.0467)
Log (Distance to a lake/river today)	-0.522***	-0.439***
	(0.0704)	(0.0643)
R^2	0.432	0.531
Adj-R^2	0.430	0.529
Observations	2616	2616
Mean (Dep. Var.)	1.875	1.875
SD (Dep. Var.)	2.636	2.636
Country FE	No	Yes
Geographic Controls	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest city whose contemporary population over 50,000, (B) the logarithm of one plus distance (km) to the nearest city whose contemporary population over 10,000, (C) the logarithm of one plus total night light luminosity (VIISR) in 2015. In only (B), the observations restrict grid cells in Mauritania, Mali, Niger and Chad. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Water Sources and Colonial Activities

	(1)	(2)	(3)
(A) Log(Distance to a colonial railway)			
Log (Distance to an ancient lake)	-0.133***		-0.0976***
	(0.0142)		(0.0118)
Log (Distance to a coast)		0.325***	0.256***
		(0.0725)	(0.0727)
Log (Distance to a lake/river today)	0.0743***	0.0483*	0.0536**
	(0.0263)	(0.0266)	(0.0261)
R^2	0.509	0.516	0.536
Adj-R^2	0.508	0.515	0.534
Observations	2616	2616	2616
Mean (Dep. Var.)	6.135	6.135	6.135
SD (Dep. Var.)	0.988	0.988	0.988
(B) Log(Distance to a missionary activity)			
	(1)	(2)	(3)
Log (Distance to an ancient lake)	-0.0578***		0.0155
	(0.0140)		(0.0127)
Log (Distance to a coast)		0.524***	0.535***
		(0.0475)	(0.0500)
Log (Distance to a lake/river today)	0.113***	0.0706***	0.0697***
	(0.0252)	(0.0195)	(0.0195)
R^2	0.679	0.767	0.768
Adj-R^2	0.678	0.767	0.767
Observations	2616	2616	2616
Mean (Dep. Var.)	5.757	5.757	5.757
SD (Dep. Var.)	1.127	1.127	1.127
(C) Log(Atlantic slave exports in 1800s)			
	(1)	(2)	(3)
Log (Distance to an ancient lake)	0.309***		0.186***
	(0.0721)		(0.0714)
Log (Distance to a coast)		-1.019***	-0.886***
		(0.227)	(0.234)
Log (Distance to a lake/river today)	0.0786	0.144	0.133
	(0.106)	(0.102)	(0.103)
R^2	0.300	0.317	0.322
Adj-R^2	0.298	0.315	0.320
Observations	2489	2489	2489
Mean (Dep. Var.)	2.720	2.720	2.720
SD (Dep. Var.)	3.827	3.827	3.827
Colonizer FE	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest colonial railway line, (B) the logarithm of one plus distance (km) to the nearest Christian mission station in late 19th century, (C) the logarithm of one plus the number of Atlantic slave trade exports in 1800s. In Panel (C), the number of observations decreases due to the missing values for the dependent variable. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial autocorrelation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Correlations—Access to Ancient Lakes and Pre-Determined Characteristics

(A) Geography					
	(1) Ecological diversity	(2) Temperature	(3) Precipitation	(4) Caloric suitability	(5) Pastoralism suitability
Log (Distance to an ancient lake)	0.00144	-0.0149	3.356***	0.00522***	-0.00426
	(0.00526)	(0.0411)	(0.654)	(0.00127)	(0.00642)
R^2	0.011	0.606	0.875	0.994	0.519
Adj-R^2	0.008	0.605	0.874	0.994	0.518
Observations	2571	2615	2615	2616	2616
Mean (Dep. Var.)	0.416	28.065	54.530	0.532	0.375
SD (Dep. Var.)	0.422	2.007	52.202	0.533	0.194
(B) Pre-colonial culture and institution					
	(1) Jurisdictional hierarchy	(2) Polygamy	(3) Irrigation	(4) Class stratification	(5) Local headman
Log (Distance to an ancient lake)	-0.0279	-0.0190	0.000665	-0.0119	-0.0104
	(0.0357)	(0.0125)	(0.0118)	(0.0213)	(0.00789)
R^2	0.356	0.336	0.563	0.189	0.616
Adj-R^2	0.353	0.333	0.561	0.185	0.614
Observations	1749	1869	1880	1700	1345
Mean (Dep. Var.)	2.443	0.836	0.272	1.332	0.182
SD (Dep. Var.)	0.888	0.371	0.445	0.705	0.386
Country FE	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). In panel (A), the dependent varibles are (1) ecological diversity (2) average temperature (3) average precipitation (4) average caloric suitability (5) average pastoralism suitability. In panel (B), the dependent varibles from the *Ethnographic Atlas* are (1) jurisdictional hierarchy (v33) (2) polygamy (v9) (3) irrigation (v28) (4) class stratification (v66) (5) local headman (v72). We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: IV Estimates of Persistent Effects on Jihad

(A)	**Log(Distance)**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point ($<$ 100,000))	1.164***	0.310	1.306***			
	(0.274)	(0.211)	(0.283)			
Log (Distance to a landlocked trade route up to 1800)				0.874***	0.233*	0.980***
				(0.167)	(0.139)	(0.173)
Log (Distance to a lake/river today)	0.139***	0.0206	0.130***	0.142***	0.0212	0.132***
	(0.0409)	(0.0313)	(0.0413)	(0.0337)	(0.0299)	(0.0331)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	4.816	5.698	4.932	4.816	5.698	4.932
SD (Dep. Var.)	1.101	0.743	1.157	1.101	0.743	1.157
(B)	**Onset**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.325***	-0.00422	-0.327***			
	(0.0786)	(0.0135)	(0.0787)			
Log (Distance to a landlocked trade route up to 1800)				-0.244***	-0.00317	-0.246***
				(0.0550)	(0.00996)	(0.0548)
Log (Distance to a lake/river today)	-0.0405***	0.00344	-0.0439***	-0.0411***	0.00343	-0.0446***
	(0.0121)	(0.00316)	(0.0120)	(0.0109)	(0.00317)	(0.0108)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.133	0.011	0.129	0.133	0.011	0.129
SD (Dep. Var.)	0.339	0.106	0.335	0.339	0.106	0.335
(C)	**Intensity**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-1.233***	-0.0236	-1.234***			
	(0.357)	(0.0218)	(0.357)			
Log (Distance to a landlocked trade route up to 1800)				-0.926***	-0.0177	-0.926***
				(0.235)	(0.0158)	(0.235)
Log (Distance to a lake/river today)	-0.0913**	0.00352	-0.0952***	-0.0937***	0.00348	-0.0976***
	(0.0370)	(0.00336)	(0.0369)	(0.0315)	(0.00342)	(0.0314)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.249	0.011	0.244	0.249	0.011	0.244
SD (Dep. Var.)	0.775	0.109	0.771	0.775	0.109	0.771
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Ancient Water Sources and Historical Conflicts

	All			Jihad		
	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Distance)	Onset	Duration	Log(Distance)	Onset	Duration
Log (Distance to an ancient lake)	-0.0471**	0.00360*	0.00964*	0.0263	0.0000728	0.00371
	(0.0216)	(0.00186)	(0.00579)	(0.0224)	(0.00151)	(0.00541)
Log (Distance to a lake/river today)	0.0737**	-0.00805**	-0.0174*	0.0533*	-0.00489	-0.00562
	(0.0288)	(0.00367)	(0.0102)	(0.0299)	(0.00316)	(0.00754)
Colonizer FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.418	0.056	0.011	0.214	0.009	0.003
Adj-R^2	0.417	0.054	0.009	0.212	0.006	0.000
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	5.397	0.024	0.058	5.612	0.013	0.036
SD (Dep. Var.)	0.896	0.152	0.552	0.802	0.112	0.450

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are logarithm of one plus distance (km) to the nearest historical conflict (Log(Distance)), dummy variables which take a value of 1 if any historical conflict, otherwise take a value of 0 (Onset), and total duration years of historical conflicts in the unit of analysis (Duration). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: IV Estimates of the Effects of Historical Trade Cities on Historical Conflicts

(A)	Log(Distance)			
	All		Jihad	
	(1)	(2)	(3)	(4)
Log (Distance to a landlocked trade point (< 100,000))	-0.443*		0.248	
	(0.227)		(0.203)	
Log (Distance to a landlocked trade route up to 1800)		-0.540		0.301
		(0.394)		(0.215)
Observations	2616	2616	2616	2616
Mean (Dep. Var.)	5.397	5.397	5.612	5.612
SD (Dep. Var.)	0.896	0.896	0.802	0.802
(B)	**Onset**			
	All		Jihad	
	(1)	(2)	(3)	(4)
Log (Distance to a landlocked trade point (< 100,000))	0.0339*		0.000685	
	(0.0189)		(0.0142)	
Log (Distance to a landlocked trade route up to 1800)		0.0413		0.000834
		(0.0275)		(0.0174)
Observations	2616	2616	2616	2616
Mean (Dep. Var.)	0.024	0.024	0.013	0.013
SD (Dep. Var.)	0.152	0.152	0.112	0.112
(C)	**Duration**			
	All		Jihad	
	(1)	(2)	(3)	(4)
Log (Distance to a landlocked trade point (< 100,000))	0.0907		0.0349	
	(0.0582)		(0.0523)	
Log (Distance to a landlocked trade route up to 1800)		0.110		0.0425
		(0.0830)		(0.0670)
Observations	2616	2616	2616	2616
Mean (Dep. Var.)	0.058	0.058	0.036	0.036
SD (Dep. Var.)	0.552	0.552	0.450	0.450
Colonizer FE	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are logarithm of one plus distance (km) to the nearest historical conflict (Log(Distance)), dummy variables which take a value of 1 if any historical conflict, otherwise take a value of 0 (Onset), and total duration years of historical conflicts in the unit of analysis (Duration). The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1) and (3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (2) and (4). We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: IV Estimates on Relative Contemporary Jihad Locations to Historical Jihad

	Distance		Log (Distance)	
	(1)	(2)	(3)	(4)
Log (Distance to a landlocked trade point (< 100,000))	0.412***		0.154***	
	(0.148)		(0.0467)	
Log (Distance to a landlocked trade route up to 1800)		0.309***		0.115***
		(0.108)		(0.0296)
Log (Distance to a lake/river today)	-0.0308	-0.0268	0.0215***	0.0230***
	(0.0527)	(0.0526)	(0.00758)	(0.00723)
Country FE	Yes	Yes	Yes	Yes
Observations	2616	2616	2616	2616
Mean (Dep. Var.)	0.818	0.818	0.884	0.884
SD (Dep. Var.)	1.154	1.154	0.202	0.202

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variable is distance (km) to the nearest contemporary jihad (2010-2019) divided by distance (km) to the nearest historical jihad. Likewise, we calculate the relative distance by taking log for each distance. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1) and (3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (2) and (4). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Cycle of Jihad—Relative Contemporary Jihad Locations to Historical Jihad

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Onset of Africa vs European (1850-)	2.456***						-0.0543		
	(0.745)						(0.100)		
Intensity of Africa vs European (1850-)		2.775***						-0.0899	
		(0.918)						(0.111)	
Duration of Africa vs European (1850-)			0.447***						-0.0297
			(0.157)						(0.0256)
Onset of jihad vs European (1850-)				4.417***			4.471***		
				(1.123)			(1.123)		
Intensity of jihad vs European (1850-)					5.399***			5.487***	
					(1.444)			(1.441)	
Duration of jihad vs European (1850-)						0.687***			0.716***
						(0.213)			(0.216)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.327	0.320	0.275	0.408	0.410	0.301	0.408	0.410	0.301
Adj-R^2	0.325	0.318	0.273	0.407	0.408	0.299	0.406	0.408	0.298
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.818	0.818	0.818	0.818	0.818	0.818	0.818	0.818	0.818
SD (Dep. Var.)	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). The dependent variable is distance (km) to the nearest contemporary jihad (2010-2019) divided by distance (km) to the nearest historical jihad. The definitions of variables as follows: the dummy variable which takes a value of 1 if African entities confronted against Europeans after 1850 in column (1), the logarithm of one plus number of conflicts where African entities confronted against Europeans after 1850 in column (2), the total duration (years) of conflict event where African entities confronted against Europeans after 1850 in column (3), the dummy variable which takes a value of 1 if African entities confronted against Europeans after 1850 in Islamic areas in column (4), the logarithm of one plus number of conflicts where African entities confronted against Europeans after 1850 in Islamic areas in column (5), and the total duration (years) of conflict event where African entities confronted against Europeans after 1850 in Islamic areas in column (6). We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: IV Estimates of Persistent Effects on Religious Ideology of Muslims

