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Is there a religious dimension to concern about farmer-herder conflicts in Nigeria?

Daniel Tuki[1]

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Abstract
Although many studies have been conducted on the conflicts between Fulani nomadic herders and sedentary farmers over land and water resources in Nigeria, very few have examined the religious dimension of these conflicts. In fact, some studies have described the religious dimension as an oversimplification of a complex social problem. But is this really the case? Is religion important in understanding the dynamics of the conflict? My instrumental variable regression results show that Muslim domination – a scenario where the population in a local government area (LGA) (i.e. municipality) is predominantly Muslim – reduces the likelihood of being concerned about farmer-herder conflicts. It also shows that Muslims are less concerned about the conflict than Christians. A plausible mechanism behind this finding is that the common religion of Islam shared by the nomadic Fulani herders and the Muslim sedentary population allows for trust to be established between members of the two groups, which in turn makes it easier for conflicts over land and water resources to be resolved amicably without recourse to violence.

[1] Research Fellow, WZB Berlin Social Science Center, Germany (Correspondence: daniel.tuki@wzb.eu)

1.0. Introduction

Conflicts between nomadic Fulani herders and sedentary farmers are not a recent phenomenon in Nigeria. Writing six years after Nigeria's independence from British colonial rule, Ibrahim (1966) highlighted the tendency for conflicts to occur between both actors when cattle strayed into farmlands and destroyed crops: "There is thus a continual struggle between Borori [nomadic Fulani herders] and farmers, and when a dispute goes to the Courts – it does in the majority of cases – it invariably ends in the Bororo paying heavy compensation for damage to crops." (p. 174). What distinguishes contemporary farmer-herder conflicts from those that have occurred in earlier times is that the latter conflicts were not violent. Also, legal remediation was often used to resolve them. Contemporary conflicts are characterized by the frequent use of violence as a means of dispute resolution (Human Rights Watch 2018; Egunyomi 2018; Godwin 2018; Stein 2016). This often leads to a downward spiral of revenge whereby conflict begets conflict, with each attack creating the condition for a reprisal attack (Olufemi 2021; Bagu & Smith 2017). Some scholars have referred to this phenomenon as the "conflict trap" (Collier 2007; Collier et al. 2003).

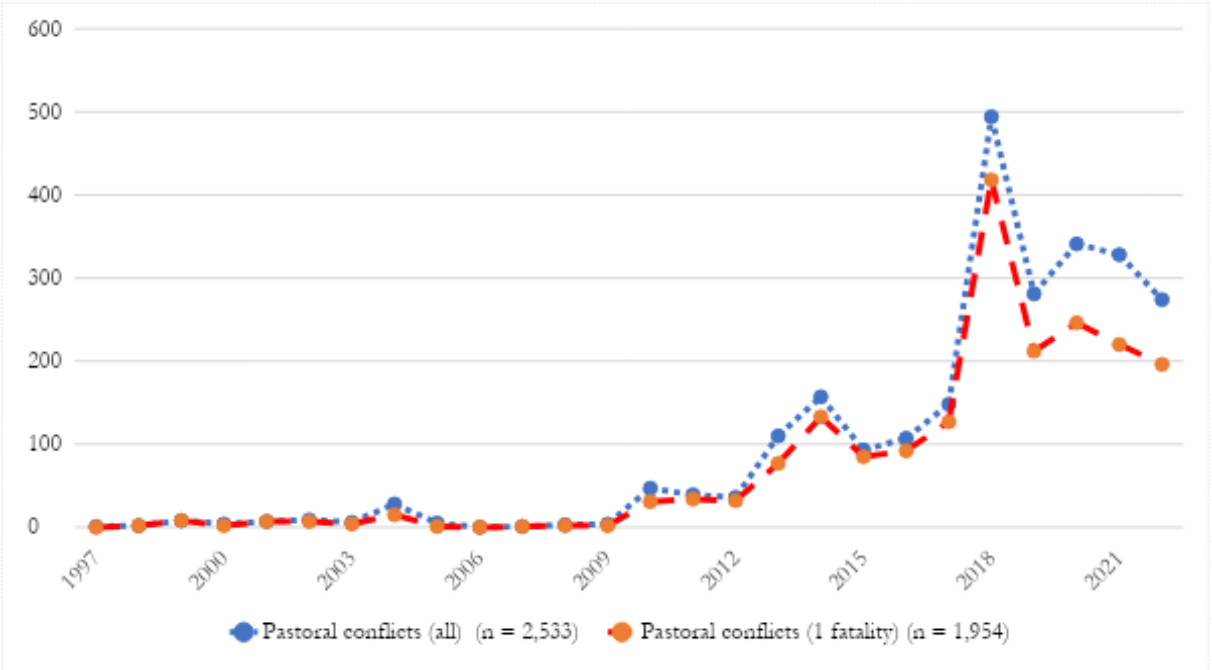

Figure 1: Trend of pastoral conflicts in Nigeria, 1997 to 2022 (ACLED)

Note: The blue dotted curve shows the annual trend of pastoral conflicts across Nigeria from 1997 to 2022. Relying on data obtained from the Armed Conflict Location and Events Database (ACLED) (Raleigh et al. 2010), I define a pastoral conflict as any incident in which at least one of the actors is a "pastoralist" or belongs to an ethnic group renowned for pastoralism. In the case of Nigeria, this would be members of the Fulani ethnic group. The terms "Fulani" and "pastoralist" are almost synonymous in the ACLED dataset because virtually all the actors defined as "pastoralist" are also identified as "Fulani Ethnic Militia." The red dashed curve shows the annual trend of pastoral conflicts that resulted in at least one fatality.

Data from the Armed Conflict Location and Events Database (ACLED) (Raleigh et al. 2010) shows that there were 2,533 pastoral conflicts in Nigeria between 1997 to 2022.[2] Majority of these incidents were violent in nature, with 77 percent of them causing at least one fatality. The total fatalities associated with pastoral conflicts during this period was 15,417. Violence against civilians (72%) and Battles (22%) were the two major categories under which pastoral conflicts fell. The remaining 6 percent of incidents fell under the categories of Explosions/Remote violence (1.3%), Protests (0.4%), Riots (1.4%), and Strategic developments (2.8%). Figure 1 shows that pastoral conflicts seldom occurred prior to 2010. In fact, only 3 percent of the 2,533 total incidents occurred before 2010. After 2009, there appears to be an upward trend in the incidence of conflicts with a peak in 2018 where almost 500 incidents were recorded. A characteristic of farmer-herder conflicts worth highlighting is their spread across all Nigeria's 36 states, including the federal capital territory – Abuja. This differs from the attacks perpetrated by the Islamist group *Boko Haram*, which is largely confined to a few states in Northeastern Nigeria. Between 1997 to 2022, all the states recorded at least one incident; 29 of them recorded at least 10 incidents. In the states of Plateau, Benue, and Kaduna, which are the three most affected states, 410, 406, and 289 incidents were recorded respectively.