(A) Neighbors from different religion: 1 (strongly like) to 5 (strongly dislike)		
	(1)	(2)
Log (Distance to a landlocked trade point (< 100,000))	-0.477***	
	(0.117)	
Log (Distance to a landlocked trade route in 1800)		-0.398***
		(0.0872)
Observations	17427	17427
Mean (Dep. Var.)	2.322	2.322
SD (Dep. Var.)	1.416	1.416
F-stat	32.616	34.927
Round FE	Yes	Yes
(B) Governed by religious law: 1 (strongly disagree) to 5 (stronlgy agree)		
	(1)	(2)
Log (Distance to a landlocked trade point (< 100,000))	-0.445***	
	(0.116)	
Log (Distance to a landlocked trade route in 1800)		-0.342***
		(0.0975)
Observations	9166	9166
Mean (Dep. Var.)	2.611	2.611
SD (Dep. Var.)	1.702	1.702
F-stat	49.731	50.773
Round FE	No	No
(C) Equal opportunities to education: 1 (strongly agree) to 5 (stronlgy disagree)		
	(1)	(2)
Log (Distance to a landlocked trade point (< 100,000))	-0.321***	
	(0.0741)	
Log (Distance to a landlocked trade route in 1800)		-0.245***
		(0.0464)
Observations	9252	9252
Mean (Dep. Var.)	1.637	1.637
SD (Dep. Var.)	0.960	0.960
F-stat	52.063	52.193
Round FE	No	No
Country FE	Yes	Yes
Geographic Controls	Yes	Yes
Individual Controls	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a respondent who is Muslim in countries of West Africa surveyed in Afrobarometer. In panel (A), the dependent variable is the ordered variable which indicates how much a respondent would dislike having people of a different religion as neighbors. This variable is available in round 6 (surveyed between 2014 and 2015) and 7 (surveyed between 2016 and 2018). In panel (B), the dependent variable is the ordered variable which indicates how much a respondent agrees with governance by religious law rather than civil law. This variable is available in round 7. In panel (C), the dependent variable is the ordered variable which indicates how much a respondent disagrees with girls and boys having equal opportunities to get an education. This variable is available in round 7. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (2). Landlocked is defined as the 1000km faraway from the nearest coast point. Geographic controls include the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, and average elevation. Individual controls include age, age squared, female dummy, nine categorical indicators of education, and four categorical indicators of living condition. If a dependent variable is available from multiple rounds of Afrobarometer, we additionally control for round fixed effects. Standard errors clustered at the country levels in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

— Appendix —

Jihad over Centuries

Masahiro Kubo & Shunsuke Tsuda

A Additional Figures and Tables

Figure A.1: Timbuktu

Notes: Salt (top-left), which has been used for various purposes (bottom-left), is still transported by caravan (top-right) even today. The bottom-right picture shows the Djinguereber mosque, which was broken by a jihadist group Ansar Dine in 2012. The top-left picture was taken by Daiki Kobayashi and the other three ones were taken by Shunsuke Tsuda in 2010, before the surge of Islamist insurgencies in Mali.

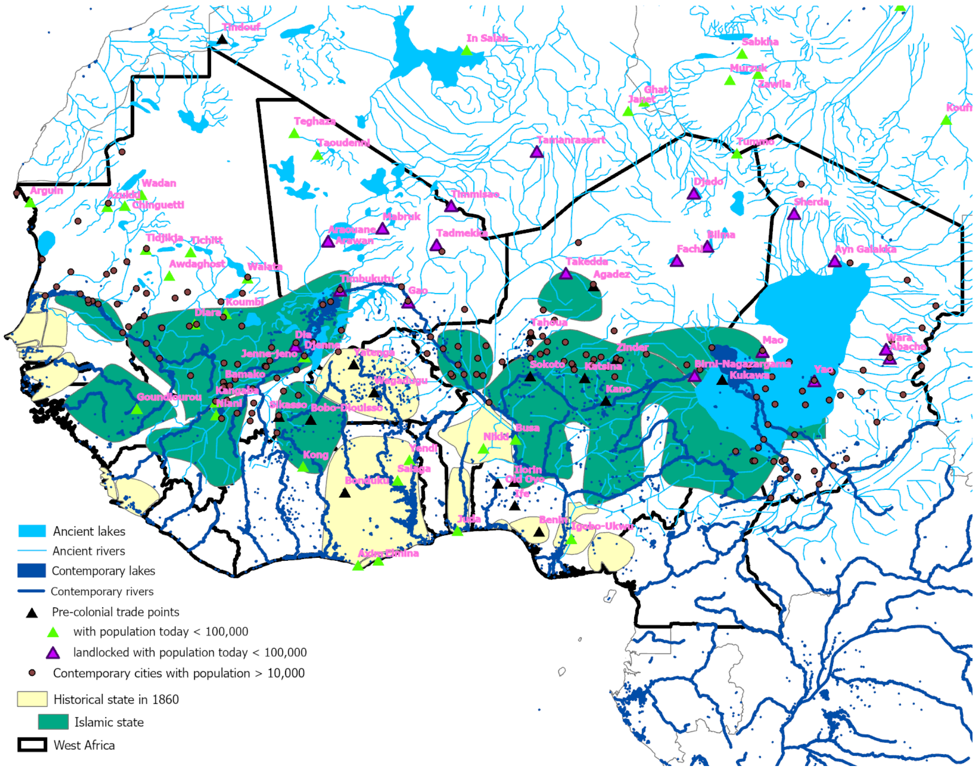

Figure A.2: Contemporary Cities over 10,000 population

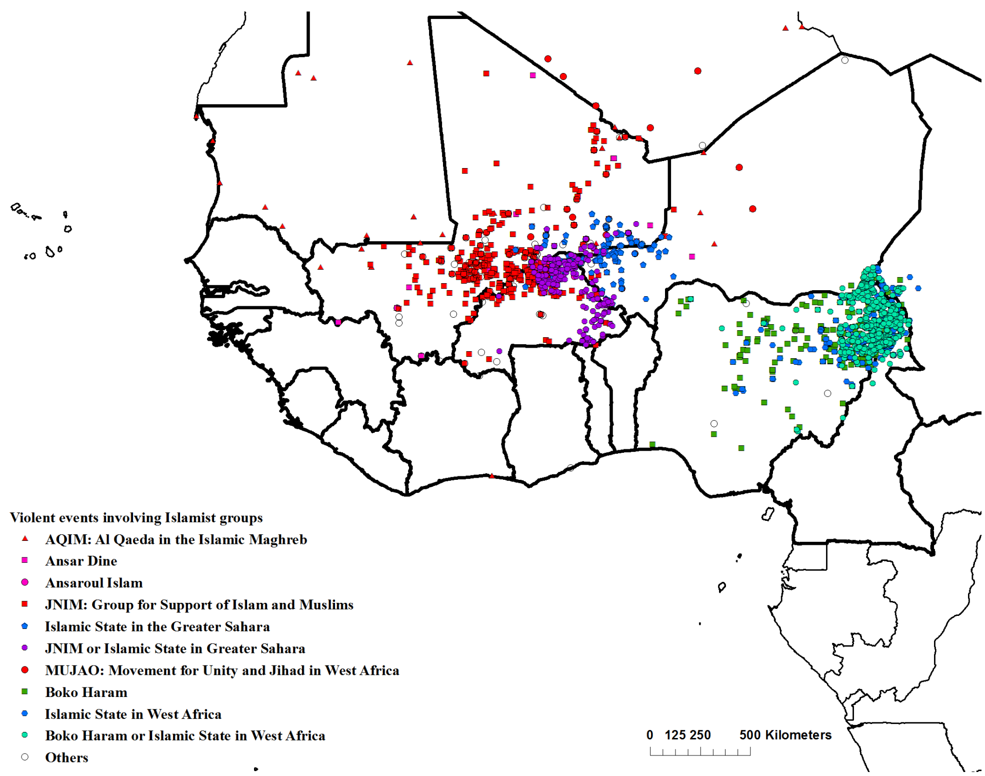

Figure A.3: Violent Islamist Groups in West Africa from 2001 to 2019

Table A.1: Correlations—Contemporary Development and Colonial Activities

(A)	Log(Distance to a city (> 50,000))				
	(1)	(2)	(3)	(4)	(5)
Log (Distance to a pre-colonial trade point)	0.0743*				
	(0.0421)				
Log (Distance to a coast)		0.136***			
		(0.0351)			
Log (Distance to a colonial railway)			0.131***		
			(0.0415)		
Log (Distance to a mission)				0.241***	
				(0.0329)	
Log (Atlantic slave exports in 1800s)					-0.0115
					(0.00723)
R^2	0.731	0.734	0.735	0.743	0.705
Adj-R^2	0.731	0.734	0.734	0.743	0.704
Observations	2616	2616	2616	2616	2489
Mean (Dep. Var.)	4.497	4.497	4.497	4.497	4.497
SD (Dep. Var.)	1.167	1.167	1.167	1.167	1.167
(B)	**Night light luminosity in 2015**				
	(1)	(2)	(3)	(4)	(5)
Log (Distance to a pre-colonial trade point)	-0.300***				
	(0.112)				
Log (Distance to a coast)		-0.963***			
		(0.131)			
Log (Distance to a colonial railway)			-0.591***		
			(0.112)		
Log (Distance to a mission)				-0.955***	
				(0.124)	
Log (Atlantic slave exports in 1800s)					0.0617***
					(0.0226)
R^2	0.530	0.570	0.544	0.567	0.518
Adj-R^2	0.529	0.569	0.542	0.566	0.517
Observations	2616	2616	2616	2616	2489
Mean (Dep. Var.)	1.875	1.875	1.875	1.875	1.875
SD (Dep. Var.)	2.636	2.636	2.636	2.636	2.636
Country FE	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest city whose contemporary population over 50,000, (B) the logarithm of one plus total night light luminosity (VIISR) in 2015. The interest variables are (1) the logarithm of one plus distance (km) to the nearest pre-colonial trade point, (2) the logarithm of one plus distance (km) to the nearest coast point, (3) the logarithm of one plus distance (km) to the nearest colonial railway line, (4) the logarithm of one plus distance (km) to the nearest Christian mission station in late 19th century, (5) the logarithm of one plus the number of Atlantic slave trade exports in 1800s. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Correlations—Contemporary Jihad and Cities

(A)					**Log(Distance)**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	2001-09	2010-19	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a city (> 50,000))	0.182***	0.0716*	0.215***						
	(0.0533)	(0.0410)	(0.0518)						
Log (Distance to a city (> 10,000))				0.263***	0.289***	0.174**			
				(0.0668)	(0.0687)	(0.0677)			
Log (Distance to a city (10,000 - 50,000))							0.152**	0.262***	0.121*
							(0.0646)	(0.0692)	(0.0624)
R^2	0.521	0.356	0.570	0.576	0.310	0.638	0.560	0.298	0.633
Adj-R^2	0.520	0.354	0.569	0.574	0.307	0.636	0.558	0.295	0.631
Observations	2616	2616	2616	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	4.816	5.698	4.932	4.816	5.698	4.932	4.816	5.698	4.932
SD (Dep. Var.)	1.101	0.743	1.157	1.101	0.743	1.157	1.101	0.743	1.157
(B)					**Onset**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	2001-09	2010-19	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a city (> 50,000))	-0.0357***	-0.00813*	-0.0343**						
	(0.0137)	(0.00417)	(0.0136)						
Log (Distance to a city (> 10,000))				-0.0355**	-0.0277***	-0.0234			
				(0.0180)	(0.00877)	(0.0174)			
Log (Distance to a city (10,000 - 50,000))							-0.0120	-0.0197***	-0.00647
							(0.0187)	(0.00764)	(0.0187)
R^2	0.293	0.013	0.305	0.321	0.030	0.338	0.317	0.019	0.336
Adj-R^2	0.291	0.011	0.303	0.318	0.025	0.335	0.314	0.015	0.333
Observations	2616	2616	2616	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	0.133	0.011	0.129	0.133	0.011	0.129	0.133	0.011	0.129
SD (Dep. Var.)	0.339	0.106	0.335	0.339	0.106	0.335	0.339	0.106	0.335
(C)					**Intensity**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	2001-09	2010-19	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a city (> 50,000))	-0.0956**	-0.0102*	-0.0912**						
	(0.0402)	(0.00531)	(0.0401)						
Log (Distance to a city (> 10,000))				-0.0465	-0.0253***	-0.0314			
				(0.0361)	(0.00772)	(0.0357)			
Log (Distance to a city (10,000 - 50,000))							-0.0170	-0.0188***	-0.00736
							(0.0374)	(0.00681)	(0.0371)
R^2	0.250	0.014	0.253	0.302	0.027	0.309	0.300	0.018	0.308
Adj-R^2	0.248	0.011	0.251	0.299	0.023	0.306	0.297	0.013	0.305
Observations	2616	2616	2616	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	0.249	0.011	0.244	0.249	0.011	0.244	0.249	0.011	0.244
SD (Dep. Var.)	0.775	0.109	0.771	0.775	0.109	0.771	0.775	0.109	0.771
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. In column (4)-(9), the observations restrict grid cells in Mauritania, Mali, Niger and Chad. The interest variables are the logarithm of one plus distance (km) to the nearest city whose contemporary population over 50,000 in column (1)-(3), the logarithm of one plus distance (km) to the nearest city whose contemporary population over 10,000 in column (4)-(6), and the logarithm of one plus distance (km) to the nearest city whose contemporary population over 10,000 and less than 50,000 in column (7)-(9). We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: First Stage—Ancient Water Sources and Historical Landlocked Cities