[2] To access the ACLED data visit: https://acleddata.com/

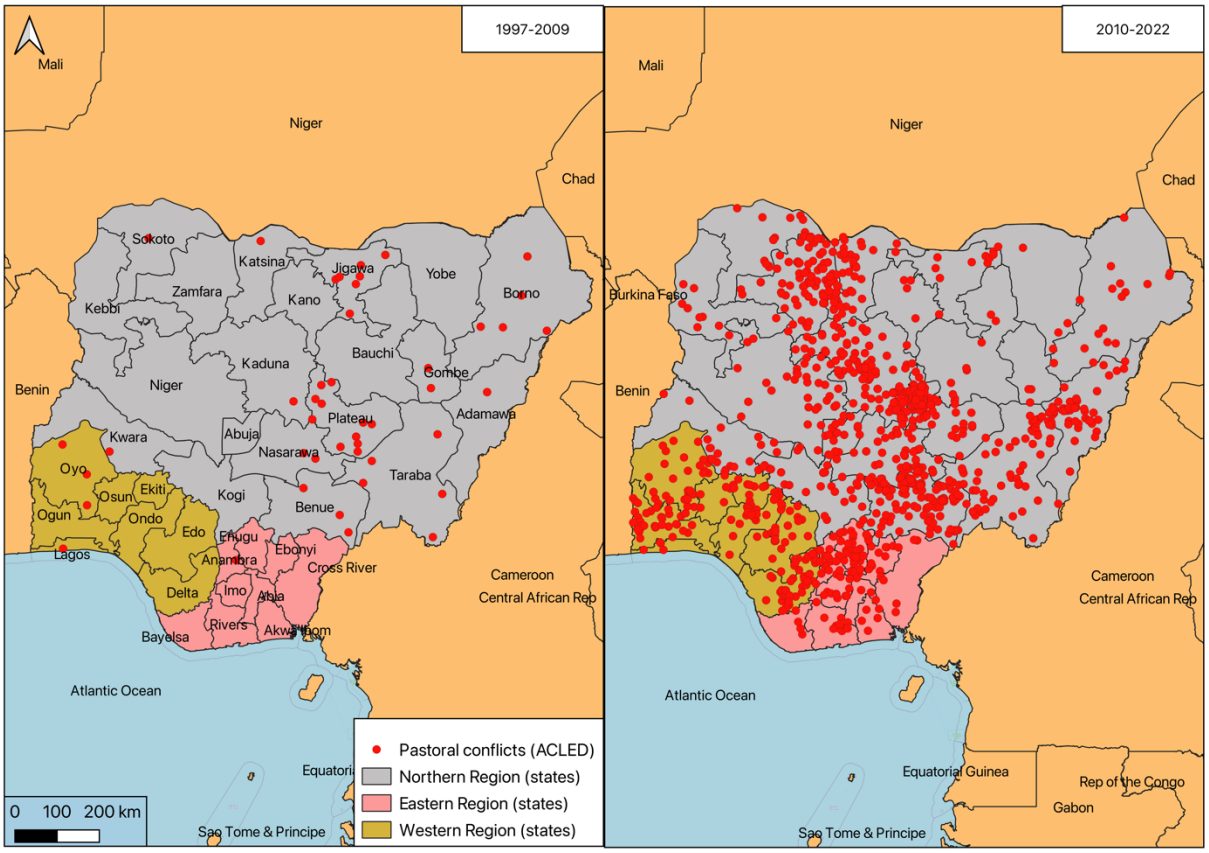

Figure 2: Geolocations of pastoral conflicts across Nigeria's three major regions

Note: The first panel shows the geolocations of the pastoral conflicts that occurred in Nigeria from 1997 to 2009 (n = 78), rendered over a map indicating the various states in Nigeria's three major regions. The second panel does same for the pastoral conflicts that occurred between 2010 to 2022 (n = 2,455). The shapefiles containing Nigeria's administrative boundaries were developed by the United Nations Office for the Coordination of humanitarian Affairs (UNOCHA).

Why the surge in the incidence of pastoral conflicts after 2009? To answer this question, one must identify the changes that occurred in Nigeria in the *watershed* year of 2009 that made the subsequent years differ considerably from the preceding ones. The year 2009 marked the advent of *Boko Haram* insurgency (Adesoji 2010). George et al. (2022) studied the impact of *Boko Haram* attacks on Farmer-herder conflicts and found that the former causes the latter. Nomadic herders have been displaced from their primary grazing areas by *Boko Haram* attacks, forcing them to migrate with their livestock to safer areas. This leads to increased competition for land and water resources in host communities between nomadic herders and the sedentary population, which in turn increases the risk of conflict. They also highlighted the tendency for the sedentary population to associate nomadic Fulani herders, who are Muslim, with *Boko Haram* insurgents, which leads to distrust and a higher risk of conflict. Suffice to add that most of the sedentary

population in the areas where farmer-herder conflicts are concentrated is Christian.

The *Boko Haram* insurgency and the general trend of insecurity in the Sahel Region has led to the proliferation of small and light weapons (United Nations Peacekeeping 2020; Ojo 2020; Blench 2019), leading to a militarization of nomadic herders – who now carry arms to protect themselves against potential attacks. "A lack of established relationships with local farmers, as well as the psychological insecurities related to war, kidnapping and rustling, makes the incoming herders more likely to use their weapons to defend their herds." (Blench 2019, p. 12). This leads to a scenario where conflicts over land and water resources, which might have been resolved amicably between farmers and herders in the absence of weapons, turn violent. The advent of the *Boko Haram* insurgency ushered Nigeria into a new phase of systematic violence that it had never before witnessed. At the height of its activity, the Nigerian government had diverted most of its attention and resources towards fighting the group, especially because of its wanton and indiscriminate use of violence in the pursuit of its objectives. This might have led to the neglect of lower intensity conflicts, thus allowing them to fester. Moreover, the inability of the Nigerian government to deal decisively with *Boko Haram* may have eroded trust in the state's security apparatus. It may have also led to the normalization of violence and apathy among the population, which in turn may have made people less hesitant to employ violence in the resolution of conflicts.

Some studies contend that the adverse effects of climate change – droughts, desertification, and rising temperatures – are at the root of farmer-herder conflicts (Madu & Nwankwo 2021; Eberle et al. 2020; Day & Caus 2020; International Crisis Group 2017). A look at Nigeria's topography shows that the Northernmost part of Nigeria is proximate to the Sahara Desert, while the Southernmost part is contiguous to the Atlantic Ocean. The amount of rainfall and vegetation cover increases as one moves from the North towards the South. The adverse effects of climate change have depleted pasturelands and water sources, forcing nomadic herders to move southwards in search of these. This puts the nomadic herders at odds with the sedentary

population. Land and water are essential inputs for both sedentary farmers and nomadic herders: Farmers need land to cultivate their crops and water to irrigate them, especially during the dry season when there is no rain. Nomadic herders need pastureland and water for their livestock to graze and drink.

Urbanization and population growth have also been touted in the literature as drivers of farmer-herder conflicts. The expansion of built-up areas as well as the areas under crop cultivation has shrunk the amount of pastureland available for herders to graze their livestock. It has also led to the blockage of the routes that nomadic herders usually ply during their seasonal migration in search of pasture, thus increasing the likelihood of conflicts between nomadic herders and sedentary peoples (Usman & Nichol 2022; Mercy Corps 2022; Blench 2019; Egbuta 2018). Moreover, diminished trust between communities, as well as the violent turn in these conflicts, has counteracted the effect of traditional dispute resolution mechanisms that had previously ensured the peaceful resolution of resource conflicts (Mercy Corps 2022; Brottem 2021; Bagu & Smith 2017).

But is there a religious dimension to farmer-herder conflicts? Does religion influence the way that Nigerians respond to these conflicts? Or is the focus on the religious angle of the conflict merely an oversimplification of a complex social problem? Ajala (2020) argued that focusing on the ethnic and religious dimension of farmer-herder conflicts diverts attention from the core issues at stake, sowing the seed of distrust and inter-communal animosity. This in turn creates an enabling environment for the elites to exploit the ethno-religious divisions among the Nigerian population to advance their political goals. Blench (2019, p. 12) observed that farmer-herder conflicts are often "seized on by irresponsible politicians and social media commentators to frame the clashes in religious terms, a narrative which suits those who like simple, science-free analyses, which also justify the irresponsible exercise of political power." Conversely, Tuki (2023) contends that there is a religious angle to the conflict. He examined the effect of pastoral conflicts on distrust of members of the Fulani ethnic group and Muslims, as

well as the conditions under which conflicts over land and water resources turn religious. He found that exposure to pastoral conflicts causes distrust of both the Fulani and Muslims. This is because members of the Fulani ethnic group are often conflated with the larger Muslim population. He also found that conflicts over land and water resources were likely to turn religious when the society was polarized along religious lines. Similarly, Campbell and Page (2018, p. 83) observed: "Where religious boundaries coincide with those of ethnicity and land use, conflict can be frequent and intense, as it is in parts of the [Nigerian] Middle Belt."

This study examines the relationship between religion and concern about farmer-herder conflicts in Nigeria. More specially, it seeks to investigate whether the predominance of Muslims in an area makes the people residing there less concerned about farmer-herder conflicts. Furthermore, it investigates whether Muslim self-identification leads to less concern about farmer-herder conflicts. To the best of my knowledge, no study has empirically investigated the heterogenous response to farmer-herder conflicts among Nigeria's Muslim and Christian populations using econometric techniques and representative data for Nigeria. This study fills that gap. It is necessary to investigate the religious dimension of farmer-herder conflicts because ignoring it prevents a holistic examination of the conflict. Moreover, given the distinct ethno-religious identities of the actors (with the nomadic herders being Muslims and sedentary farmers being predominantly Christians) coupled with the fact that religion has played a central role in shaping Nigeria's trajectory from the precolonial period up to the present (Vaughan 2016; Kukah 1993; Ibrahim 1991), the need to empirically study the religious dimension of farmer-herder conflicts cannot be overemphasized. With its population almost evenly split between Christians and Muslims (Campbell & Page 2018, p. 72), Nigeria is very polarized along religious lines. This has hindered the development of a shared national identity among the country's population, and in some instances led to violent conflicts (Angerbrandt 2018; Agbiboa 2013; Ukiwo 2003; Alabi 2002).

This study finds that Muslim domination and Muslim self-identification have a negative

effect on concern about farmer-herder conflicts. In other words, when the population in a local government area (LGA) (i.e. municipality) is predominantly Muslim, there is less concern about farmer-herder conflicts among the population residing there compared to LGAs with a predominantly Christian population. Moreover, people who self-identify as Muslims are less concerned about farmer-herder conflicts than Christians. A plausible mechanism behind these results is that the common religion of Islam shared by the nomadic Fulani herders and the sedentary population in LGAs where Muslims are dominant allows for trust to be built more easily between members of the two groups, thus allowing for conflicts over land and water resources to be resolved amicably. Within this framework, Muslims constitute an ingroup while Christians represent the outgroup. My results are congruent with the observation made by Coleman (1958, p. 39) two years before Nigeria's independence from British colonial rule: "Islam provided a transtribal bond which has been one of the most powerful integrative factors in Northern Nigeria." Suffice to add that some studies have shown the tendency for people with similar cultural characteristics like religion and ethnicity to get along – a phenomenon referred to as homophily (Yilmaz & Bashirov 2022; Adida et al. 2015; McPherson et al. 2001; Brewer 1999; Allport 1954).

This study proceeds as follows: Section 2 describes the data upon which this study relies, operationalizes the variables that will be used to estimate the regression models, and discusses the empirical strategy. Section 3 presents the regression results and discusses them, while section 4 summarizes the study and concludes.

2.0. Data and methodology

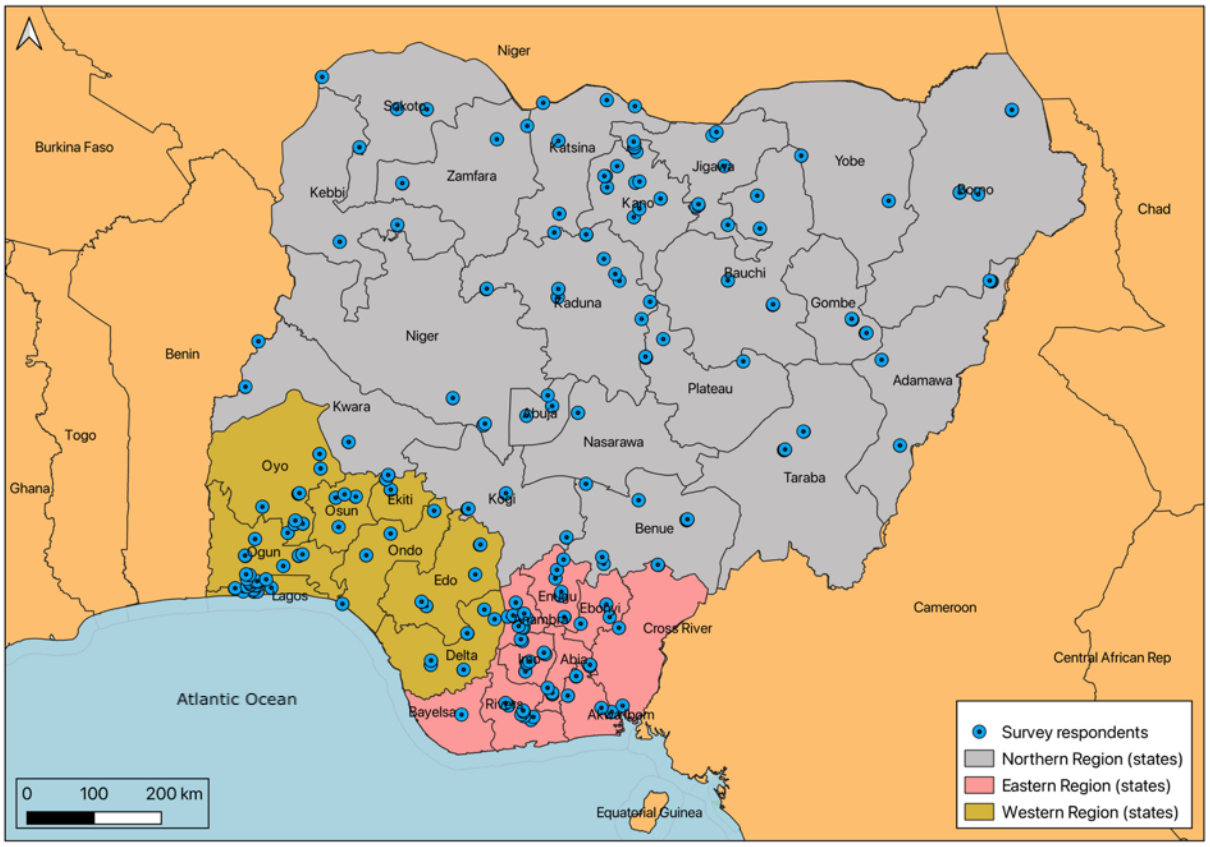

Figure 3: Geolocations of the survey respondents

Note: The figure shows the geolocations of the survey respondents as well as the states that constitute Nigeria's three major regions. The three regions were created by the British in 1939 when Nigeria was still under colonial rule. Although Nigeria currently consists of 36 states, these regions remain relevant because each of them is dominated by one of Nigeria's three major ethnic groups: The Northern Region is dominated by the Hausa/Fulani, the Eastern and Western Regions are dominated by the Igbo and Yoruba respectively. Source of map: UNOCHA.

This study relies on the Round 7 Afrobarometer (BenYishay et al. 2017) survey data that was collected in 2017.[3] It consists of 1600 observations and is representative for Nigeria. As shown in Figure 3, Data were collected from each of Nigeria's 36 states plus the federal capital territory – Abuja. Respondents were at least 18 years old. Out of Nigeria's 774 local government areas (LGAs) (i.e. municipalities), data were collected from 147 of them.[4] Males and females were equally represented in the sample in the ratio 50:50.

[3] To access the Afrobarometer data and the survey questionnaire, visit: https://www.afrobarometer.org/
[4] Each state in Nigeria consists of three senatorial districts, and the senatorial district consists of local government areas (LGAs).

2.1. Operationalization of the variables

2.1.1. Dependent variable

Concern: This measures the degree to which the respondents worry about farmer-herder conflicts. Respondents were first asked whether they were aware of farmer-herder conflicts, and those who had knowledge of the conflict were then asked how concerned they were about it. of the 1448 respondents who were asked the former question, 281 of them had said they were unaware of the conflict. This might not necessarily be accurate because some respondents may have feigned ignorance because they did not want to talk about the conflict. I thus work with only the subsample of respondents who were aware of the conflict as they are only ones who were asked the relevant question: "How concerned are you about the conflicts between farmers and herdsmen?", with the responses measured on a four-point ordinal scale ranging from "Not concerned at all" to "Very concerned." For easy interpretation of the regression results, I inverted the ordinal values assigned to the response categories by subtracting each of them from 5. This allows larger values to denote a higher level of concern and vice-versa.