(A)	**Log (Distance to a landlocked trade point (< 100,000))**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.108***	0.108***	0.128***						
	(0.0161)	(0.0162)	(0.0177)						
Log (Distance to an ancient river)				0.0519***	0.0484***	0.0173			
				(0.0160)	(0.0161)	(0.0173)			
Log (Distance to an ancient lake/river)							0.0830***	0.0808***	0.0741***
							(0.0134)	(0.0134)	(0.0151)
Log (Distance to a lake/river today)	-0.0162	-0.0140	0.00787	-0.0131	-0.0120	-0.000681	-0.0148	-0.0136	-0.00516
	(0.0222)	(0.0222)	(0.0190)	(0.0222)	(0.0220)	(0.0209)	(0.0220)	(0.0218)	(0.0199)
F-stat	44.52	44.08	50.81	10.38	8.97	0.98	37.94	35.90	23.59
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
(B)	**Log (Distance to a landlocked trade route up to 1800)**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0898**	0.0879**	0.170***						
	(0.0352)	(0.0354)	(0.0286)						
Log (Distance to an ancient river)				0.0805***	0.0752***	-0.00196			
				(0.0239)	(0.0241)	(0.0241)			
Log (Distance to an ancient lake/river)							0.0858***	0.0814***	0.111***
							(0.0264)	(0.0264)	(0.0254)
Log (Distance to a lake/river today)	-0.0304	-0.0291	0.00791	-0.0305	-0.0301	0.000343	-0.0304	-0.0298	-0.0106
	(0.0412)	(0.0414)	(0.0294)	(0.0424)	(0.0426)	(0.0362)	(0.0420)	(0.0422)	(0.0344)
F-stat	6.41	6.08	34.84	11.18	9.54	0.01	10.42	9.32	18.73
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Colonizer FE	No	Yes	No	No	Yes	No	No	Yes	No
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000, (B) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Placebo First Stage—Ancient Water Sources and Historical Cities

(A)	**Log (Distance to a landlocked trade point (> 100,000))**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0499*	0.0534**	0.0768***						
	(0.0257)	(0.0250)	(0.0218)						
Log (Distance to an ancient river)				0.0122	0.00256	-0.0191			
				(0.0182)	(0.0175)	(0.0154)			
Log (Distance to an ancient lake/river)							0.0776***	0.0725***	0.0616***
							(0.0186)	(0.0179)	(0.0173)
Log (Distance to a lake/river today)	-0.0512	-0.0403	0.00618	-0.0490	-0.0378	0.00555	-0.0532*	-0.0422	-0.00330
	(0.0317)	(0.0313)	(0.0230)	(0.0340)	(0.0335)	(0.0261)	(0.0321)	(0.0317)	(0.0243)
F-stat	3.70	4.50	12.17	0.44	0.02	1.53	17.12	16.07	12.49
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
(B)	**Log (Distance to a coastal trade point (< 100,000))**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	-0.0387	-0.0424*	-0.00604						
	(0.0241)	(0.0241)	(0.0223)						
Log (Distance to an ancient river)				0.0485*	0.0388	0.0359*			
				(0.0257)	(0.0255)	(0.0190)			
Log (Distance to an ancient lake/river)							-0.0260	-0.0354	0.00449
							(0.0236)	(0.0231)	(0.0174)
Log (Distance to a lake/river today)	-0.0500	-0.0473	-0.0457*	-0.0559*	-0.0522*	-0.0510**	-0.0507	-0.0472	-0.0459*
	(0.0312)	(0.0307)	(0.0244)	(0.0314)	(0.0310)	(0.0248)	(0.0316)	(0.0310)	(0.0245)
F-stat	2.55	3.06	0.07	3.50	2.28	3.51	1.19	2.31	0.07
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
(C)	**Log (Distance to a coastal trade route up to 1800)**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0559**	0.0528**	0.0685***						
	(0.0236)	(0.0231)	(0.0237)						
Log (Distance to an ancient river)				0.101***	0.0858***	0.0128			
				(0.0285)	(0.0274)	(0.0228)			
Log (Distance to an ancient lake/river)							0.0917***	0.0793***	0.0648***
							(0.0254)	(0.0245)	(0.0237)
Log (Distance to a lake/river today)	0.0150	0.0221	0.0392	0.0113	0.0186	0.0341	0.0125	0.0198	0.0298
	(0.0310)	(0.0305)	(0.0279)	(0.0315)	(0.0310)	(0.0298)	(0.0308)	(0.0304)	(0.0287)
F-stat	5.51	5.13	8.18	12.45	9.63	0.31	12.82	10.28	7.35
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616
Colonizer FE	No	Yes	No	No	Yes	No	No	Yes	No
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is more than 100,000, (B) the logarithm of one plus distance (km) to the nearest pre-colonial coastal (non-landlocked) trade point whose contemporary population is less than 100,000, (C) the logarithm of one plus distance (km) to the nearest pre-colonial coastal (non-landlocked) trade route up to 1800. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: IV Estimates of Persistent Effects on Night Light Luminosity

(A)			**DMSP**			
	(1)	(2)	(3)	(4)	(5)	(6)
	2005	2010	2013	2005	2010	2013
Log (Distance to a landlocked trade point (< 100,000))	0.593*	0.559*	0.704**			
	(0.317)	(0.334)	(0.348)			
Log (Distance to a landlocked trade route up to 1800)				0.445*	0.419*	0.528**
				(0.246)	(0.248)	(0.259)
Log (Distance to a lake/river today)	-0.503***	-0.561***	-0.556***	-0.497***	-0.556***	-0.550***
	(0.0669)	(0.0696)	(0.0655)	(0.0666)	(0.0695)	(0.0662)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	1.763	2.332	2.300	1.763	2.332	2.300
SD (Dep. Var.)	2.749	3.192	3.140	2.749	3.192	3.140
(B)			**VIIRS**			
	(1)	(2)	(3)	(4)	(5)	(6)
	2013	2015	2019	2013	2015	2019
Log (Distance to a landlocked trade point (< 100,000))	0.975***	1.102***	0.857**			
	(0.350)	(0.377)	(0.343)			
Log (Distance to a landlocked trade route up to 1800)				0.731***	0.826***	0.643***
				(0.252)	(0.265)	(0.246)
Log (Distance to a lake/river today)	-0.402***	-0.473***	-0.515***	-0.393***	-0.463***	-0.506***
	(0.0605)	(0.0664)	(0.0670)	(0.0598)	(0.0632)	(0.0642)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	1.751	1.875	2.057	1.751	1.875	2.057
SD (Dep. Var.)	2.565	2.636	2.783	2.565	2.636	2.783
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus total luminosity from DMSP in 2005, 2010 and 2013, (B) logarithm of one plus total luminosity from VIIRS in 2013, 2015 and 2019. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variable are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: First Stage within Countries with the Sahara

(A)	**Log (Distance to a landlocked trade point ($<$ 100,000))**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0664***	0.0664***	0.0876***						
	(0.0177)	(0.0177)	(0.0211)						
Log (Distance to an ancient river)				-0.0271	-0.0271	-0.0371*			
				(0.0211)	(0.0211)	(0.0217)			
Log (Distance to an ancient lake/river)							0.0182	0.0182	0.0178
							(0.0181)	(0.0181)	(0.0192)
Log (Distance to a lake/river today)	-0.0364	-0.0364	-0.0110	-0.0365	-0.0365	-0.0197	-0.0430	-0.0430	-0.0282
	(0.0393)	(0.0393)	(0.0351)	(0.0405)	(0.0405)	(0.0370)	(0.0400)	(0.0400)	(0.0363)
F-stat	13.70	13.70	16.82	1.62	1.62	2.87	1.00	1.00	0.84
Observations	1616	1616	1616	1616	1616	1616	1616	1616	1616
(B)	**Log (Distance to a landlocked trade route up to 1800)**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	-0.0164	-0.0164	0.119***						
	(0.0371)	(0.0371)	(0.0303)						
Log (Distance to an ancient river)				0.00164	0.00164	-0.0636**			
				(0.0368)	(0.0368)	(0.0312)			
Log (Distance to an ancient lake/river)							-0.0572	-0.0572	0.0466
							(0.0364)	(0.0364)	(0.0291)
Log (Distance to a lake/river today)	-0.0982	-0.0982	-0.0164	-0.0972	-0.0972	-0.0256	-0.0929	-0.0929	-0.0408
	(0.0874)	(0.0874)	(0.0607)	(0.0870)	(0.0870)	(0.0674)	(0.0877)	(0.0877)	(0.0681)
F-stat	0.19	0.19	15.24	0.00	0.00	4.08	2.42	2.42	2.52
Observations	1616	1616	1616	1616	1616	1616	1616	1616	1616
Colonizer FE	No	Yes	No	No	Yes	No	No	Yes	No
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). The observations restrict grid cells in Mauritania, Mali, Niger and Chad. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000, (B) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: IV Estimates of Persistent Effects on Jihad within Countries with the Sahara

(A)			**Log(Distance)**			
	(1)	(2)	(3)	(4)	(5)	(6)
	2010-19	2010-15	2016-19	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point (< 100,000))	0.575*	0.978**	0.600*			
	(0.337)	(0.388)	(0.326)			
Log (Distance to a landlocked trade route up to 1800)				0.421**	0.717***	0.440**
				(0.202)	(0.210)	(0.194)
Log (Distance to a lake/river today)	0.217***	0.128*	0.277***	0.217***	0.129***	0.278***
	(0.0632)	(0.0722)	(0.0573)	(0.0497)	(0.0488)	(0.0441)
Observations	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	5.038	5.270	5.333	5.038	5.270	5.333
SD (Dep. Var.)	1.114	0.961	1.157	1.114	0.961	1.157
(B)			**Onset**			
	(1)	(2)	(3)	(4)	(5)	(6)
	2010-19	2010-15	2016-19	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point (< 100,000))	-0.139*	-0.188**	-0.137			
	(0.0841)	(0.0790)	(0.0842)			
Log (Distance to a landlocked trade route up to 1800)				-0.102*	-0.138**	-0.101
				(0.0610)	(0.0568)	(0.0619)
Log (Distance to a lake/river today)	-0.0791***	-0.0643***	-0.0895***	-0.0792***	-0.0645***	-0.0896***
	(0.0176)	(0.0194)	(0.0171)	(0.0155)	(0.0158)	(0.0150)
Observations	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	0.110	0.051	0.095	0.110	0.051	0.095
SD (Dep. Var.)	0.312	0.220	0.293	0.312	0.220	0.293
(C)			**Intensity**			
	(1)	(2)	(3)	(4)	(5)	(6)
	2010-19	2010-15	2016-19	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point (< 100,000))	-0.458**	-0.301**	-0.392*			
	(0.224)	(0.131)	(0.206)			
Log (Distance to a landlocked trade route up to 1800)				-0.336**	-0.221**	-0.287*
				(0.164)	(0.0934)	(0.153)
Log (Distance to a lake/river today)	-0.200***	-0.0888***	-0.184***	-0.201***	-0.0891***	-0.185***
	(0.0482)	(0.0284)	(0.0436)	(0.0403)	(0.0233)	(0.0373)
Observations	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	0.186	0.070	0.154	0.186	0.070	0.154
SD (Dep. Var.)	0.619	0.355	0.551	0.619	0.355	0.551
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). Landlocked is defined as the 1000km faraway from the nearest coast point. We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: First Stage for Pre-colonial Cities with Less Than 50,000 population