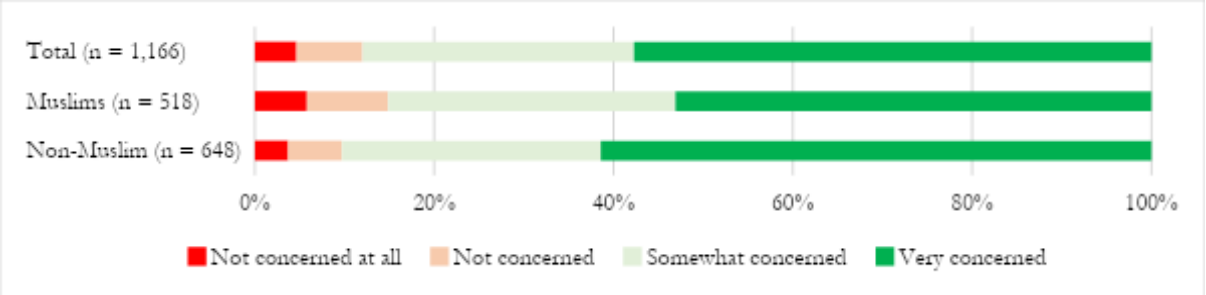

Figure 4: Concern about farmer-herder conflicts and religious affiliation

Note: The vertical axis shows the total respondents who were asked the relevant question about "concern", as well as the Muslim and non-Muslim (i.e. Christian) subsample of respondents. The non-Muslim subsample is a close approximation of the Christian subsample because all except for one respondent who practices traditional religion, is Christian. The horizontal axis shows the percentage of respondents who chose a particular response category when asked about the degree to which they were concerned about farmer-herder conflicts.

As shown in figure 4, Majority of the Nigerian population are bothered about farmer-herder conflicts. Of the 1,166 respondents who answered the relevant question, 58 and 30 percent of them chose the "Very concerned" and "Somewhat concerned" response categories, while only 12 percent chose either the "Not concerned" or "Not concerned at all" response

categories. When I broke down the data based on religious affiliation, I noticed a pattern: Muslims are less concerned about the conflict than non-Muslims (i.e. Christians). 15 percent them chose either the "Not concerned" or "Not concerned at all" response categories. The estimate for the non-Muslim subsample of respondents was 10 percent.

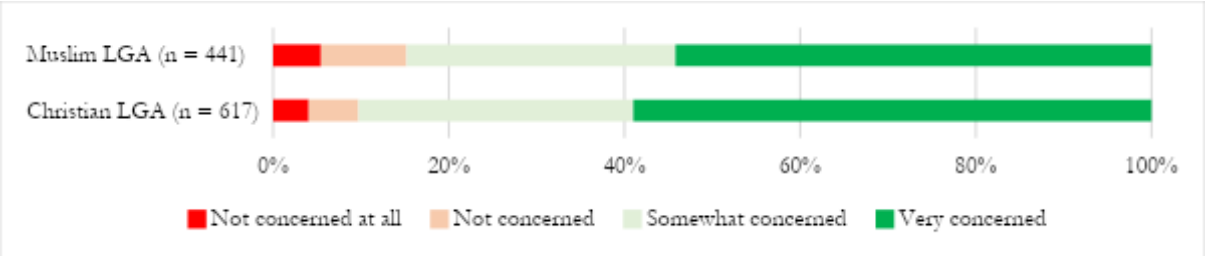

Figure 5: Concern about farmer-herder conflicts and religious domination

Note: The vertical axis shows the number of respondents residing in a local government area (LGA) with a predominantly Muslim population and a predominantly Christian population. The horizontal axis shows the percentage of respondents who chose a particular response category when asked how concerned they were about farmer-herder conflicts.

To better understand the religious pattern, I also broke down the data based on the dominant religious group residing in the LGA. Figure 5 shows that respondents in LGAs with a predominantly Muslim population are less concerned about the conflict than those residing in LGAs with a predominantly Christian population. Since majority of the responses fell under the "Very concerned" and "Somewhat concerned" categories, I developed an alternative measure of the dependent variable where I collapsed the "Very concerned" and "Somewhat concerned" responses under a value of 1, and "Not concerned at all" and "Not concerned" responses under a value of 0. I used this to conduct a robustness check in the analysis.

2.1.2. Explanatory variables

Muslim domination: This is a dummy that takes the value of 1 if the local government area where the respondent resides has a predominantly Muslim population and 0 if the population is predominantly Christian. Censuses are irregular in Nigeria. In the rare cases when they are conducted, information about religious affiliation is usually not collected, making it difficult to obtain data on the religious composition of the population from official government sources. Although Nigeria's last census was conducted in 2006, the 1963 census is the only one where

information about religious affiliation was collected (Ostien 2012). Due to this limitation, I extrapolated the religious composition of the population in the respective LGAs from a shapefile containing the geolocations of the religious institutions – churches and mosques – across Nigeria. I obtained this data from the Georeferenced Infrastructure and Demographic Data for Development (GRID3) database.[5] Except for one state – Osun – for which data is unavailable, the dataset covers all Nigeria's 36 states plus the Federal Capital Territory – Abuja. The shapefile containing the local government area (LGA) administrative boundaries for Nigeria was developed by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA).[6] Using QGIS software, I computed the total number of mosques and churches in the respective LGAs, and subsequently matched the geolocations of the respondents with the particular LGAs where they reside. This was possible because the Afrobarometer survey data is georeferenced. When an LGA had more mosques than churches, I considered it as having a predominantly Muslim population and coded it as 1. Conversely, when the number of churches exceeded the number of mosques, I coded the dummy variable as 0, indicating that the LGA has a predominantly Christian population. In the cases where the LGA had neither a church nor mosque, or had equal number of churches and mosques, I treated the observation as missing. Among the observations that I had treated as missing, majority of them had neither a church nor mosque. There were only 7 observations for which the number of churches and mosques were equal, and they all had only one of the respective infrastructures.

[5] The GRID3 dataset was collected between November 2017 to December 2018. It could be accessed here: https://grid3.gov.ng/

[6] The shapefiles containing Nigeria's administrative boundaries could be accessed here: https://data.humdata.org/dataset/nga-administrative-boundaries

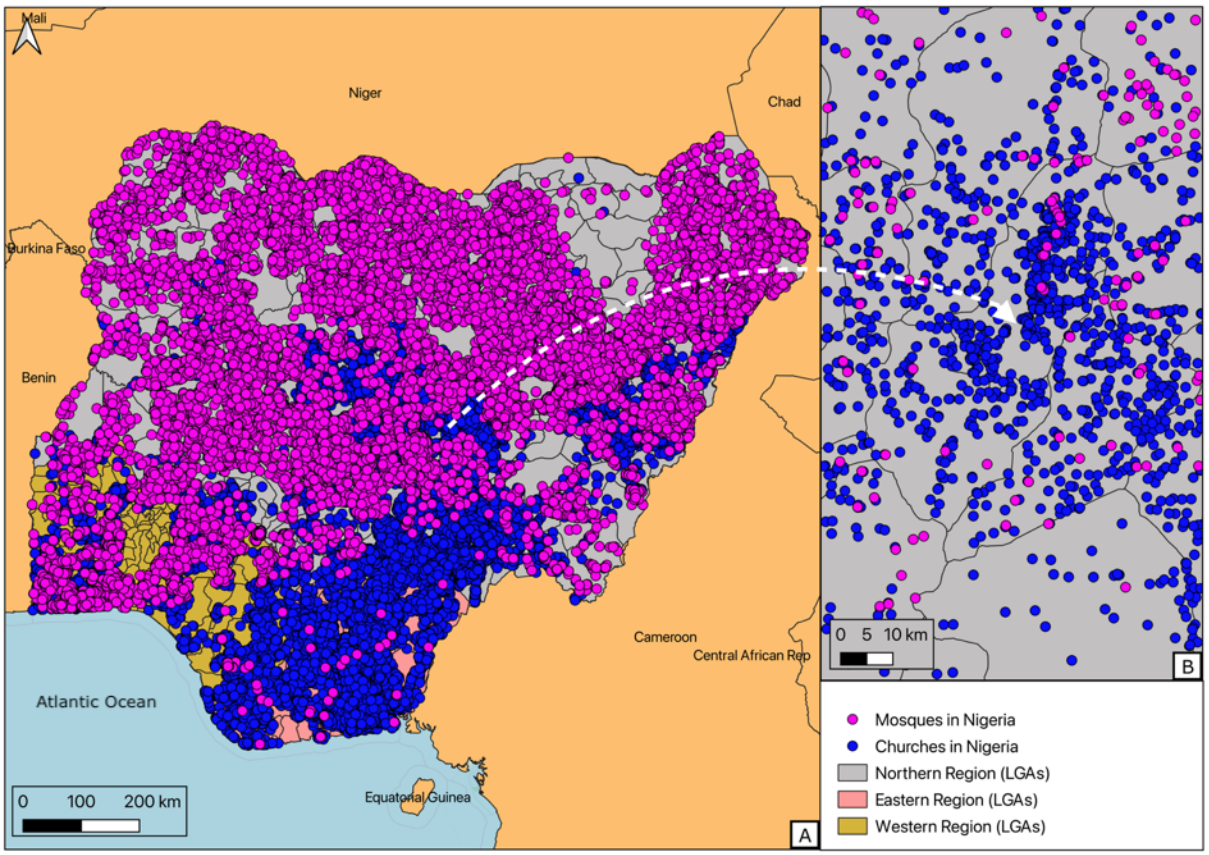

Figure 6: Religious infrastructure across Nigeria

Note: The figure shows the geolocations of the churches and mosques across Nigeria rendered over a map showing the local government areas (LGAs) that constitute Nigeria's three major regions. Panel A provides a broad picture at the country level, while panel B zooms in on an enclave in Northern Nigeria where the population is predominantly Christian.

I deliberately rendered the layer showing the mosques above that for the churches so I could better identify where the mosques are clustered. As shown in figure 6, the mosques are concentrated in the Northern Region, with a couple of enclaves having a predominantly Christian population there. As will be discussed in section 2.2, these enclaves have historical roots. In the Eastern Region, the population is predominantly Christian, with only a few Muslims, as evidenced by the sparse number of mosques there. Both religious groups are almost evenly represented in the Western Region. Looking at Nigeria from a broad perspective, the Northern Region could be viewed as one end of the religious spectrum with a predominantly Muslim population. The Eastern Region could be viewed as the other end of the religious spectrum with a predominantly Christian population. with its population almost evenly split between the two religious groups, the Western Region forms a sort of middle point on the spectrum.

Muslim self-identification: This is a dummy variable that takes the value of 1 if the respondent is Muslim and 0 otherwise. Majority of the Nigerian population is either Christian or Muslim. Of the 1,600 total observations in the Afrobarometer dataset, All the respondents were either Christian or Muslim, except for one who practiced traditional religion. This makes the "non-Muslim" reference category synonymous with being Christian.

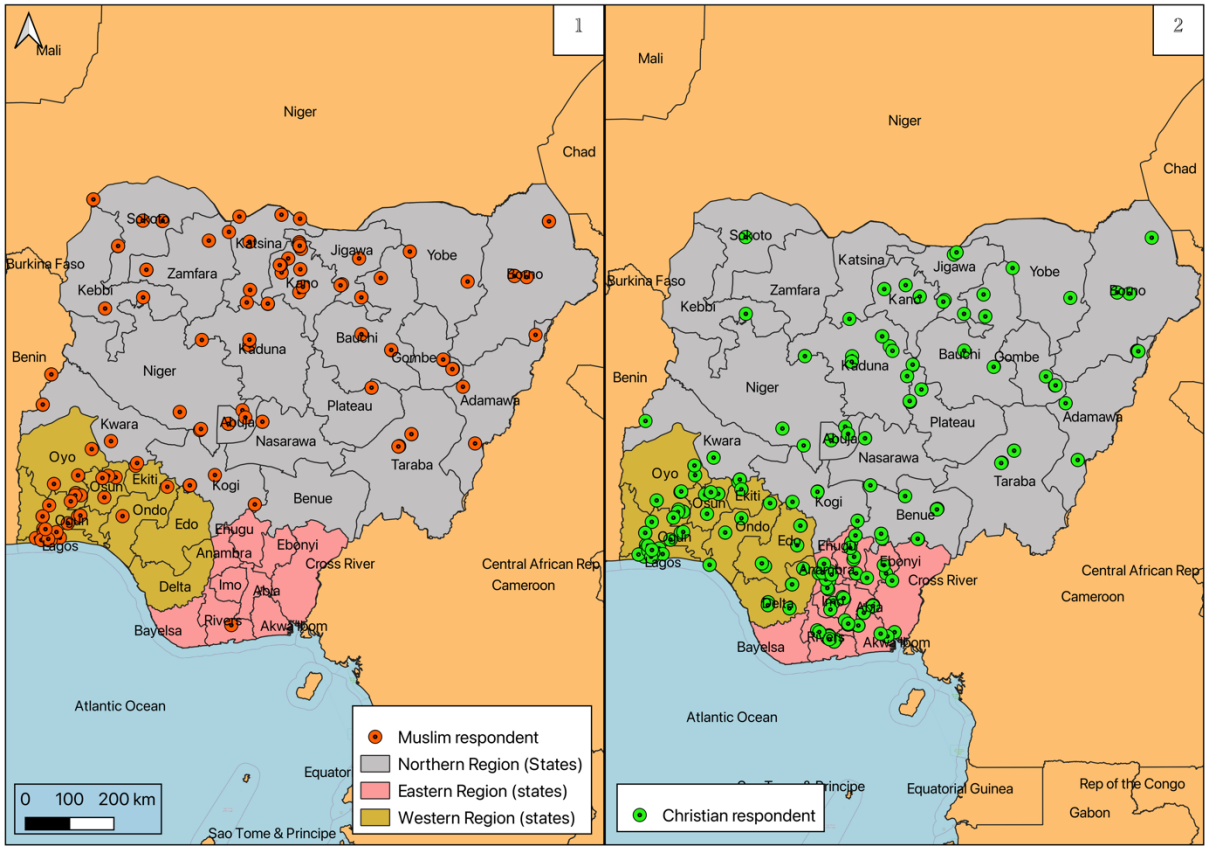

Figure 7: Spatial distribution of respondents based on religious affiliation

Note: Panel 1 shows the geolocations of the Muslim subsample of respondents across Nigeria's three major regions, while panel 2 does same for the Christian subsample of respondents.

Although majority of the Muslim respondents reside in Northern Nigeria, as shown in the first panel of figure 7, a substantial number of them also reside in Western Nigeria. Barely any Muslim resides in the Eastern Region. Comparing the Eastern Region in both panels shows that majority of the population residing there is Christian. Although a substantial number of Christians reside in Northern Nigeria, they constitute a minority as the population there is predominantly Muslim. In Western Nigeria, both religious groups are evenly represented among the population. This is congruent with the pattern in figure 6 where I rather focused on religious

infrastructure.

2.1.3. Individual demographic covariates

I consider two control variables that capture the demographic attributes of the respondents – age and gender. Gender is measured using a dummy variable that takes the value of 1 if the respondent is male, and 0 if female.

2.2. Empirical strategy

This study examines the effect of Muslim domination and Muslim self-identification on concern about farmer-herder conflicts. The general form of the model could be expressed thus:

$$Y_t = \beta_0 + \beta_1 D_t + \beta_2 X'_t + \mu_t$$

Where Y_t is the dependent variable which measures the degree to which the respondents are concerned about farmer-herder conflicts. D_t denotes the explanatory variables that have already been discussed in section 3.1.2, X'_t is a vector of control variables measuring the respondents' demographic attributes, and t denotes the year in which the variables are measured. β_0 is the intercept, β_1 and β_2 are the coefficients of the explanatory and control variables respectively, while μ_t is the error term.

My a priori expectation is that Muslim domination and Muslim self-identification will both have a negative effect on concern about farmer-herder conflicts, but it is possible that people who are less concerned about farmer-herder conflicts reside in LGAs with a predominantly Muslim population and self-identify as Muslims. This leads to the problem of reverse causality. Even if reverse causality were not a problem, omitted variable bias might still pose a challenge because I might not control for all the confounding factors that could influence concern about farmer-herder conflicts in the regression model. To address these problems, I employ an instrumental variable approach. I estimate the model using the instrumental variable ordered probit (IVOprobit) regression, which is based on maximum likelihood estimation (MLE).

I use the IVOprobit model as the main estimation method because the dependent variable is measured on a four-point ordinal scale. I conduct a robustness check where I treat all the variables as continuous and re-estimate the model using two-stage least squares regression (2SLS).