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.105***	0.106***	0.128***						
	(0.0170)	(0.0170)	(0.0186)						
Log (Distance to an ancient river)				0.0536***	0.0498***	0.0175			
				(0.0155)	(0.0155)	(0.0166)			
Log (Distance to an ancient lake/river)							0.0829***	0.0806***	0.0744***
							(0.0141)	(0.0141)	(0.0154)
Log (Distance to a lake/river today)	-0.0703***	-0.0671***	-0.0422**	-0.0675***	-0.0654***	-0.0508**	-0.0692***	-0.0668***	-0.0552***
	(0.0199)	(0.0200)	(0.0181)	(0.0208)	(0.0207)	(0.0204)	(0.0201)	(0.0200)	(0.0192)
Colonizer FE	No	Yes	No	No	Yes	No	No	Yes	No
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
F-stat	37.97	38.44	46.86	11.77	10.14	1.08	34.09	32.32	23.09
Observations	2616	2616	2616	2616	2616	2616	2616	2616	2616

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variable is the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 50,000 Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: IV Estimates of Pre-colonial Cities with Less Than 50,000 Population on Jihad

(A)		**Log(Distance)**	
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 50,000))	1.300***	1.415***	1.487***
	(0.289)	(0.277)	(0.310)
Observations	2616	2616	2616
Mean (Dep. Var.)	4.932	5.211	5.264
SD (Dep. Var.)	1.157	1.021	1.180
(B)		**Onset**	
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 50,000))	-0.326***	-0.339***	-0.312***
	(0.0786)	(0.0749)	(0.0850)
Observations	2616	2616	2616
Mean (Dep. Var.)	0.129	0.071	0.100
SD (Dep. Var.)	0.335	0.258	0.301
(C)		**Intensity**	
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 50,000))	-1.229***	-0.888***	-1.037***
	(0.351)	(0.266)	(0.330)
Observations	2616	2616	2616
Mean (Dep. Var.)	0.244	0.118	0.188
SD (Dep. Var.)	0.771	0.520	0.668
Country FE	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. In all the columns, the interest variable is the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 50,000. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.10: First Stage for Pre-colonial Cities with Less Than 50,000 population within Countries with the Sahara

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Distance to an ancient lake)	0.0618***	0.0618***	0.0873***						
	(0.0189)	(0.0189)	(0.0220)						
Log (Distance to an ancient river)				-0.0105	-0.0105	-0.0208			
				(0.0208)	(0.0208)	(0.0212)			
Log (Distance to an ancient lake/river)							0.0267	0.0267	0.0306
							(0.0187)	(0.0187)	(0.0190)
Log (Distance to a lake/river today)	-0.135***	-0.135***	-0.106***	-0.138***	-0.138***	-0.118***	-0.142***	-0.142***	-0.123***
	(0.0334)	(0.0334)	(0.0329)	(0.0356)	(0.0356)	(0.0351)	(0.0345)	(0.0345)	(0.0339)
Colonizer FE	No	Yes	No	No	Yes	No	No	Yes	No
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
F-stat	10.46	10.46	15.44	0.25	0.25	0.94	1.99	1.99	2.52
Observations	1616	1616	1616	1616	1616	1616	1616	1616	1616

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). The observations restrict grid cells in Mauritania, Mali, Niger and Chad. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variable is the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 50,000. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: IV Estimates of Pre-colonial Cities with Less Than 50,000 population on Jihad within Countries with the Sahara

(A)		**Log(Distance)**	
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 50,000))	0.577*	0.981**	0.603*
	(0.345)	(0.404)	(0.335)
Observations	1616	1616	1616
Mean (Dep. Var.)	5.038	5.270	5.333
SD (Dep. Var.)	1.114	0.961	1.157
(B)		**Onset**	
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 50,000))	-0.140*	-0.189**	-0.138
	(0.0847)	(0.0781)	(0.0851)
Observations	1616	1616	1616
Mean (Dep. Var.)	0.110	0.051	0.095
SD (Dep. Var.)	0.312	0.220	0.293
(C)		**Intensity**	
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 50,000))	-0.460**	-0.303**	-0.393*
	(0.223)	(0.130)	(0.205)
Observations	1616	1616	1616
Mean (Dep. Var.)	0.186	0.070	0.154
SD (Dep. Var.)	0.619	0.355	0.551
Country FE	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The observations restrict grid cells in Mauritania, Mali, Niger and Chad. The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. In all the columns, the interest variable is the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 50,000. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for the logarithm of distance (km) to the nearest water sources today, landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.12: Ancient Water Sources (the 2nd measure) and Historical Landlocked Cities

(A) Log (Distance to a landlocked trade point (< 100,000))			
	(1)	(2)	(3)
Log (Ancient Water Access)	-0.0892***	-0.0869***	-0.144***
	(0.0192)	(0.0188)	(0.0221)
Log (Distance to a lake/river today)	0.00558	0.00402	0.0259
	(0.0232)	(0.0230)	(0.0193)
R^2	0.649	0.651	0.722
Adj-R^2	0.648	0.650	0.721
Observations	2616	2616	2616
Mean (Dep. Var.)	5.951	5.951	5.951
SD (Dep. Var.)	0.840	0.840	0.840
(B) Log (Distance to a landlocked trade route up to 1800)			
	(1)	(2)	(3)
Log (Ancient Water Access)	-0.00173	0.00216	-0.193***
	(0.0445)	(0.0444)	(0.0398)
Log (Distance to a lake/river today)	-0.0194	-0.0209	0.0216
	(0.0383)	(0.0383)	(0.0271)
R^2	0.520	0.523	0.696
Adj-R^2	0.518	0.522	0.696
Observations	2616	2616	2616
Mean (Dep. Var.)	5.587	5.587	5.587
SD (Dep. Var.)	1.175	1.175	1.175
Colonizer FE	No	Yes	No
Country FE	No	No	Yes
Geographic Controls	Yes	Yes	Yes

Notes: All regressions are estimated using OLS. The unit of observation is a grid cell (about 55km × 55km). All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. The dependent variables are (A) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000, (B) the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800. Landlocked is defined as the 1000km faraway from the nearest coast point. We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, and ruggedness in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.13: IV Estimates of Persistent Effects on Jihad (with the 2nd IV measure)

(A)	Log(Distance)					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point (< 100,000))	1.609***	0.726***	1.833***			
	(0.330)	(0.217)	(0.355)			
Log (Distance to a landlocked trade route up to 1800)				1.193***	0.538***	1.358***
				(0.210)	(0.117)	(0.242)
Log (Distance to a lake/river today)	0.138***	0.0198	0.129***	0.142***	0.0212	0.132***
	(0.0430)	(0.0319)	(0.0443)	(0.0363)	(0.0301)	(0.0371)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	4.816	5.698	4.932	4.816	5.698	4.932
SD (Dep. Var.)	1.101	0.743	1.157	1.101	0.743	1.157
(B)	**Onset**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point (< 100,000))	-0.395***	-0.0142	-0.400***			
	(0.0942)	(0.0144)	(0.0945)			
Log (Distance to a landlocked trade route up to 1800)				-0.293***	-0.0105	-0.297***
				(0.0639)	(0.00984)	(0.0641)
Log (Distance to a lake/river today)	-0.0403***	0.00346	-0.0438***	-0.0411***	0.00343	-0.0446***
	(0.0123)	(0.00315)	(0.0122)	(0.0112)	(0.00318)	(0.0111)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.133	0.011	0.129	0.133	0.011	0.129
SD (Dep. Var.)	0.339	0.106	0.335	0.339	0.106	0.335
(C)	**Intensity**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point (< 100,000))	-1.565***	-0.0324	-1.569***			
	(0.447)	(0.0250)	(0.448)			
Log (Distance to a landlocked trade route up to 1800)				-1.160***	-0.0240	-1.163***
				(0.285)	(0.0175)	(0.285)
Log (Distance to a lake/river today)	-0.0907**	0.00354	-0.0946**	-0.0937***	0.00348	-0.0976***
	(0.0392)	(0.00337)	(0.0392)	(0.0348)	(0.00346)	(0.0347)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.249	0.011	0.244	0.249	0.011	0.244
SD (Dep. Var.)	0.775	0.109	0.771	0.775	0.109	0.771
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of the Ancient Water Access as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.14: Robustness to Spatial-Autocorrelation

(A)	**Log(Distance)**		
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	1.306	1.421	1.493
200km cutoff	[0.466]***	[0.415]***	[0.515]***
300km cutoff	[0.525]**	[0.445]***	[0.595]**
400km cutoff	[0.520]**	[0.420]***	[0.598]**
500km cutoff	[0.498]***	[0.388]***	[0.573]***
1000km cutoff	[0.588]**	[0.427]***	[0.666]**
Observations	2616	2616	2616
Mean (Dep. Var.)	4.932	5.211	5.264
SD (Dep. Var.)	1.157	1.021	1.180
(B)	**Onset**		
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.327	-0.340	-0.314
200km cutoff	[0.125]***	[0.121]***	[0.142]**
300km cutoff	[0.134]**	[0.132]**	[0.155]**
400km cutoff	[0.122]***	[0.121]***	[0.140]**
500km cutoff	[0.102]***	[0.102]***	[0.116]***
1000km cutoff	[0.108]***	[0.0927]***	[0.121]***
Observations	2616	2616	2616
Mean (Dep. Var.)	0.129	0.071	0.100
SD (Dep. Var.)	0.335	0.258	0.301
(C)	**Intensity**		
	(1)	(2)	(3)
	2010-19	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-1.234	-0.892	-1.042
200km cutoff	[0.576]**	[0.425]**	[0.540]*
300km cutoff	[0.613]**	[0.449]**	[0.570]*
400km cutoff	[0.558]**	[0.419]**	[0.510]**
500km cutoff	[0.474]***	[0.364]**	[0.429]**
1000km cutoff	[0.474]***	[0.339]***	[0.425]**
Observations	2616	2616	2616
Mean (Dep. Var.)	0.244	0.118	0.188
SD (Dep. Var.)	0.771	0.520	0.668
Country FE	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of the Ancient Water Access as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoffs in brackets.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.15: IV Estimates of Persistent Effects on Jihad (UCDP)

(A)	Log(Distance)					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point ($<$ 100,000))	1.322***	1.112***	1.473***			
	(0.270)	(0.214)	(0.280)			
Log (Distance to a landlocked trade route up to 1800)				0.992***	0.834***	1.105***
				(0.175)	(0.138)	(0.184)
Log (Distance to a lake/river today)	0.159***	0.0685**	0.155***	0.162***	0.0706**	0.158***
	(0.0396)	(0.0275)	(0.0412)	(0.0341)	(0.0291)	(0.0343)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	4.959	5.866	5.070	4.959	5.866	5.070
SD (Dep. Var.)	1.099	0.779	1.169	1.099	0.779	1.169
(B)	**Onset**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.363***	-0.0840**	-0.374***			
	(0.0808)	(0.0406)	(0.0814)			
Log (Distance to a landlocked trade route up to 1800)				-0.273***	-0.0631**	-0.281***
				(0.0588)	(0.0300)	(0.0591)
Log (Distance to a lake/river today)	-0.0463***	-0.000444	-0.0468***	-0.0470***	-0.000607	-0.0476***
	(0.0120)	(0.00362)	(0.0121)	(0.0107)	(0.00407)	(0.0108)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.123	0.015	0.120	0.123	0.015	0.120
SD (Dep. Var.)	0.328	0.123	0.325	0.328	0.123	0.325
(C)	**Intensity**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-1.248***	-0.0827**	-1.250***			
	(0.354)	(0.0402)	(0.355)			
Log (Distance to a landlocked trade route up to 1800)				-0.937***	-0.0621**	-0.938***
				(0.236)	(0.0295)	(0.236)
Log (Distance to a lake/river today)	-0.0747**	-0.00109	-0.0746**	-0.0771**	-0.00125	-0.0770**
	(0.0368)	(0.00358)	(0.0368)	(0.0319)	(0.00405)	(0.0318)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.217	0.013	0.214	0.217	0.013	0.214
SD (Dep. Var.)	0.712	0.112	0.708	0.712	0.112	0.708
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). In this table, the jihadistic events data comes from Uppsala Conflict Data Program (UCDP) in 2001-2019. The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.16: IV Estimates of Persistent Effects on Non-Jihad within Countries with the Sahara