I use the expansion of the Muslim caliphate in precolonial Nigeria as an instrumental variable for Muslim domination and Muslim self-identification. The rationale behind using this as an instrumental variable is influenced by the tendency for the past to persist and influence the present (Cirone & Pepinsky 2022; Guiso et al. 2016; Nunn 2012). In present-day Nigeria, majority of the population in the states that overlap with the territory that was part of the Muslim caliphate during the precolonial period is Muslim. In fact, 12 of the 19 states in Northern Nigeria adopted shariah law in 2000, a move that polarized Christians and Muslims across the country and led to violent clashes between members of the two religious groups (Kendhammer 2013; Suberu 2009).

Before Northern Nigeria was captured by the British at the beginning of the 20th century, it had been an Islamic caliphate (i.e. Sokoto Caliphate) for a century. The caliphate consisted of several emirates that were governed based on Islamic law (Kirk-Greene 1965, pp. 43-44). Prior to the establishment of the Sokoto Caliphate, Northern Nigeria was known as Hausaland and consisted mainly of people of Hausa ethnicity. The trans-Sahara trade between the Hausa people and merchants from the Maghreb states infused Islam into Northern Nigeria as early as the eleventh century. However, the religion was largely confined the courts of the Hausa rulers without any imposition on the local population (Falola & Heaton 2008, pp. 244-246; Harnischfeger 2006, pp. 40-41). Islam became deeply entrenched in Northern Nigeria when an Islamic cleric named Othman dan Fodio, launched a jihad against the rulers of Hausaland in 1904 (Smith 1976, p. 48). The jihad was aimed at reviving the commitment to Islam among the Hausa rulers whom dan Fodio had accused of engaging in pagan practices, enslaving Muslims, and subverting justice. The successful jihad led to the dethronement of the Hausa rulers and the

establishment of the Sokoto Caliphate – a state governed by Islamic law (Vaughan 2016, pp. 16-17; Van Beek 1988, pp. 157-158; Morel 1911, pp. 155-159).

After the capture of Hausaland, the jihadists pushed southwards, launching military campaigns against the pagan tribes in neighboring territories in order to spread Islam. The tribes residing in Nigeria's Middlebelt region – the spatial area around the southernmost part of Northern Nigeria, were particularly vulnerable to these attacks because of their proximity to the Muslim emirates (Vaughan 2016, p. 17; Harnischfeger 2006, p. 41; Morel 1911, p. 99). The Muslim emirates depended on slaves to function. Since it was forbidden for Muslims to enslave fellow Muslims – due to the brotherhood they shared under Islam, the jihadists frequently raided the pagan tribes whom they considered as "unbelievers" and enslaved them. The slaves were used as farm labor and for batter – i.e. in exchange for ammunition, horses, and other valuables (Van Beek 1988, pp. 163-166; Morel 1902, pp. 100-101). The spread of emirate influence was determined by exogenous factors like geography and the advent of British colonial rule.

The presence of tsetse flies and the dense tropical forests in Southern Nigeria made it inhospitable for the Muslim jihadists, thus curtailing the extent to which they could penetrate the Region (Coleman 1958, p. 39; Morel 1911, p. 99; Morel 1902, pp. 135). [7] Even within Northern Nigeria, some areas proved difficult for the jihadists to capture. For instance, the Jos Plateau, a highland nested between the Zaria and Bauchi Emirates, was never captured by the jihadists even though it was attacked serval times. This was because of the strategic military advantage that the elevated highland provided, coupled with the skill that the tribes residing there possessed in warfare (Morrison 1982).

The advent of the British colonialism also curtailed emirate expansion. In his 1903 speech at Sokoto after capturing Northern Nigeria, Lord Lugard, Nigeria's first Governor General, had stated: "Buying and selling slaves and enslaving people are forbidden." (Kirk-Greene, 1965, p. 43). However, Morel (1902) questioned the morality of the British, especially because of the

[7] A large swathe of the land area in Southern Nigeria falls within the rainforest vegetation zone.

violent approach they had adopted towards ending the practice of slavery. He also established parallels between British colonial rule and the slavery system they sought to abolish: "[H]ow often may not an expedition entered upon by a Mohammedan Emir against his pagan subjects in West Africa be as justifiable, if reckoned by the same standard, as the chastisement of a tribe by the representative of a European Power for resisting a tax enforced by that power, and considered by the tribe excessively unjust?" (p. 100).

Figure 8: Islam and Indigenous Religions in the Northern Nigerian Protectorate, 1900–1940.

Note: The map shows the sphere of emirate influence in pre-colonial Northern Nigeria. The degree of emirate influence varied across the region. It was strongest in the areas labeled "Mainly Muslim" and entirely absent in those areas labelled "Indigenous districts." Source of precolonial map: Vaughan (2016).

The pagan tribes, who did not appreciate being enslaved by the jihadists, often fought back. Some of them migrated to the Jos plateau because it was safer there (Morrison, 1982).

Majority of these pagan tribes who had lived under the threat of jihadist incursions, but who were never captured, eventually embraced Christianity as a means of resisting Muslim dominance. Vaughan (2016, p. 5) observed that "conversion from indigenous religions to Christianity by missionary societies was far from a simple religious act; Christian conversion became a crucial medium of collective action against Hausa-Fulani Muslim rulers." Similarly, Campbell and Page (2018, p. 70) noted: "[M]inority tribes prepared to move from, or add to, their traditional religion have found Christianity more attractive than Islam, especially in the north and the Middle Belt." The areas labelled as "Independent indigenous districts" in figure 8 are the uncaptured territories. These areas fall largely within the Middlebelt region. The population in the uncaptured territories still remains Christian today. To better demonstrate this historical persistence, I georeferenced the precolonial map using QGIS software and rendered the geolocations of the religious institutions over it. I deliberately put the layer containing all the mosques above that for the churches so the areas where churches are clustered could be better identified.

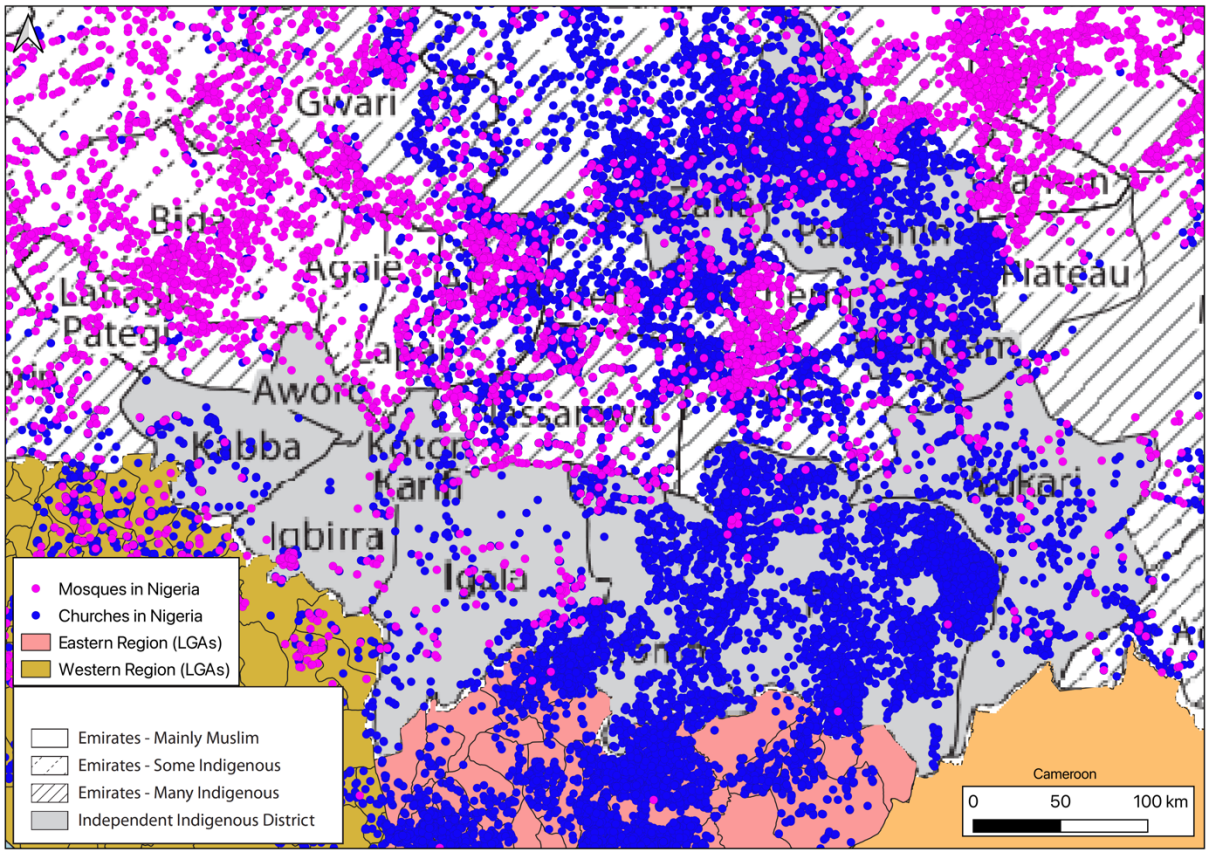

Figure 9: Concentration of Mosques and Churches in Uncaptured territory

Note: The figure zooms in on the area in Nigeria's Middlebelt Region that was never under emirate rule and shows the geolocations of all the churches and mosques there.

As shown in figure 9, majority of the religious infrastructure in the uncaptured territory are churches, which suggests that the population residing there is predominantly Christian. The figure also shows that the mosques are concentrated in the areas that were under emirate control in precolonial Nigeria. Such cultural persistence justifies my decision to use emirate influence as an instrumental variable for Muslim domination and Muslim self-identification. Campbell and Page (2018, p. 78) observed that "there is significant social and religious continuity between modern northern Nigeria and the two Muslim kingdoms, the Sultanate of Sokoto and the Kingdom of Bornu." I expect emirate influence to have a direct effect on Muslim self-identification and Muslim domination in present-day Nigeria, especially because culture, as well as settlement patterns, have persisted over time in Nigeria (Tuki 2022, pp. 13-14). However, I do not expect the jihadist incursions from over a century ago to have a direct effect on concern about farmer-herder conflicts today. Moreover, I have shown in the introductory section that violent farmer-herder conflicts are a recent phenomenon. I discuss the steps I undertook to develop the instrumental variable below.

Muslim Caliphate: The instrumental variable – *Muslim Caliphate* – is a dummy that takes the value of 1 if at least half of the spatial area that constitutes a local government area (LGA) overlaps with an area that was under emirate control in precolonial Nigeria. Relying on the map of precolonial Northern Nigeria, I define emirate territory as an area under any of the following three categories: "Emirates – Mainly Muslim", "Emirates – Some indigenous", and "Emirate – Many indigenous". I coded the remaining LGAs – i.e. those where at least half of their spatial area overlapped with the "Independent indigenous district" as well as those LGAs situated in Southern Nigeria – as 0.[8]

[8] I use the term "Southern Nigeria" loosely to mean the Eastern and Western Regions. Nigeria had previously consisted of only two main regions: Northern and Southern Regions. In fact, these two regions were distinct protectorates of the British, until in 1914 when, for administrative convenience, the British merged them to form Nigeria. In 1939, Southern Nigeria was divided into the Eastern and Western Regions, bringing the total number of administrative units to three.

Using QGIS software, I placed a shape file containing Nigeria's LGA administrative boundaries over the georeferenced precolonial map. Having made the shapefile containing the LGA administrative boundaries opaque, I was able to highlight all the LGAs that overlapped sufficiently with the areas under emirate control. The LGAs fitted snugly within the respective categorizations of the precolonial map due to their small sizes. See figure 10 for a visualization.

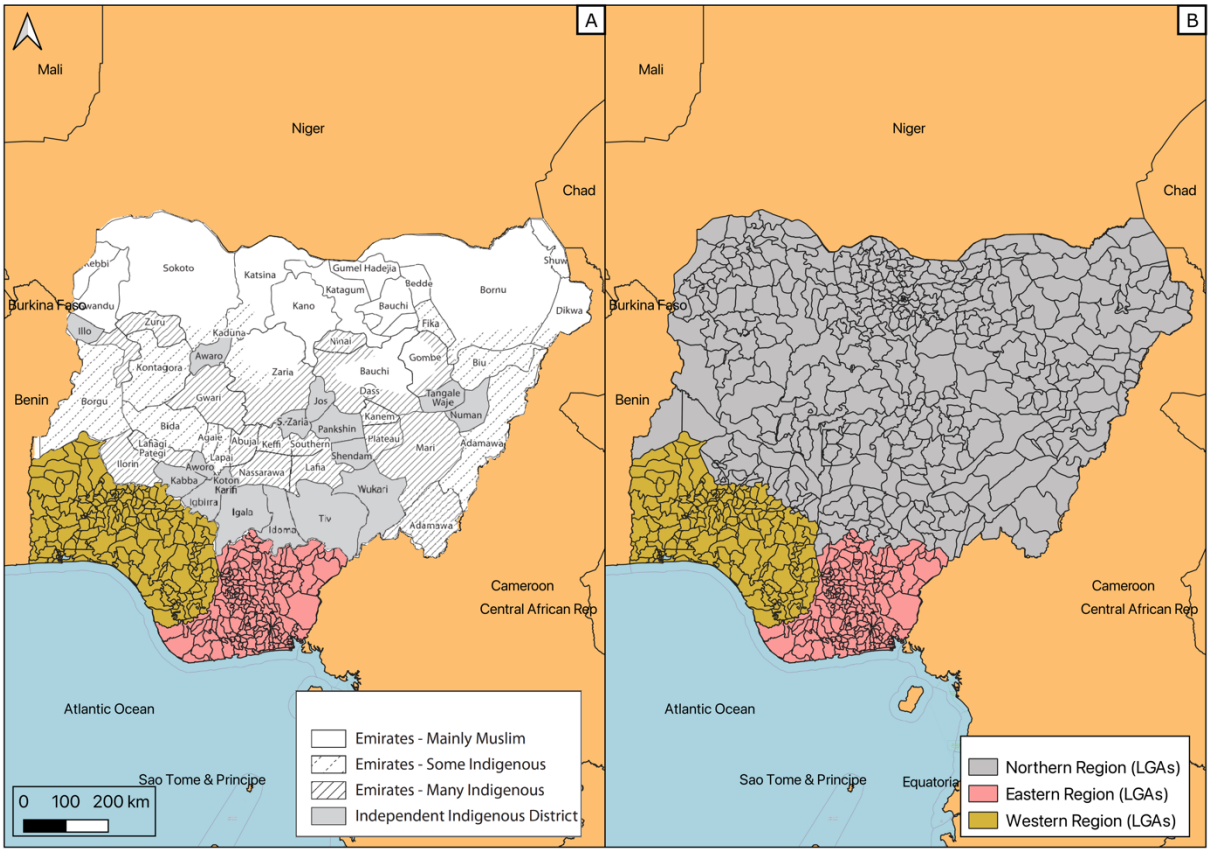

Figure 10: Developing a measure for Muslim Caliphate.

Note: Panel A shows Nigeria's precolonial map and the local government areas (LGAs) that constitute Nigeria's Eastern and Western Regions. Panel B shows the LGA administrative boundaries in Nigeria's three major regions.

2.3. Summary statistics

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Concern$^{\phi}$	1166	3.411	0.817	1	4
Concern (binary)$^{\phi}$	1166	0.88	0.325	0	1
Muslim domination	1195	0.435	0.496	0	1
Muslim self-identification	1319	0.393	0.489	0	1
Muslim caliphate	1319	0.407	0.491	0	1
Age	1166	33.214	12.761	18	80
Gender	1167	0.534	0.499	0	1

Note: *ϕ is the dependent variable. "Concern (binary)" is a reduced form of "Concern" where I collapse the responses into two main categories – concerned and not concerned.*

Table 1 presents the summary statistics of the variables used to estimate the regression models. The values are based on the subsample of respondents who had answered in the affirmative to the question probing whether they were aware of farmer-herder conflicts.