(A)	**Log(Distance)**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point (< 100,000))	-0.259	-0.867***	0.00606			
	(0.275)	(0.309)	(0.248)			
Log (Distance to a landlocked trade route up to 1800)				-0.190	-0.636**	0.00444
				(0.203)	(0.260)	(0.182)
Log (Distance to a lake/river today)	0.138***	0.0857	0.201***	0.138***	0.0848	0.201***
	(0.0500)	(0.0619)	(0.0447)	(0.0500)	(0.0575)	(0.0447)
Observations	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	4.433	5.047	4.576	4.433	5.047	4.576
SD (Dep. Var.)	0.930	0.934	0.892	0.930	0.934	0.892
(B)	**Onset**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point (< 100,000))	0.0185	0.132*	-0.0732			
	(0.0947)	(0.0711)	(0.0826)			
Log (Distance to a landlocked trade route up to 1800)				0.0136	0.0967*	-0.0537
				(0.0691)	(0.0547)	(0.0640)
Log (Distance to a lake/river today)	-0.0397*	0.0168	-0.0613***	-0.0397*	0.0169	-0.0614***
	(0.0217)	(0.0142)	(0.0190)	(0.0217)	(0.0143)	(0.0198)
Observations	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	0.166	0.063	0.130	0.166	0.063	0.130
SD (Dep. Var.)	0.372	0.242	0.336	0.372	0.242	0.336
(C)	**Intensity**					
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2001-09	2010-19	All	2001-09	2010-19
Log (Distance to a landlocked trade point (< 100,000))	0.137	0.201	-0.0391			
	(0.193)	(0.126)	(0.153)			
Log (Distance to a landlocked trade route up to 1800)				0.100	0.148	-0.0287
				(0.140)	(0.0967)	(0.114)
Log (Distance to a lake/river today)	-0.0953**	0.0368	-0.133***	-0.0951**	0.0370	-0.133***
	(0.0462)	(0.0234)	(0.0393)	(0.0457)	(0.0235)	(0.0396)
Observations	1616	1616	1616	1616	1616	1616
Mean (Dep. Var.)	0.256	0.085	0.194	0.256	0.085	0.194
SD (Dep. Var.)	0.676	0.383	0.590	0.676	0.383	0.590
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The observations restrict grid cells in Mauritania, Mali, Niger and Chad. The dependent variables are (A) logarithm of one plus distance (km) to the nearest non-jihadist event during a period given in each column, (B) dummy variables which take a value of 1 if non-jihadist event occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of non-jihadist events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

B Construction of Historical States

Cultures of West Africa creates the maps that show spatial locations of historical states before colonization as well as modern countries after independence by using multiple sources of references. They provide maps about state landscapes from 0 AD to 1980 AD. We digitized maps for historical states from 1330 AD to 1914 AD just after colonization conquest, using Arc GIS. Figure B.1 and Figure B.2 shows our digitized maps.

To identify which states consist of Muslims predominantly, we rely on Kasule (1998) (p.58) and Ruthven et al. (2004) (p.74-75) that show the extent of Islam circa 1800 AD and locations of states. However, Mossi state and Kong state extended out of Islamic extent. Hence, we rely on additional resources to judge if they were Islamic states. According to Azarya (1980) (p.425), since Kong state was ruled by Muslim, we judge it as the Islamic state. On the other hand, according to Skinner (1958) (p. 1102), since Mossi state was pagan until European conquests, it was not the Islamic state.

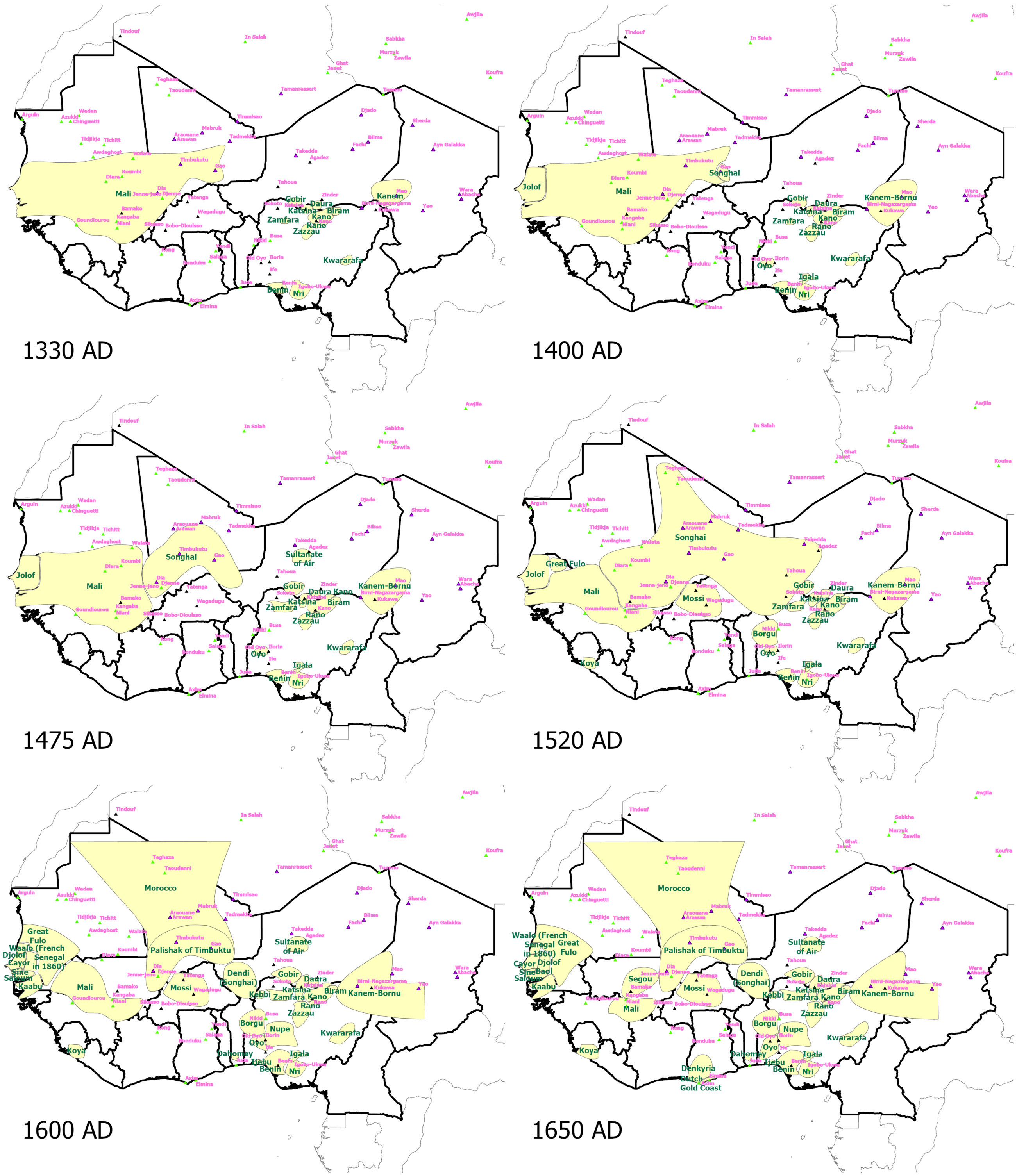

Figure B.1: Historical States over the Centuries

Notes: These maps show the evolution of historical states from 1330 AD to 1650 AD. Yellow regions indicate historical states. We digitize the maps from Cultures of West Africa. The purple triangles indicate pre-colonial inland trade points with less than 100,000 population today, the yellow green triangles indicate pre-colonial coastal trade points with less than 100,000 population today, and the black triangles indicate the other pre-colonial trade points.

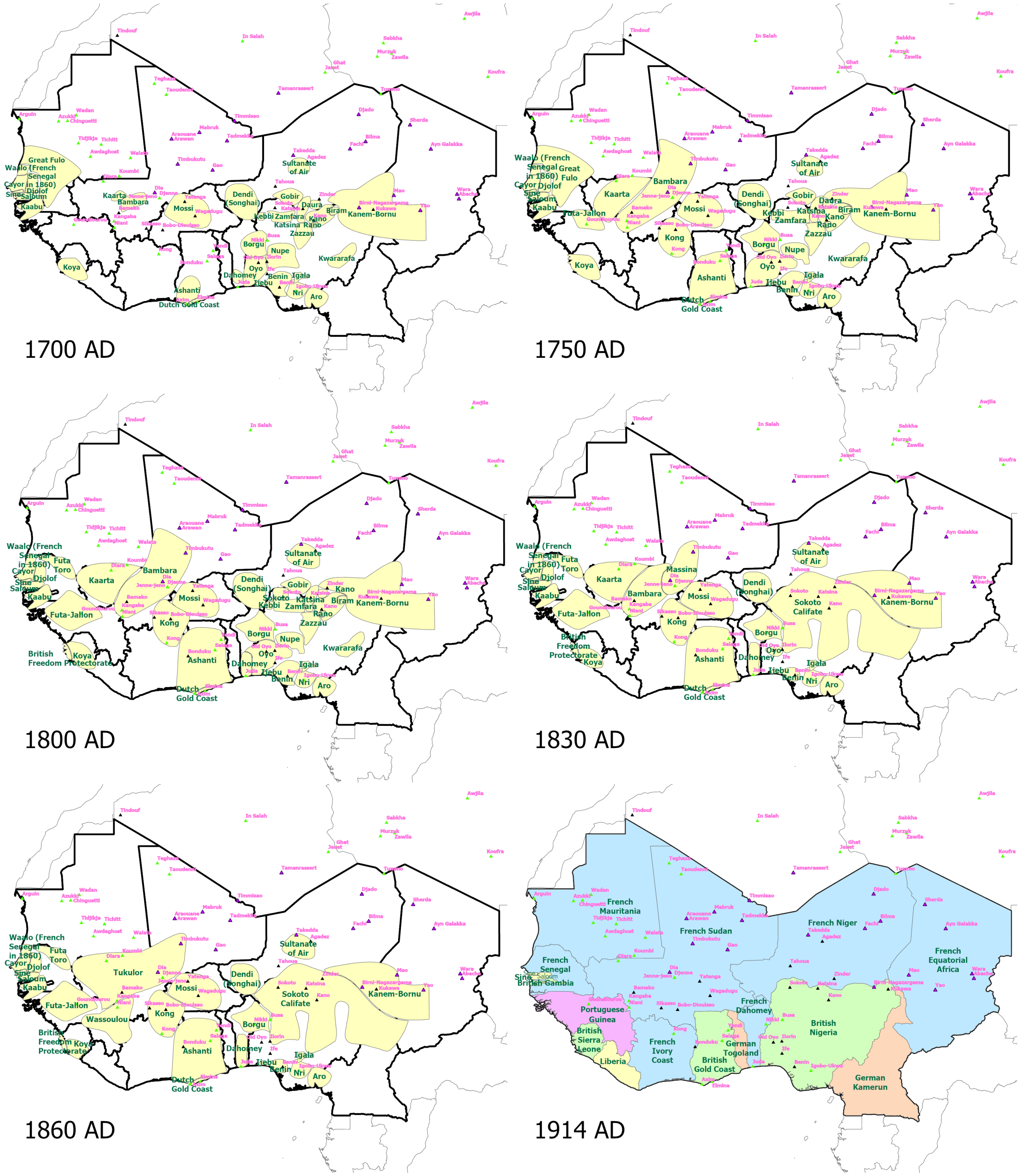

Figure B.2: Historical States over the Centuries (cont'd)

Notes: These maps show the evolution of historical states from 1700 AD to 1914 AD. Yellow regions indicate historical states before 1860 AD. In 1914 AD, the light blue regions indicate the French territory, the light green regions indicate British territory, the light purple region indicates Portuguese territory, the light orange regions indicate German territory, and the yellow regions indicate independent states. We digitize the maps from Cultures of West Africa. The purple triangles indicate pre-colonial inland trade points with less than 100,000 population today, the yellow green triangles indicate pre-colonial coastal trade points with less than 100,000 population today, and the black triangles indicate the other pre-colonial trade points.

C Additional Data Sources and Variables

Pre-Colonial Variables

Cities in 1400. Indicator for whether a city with a population larger than 200,000 in 1400 was in a given area. Source: Chandler (1987).
Population in 800. We use the History Database of the Global Environment (HYDE, version 3.1) constructed by Klein Goldewijk et al. (2010).
Historical Islamic states. The indicator which takes a value of one if a grid cell locates in historical Islamic states (given by Appendix B), otherwise takes a value of 0. If a grid cell strands in both Islamic states and Non-Islamic states, we assign the state information with larger size in a grid cell.
Jurisdictional hierarchy. We use "Jurisdictional Hierarchy beyond the Local Community" (v33) in *Ethnographic Atlas*. This is an ordered variable which indicates 1. "No political authority beyond local community (e.g., autonomous bands and villages)," 2. "One level (e.g., petty chiefdoms)," 3."Two levels (e.g., larger chiefdoms)," 4."Three levels (e.g., states)," and 5."Four levels (e.g., large states)."
Polygamy. We use "Marital composition: monogamy and polygamy" (v9) in *Ethnographic Atlas*. This is an categorical variable which indicates 1. "Monogamous," 2. "Polygynous, with polygyny occasional or limited," 3."Polygynous, with polygyny common and preferentially sororal, and co-wives not reported to occupy separate quarters," 4."Polygynous, with polygyny common and preferentially sororal, and co-wives typically occupying separate quarters," 5."Polygynous, with polygyny general and not reported to be preferentially sororal, and co-wives typically occupying separate quarters," 6. "Polygynous, with polygyny general and not reported to be preferentially sororal, and co-wives not reported to occupy separate quarters," and 7."Polyandrous." For our analyses, we use an indicator variable which takes a value of 0 if the categorical variable takes a value of either 0 or 7, otherwise takes a value of 1.
Irrigation. We use "Agriculture: intensity" (v28) in *Ethnographic Atlas*. This is an ordered variables which indicates 1. "Complete absence of agriculture," 2. "Casual agriculture, i.e., the slight or sporadic cultivation of food or other plants incidental to a primary dependence upon other subsistence practices," 3."Extensive or shifting cultivation, as where new fields are cleared annually, cultivated for a year or two, and then allowed to revert to forest or brush for a long fallow period," 4."Horticulture, i.e., semi-intensive agriculture limited mainly to vegetable gardens or groves of fruit trees rather than the cultivation of field crops," 5."Intensive agriculture on permanent fields, utilizing fertilization by compost or animal manure, crop rotation, or other techniques so that fallowing is either unnecessary or is confined to relatively short periods," and 6."Intensive cultivation where it is largely dependent upon irrigation." For our analyses, we use an indicator variable which takes a value of 1 if the ordered variable takes a value of 6, otherwise takes a value of 0.
Class stratification. We use "Class differentiation: primary" (v66) in *Ethnographic Atlas*. This is an categorical variable which indicates 1. "Absence of significant class distinctions among freemen (slavery is treated in EA070), ignoring variations in individual repute achieved through skill, valor, piety, or wisdom," 2. "Wealth distinctions, based on the possession or distribution of property, present and socially important but not crystallized into distinct and hereditary social classes," 3."Elite stratification, in which an elite class derives its superior status from, and perpetuates it through, control over scarce resources, particularly land, and is thereby differentiated from a property-less proletariat or serf class," 4."Dual stratification into a hereditary

aristocracy and a lower class of ordinary commoners or freemen, where traditionally ascribed noble status is at least as decisive as control over scarce resources," and 5."Complex stratification into social classes correlated in large measure with extensive differentiation of occupational statuses." For our analyses, we use an ordered variable which takes a value of 0 if the categorical variable takes a value of 1, and takes a value of 1 if the categorical variable takes a value of 1otherwise takes a value of either 2 or 3, otherwise takes a value of 2.

Local headman. We use "Political succession" (v72) in *Ethnographic Atlas*. This is an categorical variable which indicates 1. "Patrilineal heir," 2. "Matrilineal heir," 3."Nonhereditary succession through appointment by some higher authority," 4."Nonhereditary succession on the basis primarily of seniority or age," 5."Nonhereditary succession through influence, e.g., of wealth or social status," 6."Nonhereditary succession through election or some other mode of formal consensus," 7."Nonhereditary succession through informal consensus," and 8."Absence of any office resembling that of a local headman." For our analyses, we use an indicator variable which takes a value of 1 if the categorical variable takes a value of either 6 or 7, otherwise takes a value of 0.

Colonial Variables

Atlantic slave exports. The logarithm of one plus the number of the Atlantic slave trade exports at ethnic homeland in the 1800s. Source: Nunn (2008).

Distance to a mission station. The logarithm of one plus distance (km) to the nearest mission station from a centroid of each grid cell. Source: Nunn (2010).

Distance to a colonial railway. The logarithm of one plus distance (km) to the nearest colonial railway from a centroid of each grid cell. Source: Nunn and Wantchekon (2011).

Geographical Variables

Distance to water sources today. The minimum distance to either river or lakes from a unit of analysis. The source of river centerlines come from Natural Earth. "Rivers + lake centerlines" version4.1.0. and lakes from HydroLAKES.

Elevation. Mean elevation within a given area in kilometers. Source: Four Tiles: "GT30W020N40," "GT30E020N40," "GT30W020S10," and "GT30E020S10" from GTOPO30.

Agricultural suitability. Mean land quality for agriculture within a given area. Source: Michalopoulos (2012).

Caloric suitability. The average caloric suitability (1000 Cal) within the unit of analysis. Source: Galor and Özak (2015), Galor and Özak (2016) and Galor et al. (2017).

Ecological diversity. Ecological diversity constructed by Fenske (2014).

Temperature. The average temperature within the unit of analysis for the period 2001-2017, calculated based on Terrestrial Air Temperature: 1900-2017 Gridded Monthly Time Series (V 5.01) from Matsuura and Willmott (2018).

Precipitation. The average precipitation within the unit of analysis for the period 2001-2017, calculated based on Terrestrial Precipitation: 1900-2017 Gridded Monthly Time Series (V 5.01) from Matsuura and Willmott (2018).

Malaria suitability. Mean malaria suitability index within a given area. Source: Sachs et al. (2004)

Distance to the coast. The logarithm of one plus distance (km) to the nearest coastal point from a centroid of each grid cell. Source: Natural Earth. "Coastline" version 4.1.0.
Ruggedness. Index of terrain ruggedness as constructed by Nunn and Puga (2012) for cells at 30 arc-second resolution. The variable used in the analysis is the average value of the index within the unit of analysis.

Contemporary Variables

Ethnologue. World Language Mapping System (WLMS) Database maps the location of ethnic groups' homelands. It maps the traditional homelands which correspond to the ones covered by the 15th edition of Ethnologue (2005). However, the WLMS does not map in the following: populations away from their homelands (e.g., in cities, refugee populations, etc.), immigrant languages, ethnic groups of unknown location, widespread ethnicities (i.e., groups whose boundaries are essentially identical to a countries boundary) and extinct languages. We match between Ethnologue and WRD based on the unique Ethnologue identifier for each ethnic group within a country.[30]
Muslims in 2005. World Religion Database (WRD) provides us with fractions of Muslims at ethnic group level within a country in 2005.
Population. WorldPop datasets provide approximately 100m$\times$100m cell-level estimated population density (Tatem 2017). See Stevens et al. (2015) and Lloyd et al. (2019) for the technical detail for constructing this dataset. From this raw data, we construct approximately 1km$\times$1km cell-level estimated population density in the both countries.
Alternative conflict events data. Additional data on conflict comes from Uppsala Conflict Data Program Georeferenced Event Dataset Version 21.1 (UCDP GED) (Croicu and Sundberg 2013; Pettersson and Öberg 2020; Pettersson et al. 2021; Sundberg and Melander 2013). The UCDP GED codes geo-locations of events, times of events, and names of conflict actors which engage in each event, covering the period between 1989 and 2020. We follow a similar strategy as what we did with the ACLED to pick jihadist organizations.

Afrobarometer

We use respondents in West African countries available in rounds 6 and 7. The West African countries include Benin, Burkina Faso, Cabo Verde, Cameroon, Côte d'Ivoire, Gambia (round 7 only), Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. Round 6 was surveyed between 2014 and 2015. Round 7 was surveyed between 2016 and 2018.
Age. A respondent's age. Survey questions: Q1 (rounds 6 and 7).
Female. A dummy for whether a respondent is female. Survey questions: Q101 (rounds 6 and 7).
Education. The ten categories of educational attainment. They are classified as "no formal schooling," "Informal schooling only," "Some primary schooling," "Primary school completed," "Some secondary school/high school," "Secondary school completed/high school," "Post-secondary qualifications, not univ," "Some university," "University completed," or "Post-graduate." Survey questions: Q97 (rounds 6 and 7).
Living conditions. The five categories of present living conditions. They are classified as "Very Bad," "Fairly bad," "Neither good nor bad," "Fairly good," or "Very good." Survey questions:

[30] There are fifteen groups which cannot be matched to WRD. For the ethnic groups, we utilize the percent of each religion from Joshua Project.

Q4B (rounds 6 and 7).
Religion. A respondent's religion was asked in Q98A (round 6) and Q98 (round 7). They are condensed as "Christian," "Muslim," or "Other" in the variable "RELIG_COND" of rounds 6 and 7. We use the variable to restrict the sample to Muslim respondents.
Neighbors from different religion. A respondent was asked whether she would like having people of a different religion as neighbors, dislike it, or not care. A respondent chose one of the following answers: 1."Strongly dislike," 2."Somewhat dislike," 3."Would not care," 4."Somewhat like," or 5."Strongly like." We use the variable which takes the values of 1 through 5 as a dependent variable. Survey questions: Q89A (round 6) and Q87A (round 7). In Table 10, we re-scaled the variable to the following for the clearer interpretation of the results: 1."Strongly like," 2."Somewhat like," 3."Would not care," 4."Somewhat dislike," and 5."Strongly like."
Governed by religious law. A respondent was asked which of the following statements is closest to her view: "Our country should be governed primarily by religious law" (Statement 1) or "Our country should be governed only by civil law" (Statement 2). A respondent chose one of the following answers: 1."Agree very strongly with statement 2," 2."Agree with statement 2," 3."Agree with neither," 4."Agree with statement 1," or 5."Agree very strongly with statement 1." We use the variable which takes the values of 1 through 5 as a dependent variable. Survey question: Q65 (round 7).
Equal opportunities to education. A respondent was asked whether she disagrees or agrees with the following statement: "In our country today, girls and boys have equal opportunities to get an education." A respondent chose one of the following answers: 1."Strongly disagree," 2."Disagree," 3. "Neither agree nor disagree," 4."Agree," or 5."Strongly agree." We use the variable which takes the values of 1 through 5 as a dependent variable. Survey question: Q77A (round 7). In Table 10, we re-scaled the variable to the following for the clearer interpretation of the results: 1."Strongly agree," 2."Agree," 3."Neither agree nor disagree," 4."Disagree," and 5."Strongly disagree."

D Appendix for Heterogeneity across Jihadist Organizations

Recall that Figure A.3 shows violence events by jihadist groups in West Africa. Table D.1 lists groups affiliated with Al Qaeda and the Islamic State, the two largest factions under global competition. Drawing directly from Mapping Millitants Project (MMP), we list stated ideologies and goals of major jihadist organizations below.

Al Qaeda. "Al Qaeda aims to rid the Muslim world of Western influence, to destroy Israel, and to create an Islamic caliphate stretching from Spain to Indonesia that imposes strict Sunni interpretation of Shariah law."
The Islamic State. "The Islamic State's ideology is rooted in Salafism—a fundamentalist movement within Sunni Islam—and Jihadism—a modern interpretation of the Islamic concept of struggle, often used in the context of defensive warfare...Salafis believe the most pure, virtuous form of Islam was practiced by the early generation of Muslims (known as Salaf) who lived around the lifetime of the prophet Muhammed...Since its inception, the Islamic State has sought to establish an Islamic caliphate based on its Salafi philosophy and fundamentalist interpretation of Shariah law."
AQIM: Al Qaeda in the Islamic Maghreb. "The group's main focus was the overthrow of the Algerian government and establishment of an Islamic caliphate in the Maghreb that would enforce Shariah law...expanded this goal in the early 2000s to include the overthrow of the governments of Mauritania, Morocco, Tunisia, and Mali, and the reclamation of lost Islamic lands in southern Spain."
Ansar Dine. "Ansar Dine was a Salafi-jihadist group that aimed to establish Shariah law across Mali and targeted western civilians, especially peacekeepers in Mali. Ansar Dine's ideology closely mirrored that of AQIM, which came to view Ansar Dine as its southern arm in Mali. Unlike the MNLA, Ansar Dine did not seek independence for northern Mali but rather a country unified under Islam."
Ansaroul Islam. "Ansaroul Islam's main goal is allegedly to reconquer and rebuild Djeelgodji, an ancient Fulani empire that disappeared after French colonization in the late 19th century...Ansaroul Islam interacts closely with AQ front groups and affiliates in North Africa; Ansaroul Islam activity has purportedly created a front allowing AQ to achieve its primary aim—inspiring Muslims globally to attack enemies of Islam—in Burkina Faso."
JNIM: Group for Support of Islam and Muslims. "The group's goals and ideological basis are closely aligned with those of AQIM, and it seeks to build up a Salafi-Islamist state while restoring the caliphate. The merger of various AQ-affiliates into the JNIM was consistent with AQ's new operational focus on "unity" as a means to fully and effectively implement Shariah law in areas where the jihadists previously had not possessed complete control."
MUJAO: Movement for Unity and Jihad in West Africa. "MUJAO's stated goal was to engage in and encourage the spread of jihad in West Africa, as well as establish Shariah law in the region...MUJAO's ideology and goals closely mirrored those of AQ and AQIM, the group it broke off from."
Al Mulathamun Battalion. "Despite its split from AQIM, the AMB claimed to remain loyal to the ideology and command of Al Qaeda Central. The militant group aimed to spread jihad through all of the Sahara and impose Shariah law in North Africa."
Islamic State in the Greater Sahara. "The ISGS draws much of its strategic direction and ideological goals from the IS. As an affiliate of the Islamic State, the ISGS has pledged loyalty to the IS's goal of restoring the Islamic caliphate."

Boko Haram. "Boko Haram, which translates roughly to "Western education is forbidden," is a Sunni Islamist militant organization that opposes Western education and influence in Nigeria. Its founder Mohammad Yusuf...originally followed and preached the Izala doctrine, which advocates the establishment of a Muslim society that follows the lessons of its pious ancestors. After his initial radicalization in 2002, Yusuf's ideology evolved and radicalized into a philosophy that rejected all Western and secular aspects of Nigerian society. Boko Haram originally advocated a doctrine of withdrawal from society but did not aim to overthrow the Nigerian government. Yusuf's death and increased conflict with the Nigerian government in 2009 sparked the political opposition and violent campaign that Boko Haram became known for. Under the leadership of Abubakar Shekau and Abu Musab al-Barnawi, the group sought to establish an Islamic caliphate to replace the Nigerian government."

Table D.1: Jihadist Organizations in West Africa Affiliated with Al Qaeda and the Islamic State

Al Qaeda-affiliated groups	**IS-affiliated groups**
AQIM: Al Qaeda in the Islamic Maghreb	Islamic State in West Africa
Ansar Dine	Islamic State in the Greater Sahara
Ansaroul Islam	
JNIM: Group for Support of Islam and Muslims	
MUJAO: Movement for Unity and Jihad in West Africa	
Katiba Macina	
Al Mourabitoune Battalion	
GMA: Mourabitounes Group of Azawad	
Ansaru	
Katiba Salaheddine	
MIA: Islamic Movement of Azawad	

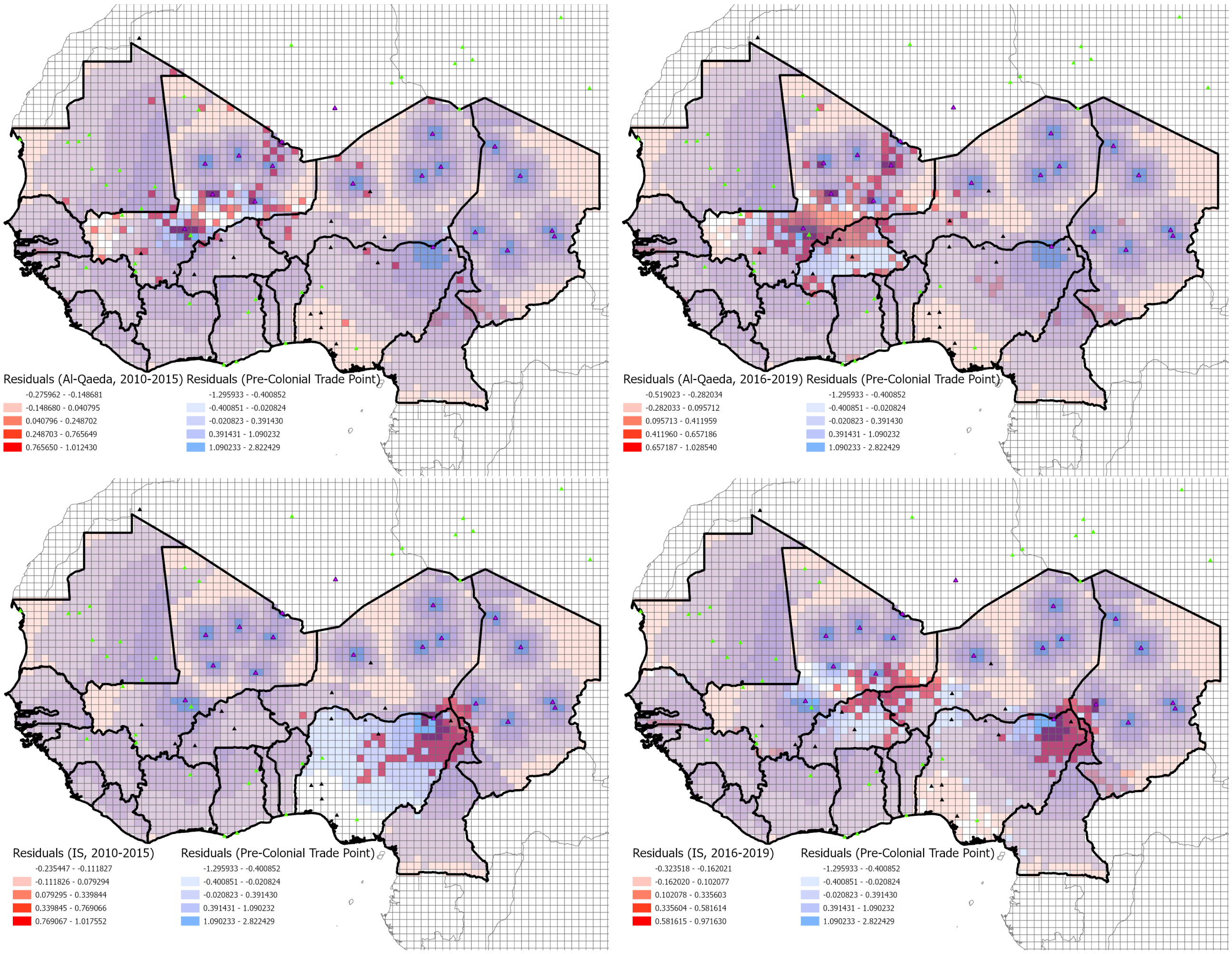

Figure D.1: Overlay of Residuals across Jihadist Organizations over Time

Notes: These maps overlay of two residuals—the red scheme represents residuals from the regression of a dummy variable of jihad on the full controls; the blue scheme indicates negative residuals from the regression of log distance to a pre-colonial inland trade point with less than 100,000 population today on the full controls. The full controls include landlocked dummy, malaria suitability, caloric suitability in post 1500, elevation. ruggedness, and country fixed effects. The purple triangles indicate pre-colonial inland trade points with less than 100,000 population today, the yellow green triangles indicate pre-colonial coastal trade points with less than 100,000 population today, and the black triangles indicate the other pre-colonial trade points. The color of cells where high residuals overlap turns purple (a mix of red and blue).

Table D.2: IV Estimates of Persistent Effects on Jihad by Al Qaeda-Affiliated Groups (2001-2019)

(A)				**Log(Distance)**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	2001-09	2010-15	2016-19	All	2001-09	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	0.251	-0.740***	0.559***	-0.204				
	(0.193)	(0.157)	(0.185)	(0.143)				
Log (Distance to a landlocked trade route up to 1800)					0.189	-0.555***	0.420***	-0.153
					(0.140)	(0.144)	(0.123)	(0.105)
Log (Distance to a lake/river today)	0.0587**	-0.0115	0.0167	0.0751***	0.0592**	-0.0129	0.0178	0.0747***
	(0.0283)	(0.0304)	(0.0248)	(0.0283)	(0.0295)	(0.0313)	(0.0255)	(0.0274)
Observations	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	5.155	5.938	5.524	5.856	5.155	5.938	5.524	5.856
SD (Dep. Var.)	0.984	0.804	0.884	1.201	0.984	0.804	0.884	1.201
(B)				**Onset**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	2001-09	2010-15	2016-19	All	2001-09	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.0550	0.0198**	-0.0480	-0.0569				
	(0.0421)	(0.00918)	(0.0316)	(0.0410)				
Log (Distance to a landlocked trade route up to 1800)					-0.0413	0.0149**	-0.0360	-0.0427
					(0.0339)	(0.00715)	(0.0252)	(0.0334)
Log (Distance to a lake/river today)	-0.0168**	0.00405	-0.0139**	-0.0202***	-0.0169**	0.00408	-0.0140**	-0.0203***
	(0.00778)	(0.00262)	(0.00614)	(0.00735)	(0.00819)	(0.00263)	(0.00642)	(0.00782)
Observations	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.069	0.009	0.027	0.053	0.069	0.009	0.027	0.053
SD (Dep. Var.)	0.253	0.093	0.162	0.224	0.253	0.093	0.162	0.224
(C)				**Intensity**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	2001-09	2010-15	2016-19	All	2001-09	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.144	0.0109	-0.0493	-0.139				
	(0.0984)	(0.0110)	(0.0461)	(0.0926)				
Log (Distance to a landlocked trade route up to 1800)					-0.108	0.00821	-0.0370	-0.104
					(0.0799)	(0.00834)	(0.0362)	(0.0754)
Log (Distance to a lake/river today)	-0.0328**	0.00433*	-0.0160*	-0.0312**	-0.0331**	0.00435*	-0.0161*	-0.0314**
	(0.0152)	(0.00231)	(0.00817)	(0.0136)	(0.0164)	(0.00230)	(0.00857)	(0.0147)
Observations	2616	2616	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.104	0.008	0.035	0.080	0.104	0.008	0.035	0.080
SD (Dep. Var.)	0.451	0.085	0.245	0.391	0.451	0.085	0.245	0.391
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(4), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (5)-(8). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table D.3: IV Estimates of Persistent Effects on Jihad by IS-Affiliated Groups (2010-2019)

(A)				**Log(Distance)**		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2010-15	2016-19	All	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	1.319***	1.496***	1.371***			
	(0.306)	(0.282)	(0.317)			
Log (Distance to a landlocked trade route up to 1800)				0.990***	1.123***	1.029***
				(0.180)	(0.163)	(0.182)
Log (Distance to a lake/river today)	0.215***	0.0908**	0.214***	0.217***	0.0937***	0.217***
	(0.0425)	(0.0434)	(0.0415)	(0.0356)	(0.0309)	(0.0352)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	5.858	6.376	5.927	5.858	6.376	5.927
SD (Dep. Var.)	1.094	1.028	1.037	1.094	1.028	1.037
(B)				**Onset**		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2010-15	2016-19	All	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.254***	-0.284***	-0.223**			
	(0.0880)	(0.0825)	(0.0888)			
Log (Distance to a landlocked trade route up to 1800)				-0.190***	-0.213***	-0.167***
				(0.0559)	(0.0525)	(0.0571)
Log (Distance to a lake/river today)	-0.0322**	-0.0120	-0.0286**	-0.0327***	-0.0126	-0.0291***
	(0.0135)	(0.0130)	(0.0119)	(0.0112)	(0.0104)	(0.00995)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.050	0.026	0.042	0.050	0.026	0.042
SD (Dep. Var.)	0.219	0.160	0.201	0.219	0.160	0.201
(C)				**Intensity**		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2010-15	2016-19	All	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.685***	-0.539***	-0.499**			
	(0.258)	(0.191)	(0.214)			
Log (Distance to a landlocked trade route up to 1800)				-0.514***	-0.404***	-0.375***
				(0.167)	(0.125)	(0.139)
Log (Distance to a lake/river today)	-0.0475*	-0.00919	-0.0426*	-0.0488**	-0.0102	-0.0435**
	(0.0276)	(0.0182)	(0.0221)	(0.0219)	(0.0148)	(0.0181)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.082	0.041	0.063	0.082	0.041	0.063
SD (Dep. Var.)	0.416	0.281	0.347	0.416	0.281	0.347
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table D.4: IV Estimates of Persistent Effects on Jihad by Boko Haram (2010-2019)

(A)			**Log(Distance)**			
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2010-15	2016-19	All	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	1.266***	1.261***	1.498***			
	(0.255)	(0.254)	(0.275)			
Log (Distance to a landlocked trade route up to 1800)				0.950***	0.946***	1.124***
				(0.141)	(0.141)	(0.167)
Log (Distance to a lake/river today)	0.0926**	0.0926**	0.0262	0.0951***	0.0950***	0.0291
	(0.0380)	(0.0380)	(0.0376)	(0.0278)	(0.0278)	(0.0290)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	6.198	6.198	6.945	6.198	6.198	6.945
SD (Dep. Var.)	1.166	1.165	0.884	1.166	1.165	0.884
(B)			**Onset**			
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2010-15	2016-19	All	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.273***	-0.273***	-0.116**			
	(0.0748)	(0.0748)	(0.0569)			
Log (Distance to a landlocked trade route up to 1800)				-0.205***	-0.205***	-0.0873**
				(0.0477)	(0.0477)	(0.0405)
Log (Distance to a lake/river today)	-0.0139	-0.0139	0.00401	-0.0144	-0.0144	0.00379
	(0.0113)	(0.0113)	(0.00352)	(0.00936)	(0.00936)	(0.00366)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.037	0.037	0.007	0.037	0.037	0.007
SD (Dep. Var.)	0.190	0.190	0.083	0.190	0.190	0.083
(C)			**Intensity**			
	(1)	(2)	(3)	(4)	(5)	(6)
	All	2010-15	2016-19	All	2010-15	2016-19
Log (Distance to a landlocked trade point ($<$ 100,000))	-0.730***	-0.714***	-0.170*			
	(0.253)	(0.246)	(0.0932)			
Log (Distance to a landlocked trade route up to 1800)				-0.548***	-0.536***	-0.128*
				(0.169)	(0.164)	(0.0665)
Log (Distance to a lake/river today)	-0.00624	-0.00707	0.00625	-0.00766	-0.00845	0.00592
	(0.0205)	(0.0202)	(0.00516)	(0.0197)	(0.0193)	(0.00555)
Observations	2616	2616	2616	2616	2616	2616
Mean (Dep. Var.)	0.070	0.069	0.009	0.070	0.069	0.009
SD (Dep. Var.)	0.422	0.415	0.119	0.422	0.415	0.119
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All regressions are estimated using IV with logarithm of one plus distance (km) to the nearest ancient lake as an instrument. The unit of observation is a grid cell (about 55km × 55km). The dependent variables are (A) logarithm of one plus distance (km) to the nearest jihad during a period given in each column, (B) dummy variables which take a value of 1 if jihad occurred during a period given in each column, otherwise take a value of 0, (C) logarithm of one plus the number of jihad events during a given period in each column. All Log(Distance) variables indicate the logarithm of one plus distance (km) to the nearest object. Landlocked is defined as the 1000km faraway from the nearest coast point. The interest variables are the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade point whose contemporary population is less than 100,000 in columns (1)-(3), and the logarithm of one plus distance (km) to the nearest pre-colonial landlocked trade route up to 1800 in columns (4)-(6). We control for landlocked dummy, average malaria suitability, average caloric suitability in post 1500, average elevation, ruggedness, and logarithm of one plus population in 2010 in all the specifications. We report standard errors adjusting for spatial auto-correlation with distance cutoff at 100km in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

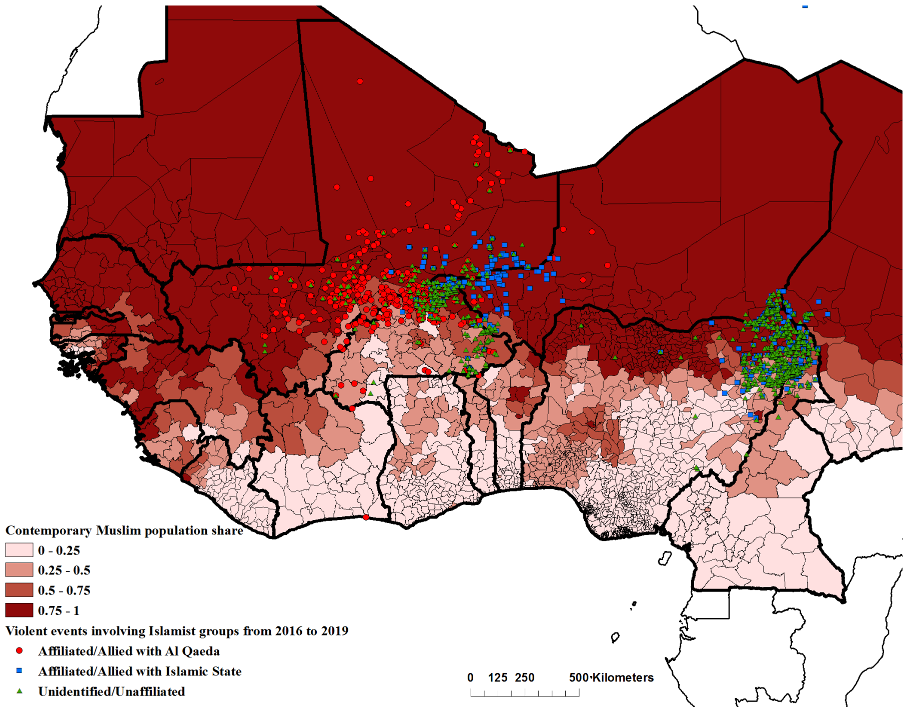

Figure D.2: Contemporary Muslim Population and Jihad in West Africa
(Source: ACLED and World Religion Database)

Table D.5: Market Access and Jihadist Violence by Major Organizations

	log (Number of Jihadist Violence)					
	Al Qaeda		Islamic State		Boko Haram	
	(1)	(2)	(3)	(4)	(5)	(6)
log (ILMA)	-0.00554**	-0.00321	0.0256***	0.0171***	0.0454***	0.0286***
	(0.00225)	(0.00213)	(0.00404)	(0.00369)	(0.00561)	(0.00497)
log (ITA)	-0.0189***	0.00409	-0.0591***	-0.143***	-0.0831***	-0.249***
	(0.00734)	(0.0102)	(0.00826)	(0.0181)	(0.00888)	(0.0224)
log (Population)		-0.0109***		0.0399***		0.0789***
		(0.00397)		(0.00559)		(0.00768)
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.307	0.307	0.069	0.075	0.052	0.069
Adjusted R^2	0.299	0.299	0.059	0.064	0.041	0.058
Mean (Dep. Var.)	0.020	0.020	0.018	0.018	0.024	0.024
SD (Dep. Var.)	0.194	0.194	0.185	0.185	0.209	0.209
Observations	15320	15320	15320	15320	15320	15320

Notes: Robust standard errors in parentheses. The sample includes all districts in West Africa from 2010 to 2019. Other controls include district area size. ITA ≡ Insurgent's Target Market Access. ILMA ≡ Insurgent's Labor Market Access.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

E Conflict Catalogue

In this section, we construct conflict confrontation sample between European actors and historical states from conflict catalogue. We match conflict actors in the database with historical states in 1860 from Cultures of West Africa by using online resources.[31] We follow the procedures below:

1. We match a historical state with a conflict actor by its name (direct match).
2. If a state name cannot be found in conflict catalogue, we match by its alternate names or spellings (alternate name match). Matched conflicts must occur following the establishment years.

However, Brecke (1999) includes many conflicts that indicate only larger ethnic groups (e.g., Fulani) or larger areas (e.g., Sierra Leone) that may have been related to historical states. As additional sources, we make use of information about locations of conflict from Fenske and Kala (2017) and Boxell et al. (2019). Fenske and Kala (2017) provides the information about conflicts between 1700 and 1900. Regarding conflicts after 1901, we use digitized information by ourselves, using web sources (e.g., wikipedia and google maps).

Below Table E.1 lists up all the conflicts related to historical states in West Africa from Brecke (1999).[32]

[31] We mainly depend on wikipedia, and Joshua Project.

[32] We exclude the following conflicts from the list since they are not identified in alternative sources: "France-England (Benin), 1792", "Nikki-France (Borgou, Benin), 1916" and "Adja-France (Mono, Benin), 1918-19".

Table E.1: Colonial Conflicts in West Africa involving Historical States

Historical State	Islamic	European Enemy	Start Year	End Year
Djolof	N	Portugal	1697	1697
Ashanti	N	Britain	1711	1712
Dahomey	N	Britain	1727	1729
Ashanti	N	Denmark	1742	1742
Ashanti	N	Denmark	1743	1743
Ashanti	N	Britain	1823	1826
Ijebu	N	Britain	1851	1851
Tukulor	Y	France	1854	1861
Saloum	N	France	1856	1858
Koya	N	Britain	1861	1861
Futa Toro	Y	France	1862	1862
Ashanti	N	Britain	1863	1864
Cayor	N	France	1864	1864
Dahomey	N	Britain	1864	1865
Ashanti	N	Britain	1865	1865
Ashanti	N	Britain	1868	1869
Cayor	N	France	1869	1869
Ashanti	N	Britain	1873	1874
Futa Toro	Y	France	1875	1875
Dahomey	N	Britain	1878	1878
Wassoulou	Y	France	1881	1888
Wassoulou	Y	France	1885	1886
Wassoulou	Y	France	1888	1891
Dahomey	N	France	1889	1890
Dahomey	N	France	1892	1893
Ashanti	N	Britain	1893	1894
Wassoulou	Y	France	1894	1895
Ashanti	N	Britain	1895	1896
Benin	N	Britain	1897	1897
Wassoulou	Y	France	1898	1898
Kanem-Bornu	Y	France	1899	1901
Ashanti	N	Britain	1900	1903
Aro	N	Britain	1901	1901
Kanem-Bornu	Y	Britain	1902	1902
Kanem-Bornu	Y	Britain	1902	1902
Sokoto Califate	Y	Britain	1903	1903
Sokoto Califate	Y	Britain	1906	1906
Ijebu	N	Britain	1912	1913
Benin	N	France	1914	1914
Benin	N	France	1915	1916
Wassoulou	Y	France	1915	1915
Wassoulou	Y	France	1916	1916

Note: The names of the historical states come from Culture of West Africa. Y indicates a state is Islamic and N indicates it is not. The two conflicts against Britain in 1902 involving with Kanem-Bornu are not the same.

F Strategies against Colonization

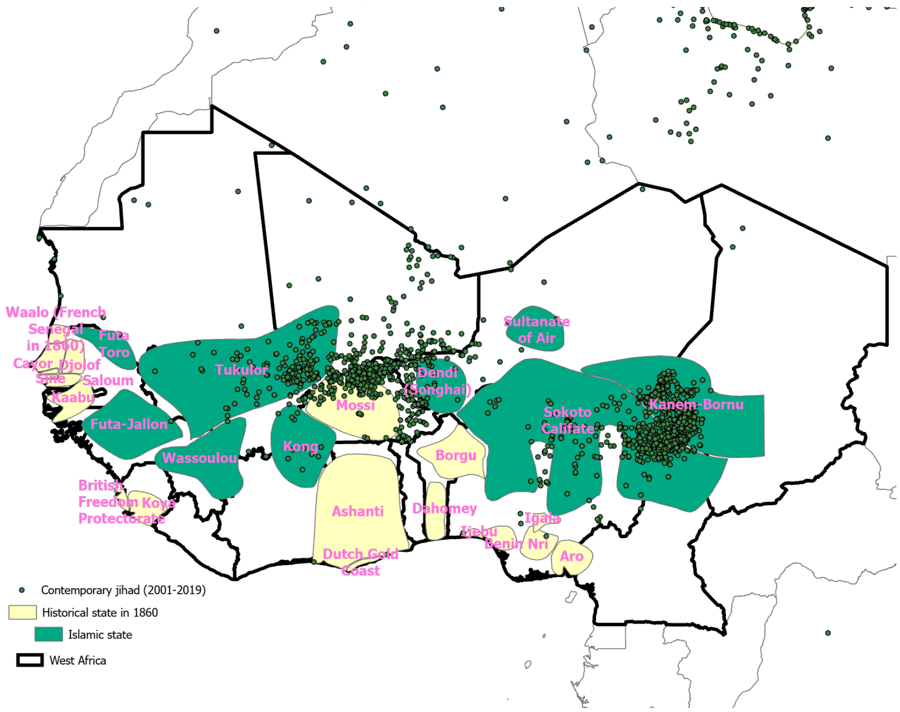

Figure F.1: Islamic States in 1860 and Contemporary Jihad
(Source: ACLED and Cultures of West Africa)

Futa Toro. The leader of Tukulor empire, Ahmadu, recruited *talibés* (i.e., students of religion who formed the backbone of his father's army) from Futa Toro (Boahen 1985 p.120).
Futa Jallon. Futa Jallon resistance to French expansion relied on the use of diplomacy rather than military measures (McGowan 1981, p.246).
Kong Empire. Kong empire was destroyed in 1895 by Samori who accused of soliciting French protection (Azarya 1980 p.434).
Sokoto Califate. The Sokoto Caliphate was conquered by British colonial forces in 1903. It was military conquest (Boahen 1985 p.137). The territory was divided between British, French, and German powers.
Tukulor Empire. The leader Ahmadu, who succeeded the founder of the empire, chose strategies of alliance and militant confrontation and relied more on the alliance than confrontation (Boahen 1985 p.119). Besides the French, he was forced to fight on other two fronts: against his brothers who contested his authority and rebellions of his subjects. To deal with these two, he needed arms and ammunition as well as financial resources through trade, both of which necessitated friendly relations with the French (Boahen 1985 p.119-120).
Wassoulou (Mandingo/Mandinka) Empire. The ruler, Samori Ture, chose the strategy of confrontation (Boahen 1985 p.123).

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