3.0. Results and discussion

3.1. Correlational analysis

Table 2: Correlates of concern about farmer-herder conflicts

Concern$^{\phi}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Muslim domination	-0.155**	-0.16**	-0.119**	-0.055***				
	(0.073)	(0.073)	(0.051)	(0.021)				
Muslim self-identification					-0.222***	-0.218***	-0.152***	-0.05**
					(0.069)	(0.069)	(0.048)	(0.02)
Constant			3.376***	0.888***			3.395***	0.894***
			(0.069)	(0.027)			(0.066)	(0.026)
Intercept 1	-1.753***	-1.638***			-1.791***	-1.654***		
	(0.075)	(0.118)			(0.073)	(0.113)		
Intercept 2	-1.243***	-1.126***			-1.281***	-1.141***		
	(0.058)	(0.109)			(0.058)	(0.105)		
Intercept 3	-0.241***	-0.117			-0.294***	-0.149		
	(0.049)	(0.106)			(0.048)	(0.102)		
Estimation method	Oprobit	Oprobit	OLS	LPM	Oprobit	Oprobit	OLS	LPM
Demographic controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	1058	1057	1057	1057	1166	1165	1165	1165
Pseudo R^2	0.002	0.007			0.004	0.009		
R^2			0.014	0.01			0.017	0.009
Log pseudolikelihood	-1074.767	-1069.329			-1176.560	-1170.591		
AIC	2157.534	2150.658	2563.733	621.973	2361.121	2353.182	2823.141	685.957

Note: *Robust standard errors are in parentheses, ϕ is the dependent variable, *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is measured on a four-point ordinal scale, except for models 4 and 8 where it is measured on a binary scale. Demographic control variables are the age and gender of the respondents.*

Table 2 reports the results of regression models examining the correlation between Muslim domination/self-identification and concern about farmer-herder conflicts. I used Muslim domination as the explanatory variable in models 1 to 4, and Muslim self-identification as the explanatory variable in models 5 to 8. I deliberately did not include both of them in the same

model to avoid the problem of multicollinearity. The correlation between them is 0.6, which is quite high. In model 1 – the baseline model where no control variables were added – Muslim domination carried the expected negative sign and was significant at the five percent level. This suggests a negative correlation between Muslim domination and concern about farmer-herder conflicts. In model 2 where I controlled for the respondents' demographic characteristics, Muslim domination remained significant at the five percent level and retained its negative sign. Also, the Akaike Information Criterion (AIC) statistic declined from 2,157 to 2,150, indicating that model 2 has a better fit than its predecessor. Keeping all covariates at their mean levels, the analysis showed that respondents residing in LGAs with a predominantly Muslim population are 7 percent less likely to choose the "Very concerned" response category compared to their counterparts residing in LGAs with a predominantly Christian population, when asked about how concerned they are about farmer-herder conflicts.[9] As a robustness check, I treated all the variables as continuous and re-estimated the model using ordinary least squares (OLS) regression rather than ordered probit (Oprobit) regression. As shown in model 3, Muslim domination retained its negative sign and remained significant at the 5 percent level. 88 percent of the respondents chose either the "Very concerned" or "Somewhat concerned" response categories when asked about how concerned they were about farmer-herder conflicts, while only 12 percent chose the "Not concerned at all" and "Not concerned" response categories. To better account for this skew, I estimated model 4 using the binary measure for concern about farmer-herder conflicts as the dependent variable. I also estimated the model using linear probability regression model (LPM). The results were consistent with those from the preceding models.

In model 5, I shifted the focus of the analysis to Muslim self-identification. Muslim self-identification carried the expected negative sign and was significant at the one percent level. This suggests a negative correlation between being Muslim and concern about farmer-herder conflicts. In model 6 where I added the demographic control variables, Muslim self-identification

[9] Table A1 in the appendix reports the marginal effects at the mean for model 2.

was still significant at the one percent level and carried a negative sign. The AIC statistic also declined from 2,361 to 2,353, indicating that model 6 has a better fit than its predecessor. Keeping all covariates at their mean levels, the analysis showed that respondents who identify as Muslims are 9 percent less likely to choose the "Very concerned" response category compared to their Christian counterparts, when asked about how concerned they are about farmer-herder conflicts.[10] In model 7 where I treated all the variables as continuous and re-estimated the model using OLS regression rather than Oprobit regression, the sign and significance level of Muslim self-identification remained unchanged. In model 8 where I rather used the binary measure for concern about farmer-herder conflicts and estimated the model using LPM, Muslim self-identification retained its negative sign; however, its significance level dropped to five percent. These results presented so far are correlations. To move towards a causal claim, I estimated some models using instrumental variable regression. I present the results in the subsequent section.

3.2. Effect of Muslim domination and Muslim self-identification on concern about farmer-herder conflicts

3.2.1. First-stage regressions

Table 3: Association between instrumental and endogenous variables

	Muslim domination$^{\phi}$		**Muslim self-identification$^{\phi}$**	
	(1)	**(2)**	**(3)**	**(4)**
Muslim caliphate	0.7***	0.713***	0.537***	0.643***
	(0.021)	(0.022)	(0.024)	(0.023)
Constant	0.136***	0.112***	0.174***	0.165***
	(0.013)	(0.029)	(0.014)	(0.033)
Estimation method	OLS	OLS	OLS	OLS
Demographic controls	No	Yes	No	Yes
Observations	1195	1058	1319	1166
R^2	0.487	0.506	0.292	0.402

Note: *Robust standard errors are in parentheses, ϕ is the dependent variable, *** p<0.01, ** p<0.05, * p<0.10. Demographic control variables are the age and gender of the respondents.*

Table 3 reports the results of the first-stage regressions examining the association between Muslim caliphate and Muslim domination/self-identification. I used Muslim domination as the dependent variable in models 1 and 2, and Muslim self-identification as the dependent

[10] Table A2 in the appendix reports the marginal effects at the mean for model 2.

variable in models 3 and 4. In model 1 – the baseline model – Muslim caliphate carried the expected positive sign and was significant at the one percent level. This suggests a positive relationship between areas that were under emirate influence in precolonial Nigeria and Muslim dominance in an LGA in present-day Nigeria. Muslim caliphate retained its positive sign and remained significant at the 1 percent level in model 2 where I added the demographic control variables. In model 3 where I rather focused on Muslim self-identification, Muslim caliphate was significant at the one percent level and carried the expected positive sign. This indicates a positive association between emirate influence in precolonial Nigeria and Muslim self-identification today. As shown in model 4, this result is robust to the inclusion of demographic control variables.

3.2.2. Second-stage regressions

Table 4 reports the results of the second-stage regression models examining the effect of Muslim domination/self-identification on concern about farmer-herder conflicts. I used Muslim domination as the explanatory variable in models 1 to 4, and Muslim self-identification as the explanatory variable in models 5 to 8. In model 1 – the baseline model – Muslim domination was significant at the five percent level and carried the expected negative sign. This suggests that Muslim domination has a negative effect on concern about farmer-herder conflicts. In model 2 where I added the demographic control variables, Muslim domination retained both its sign and significance level. In model 3 where I added dummy variables for all the ethnic groups represented in the sample, the sign and significance level of Muslim domination remained unchanged. In model 4, I treated all the variables as continuous and re-estimated the model using two-stage least squares (2SLS) regression rather than the instrumental variable ordered probit (IVOprobit) regression model. Congruent with the previous models, Muslim domination remained significant at the five percent level and retained its negative sign. The Durbin and Wu-Hausman statistics were 4.65 and 4.53, both of which were significant at the 5 percent level. This suggests that endogeneity was indeed present and the use of an instrumental variable approach in estimating the model was appropriate. Moreover, the first-stage regression had an F

statistic of 170 which exceeds the threshold of 10 specified by Stock et al. (2002) to determine the reliability of the 2SLS estimates.

Table 4: Muslim domination/self-identification and concern about farmer-herder conflicts I

Concern$^{\phi}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Muslim domination	-0.233**	-0.24**	-0.392**	-0.535**				
	(0.101)	(0.102)	(0.197)	(0.231)				
Muslim self-identification					-0.33***	-0.33***	-0.589***	-0.86**
					(0.107)	(0.108)	(0.209)	(0.357)
Constant				3.625***				3.923***
				(0.223)				(0.341)
Intercept 1	-1.785***	-1.669***	-1.672***		-1.838***	-1.703***	-1.818***	
	(0.079)	(0.124)	(0.203)		(0.079)	(0.122)	(0.206)	
Intercept 2	-1.275***	-1.155***	-1.145***		-1.327***	-1.189***	-1.293***	
	(0.065)	(0.116)	(0.2)		(0.067)	(0.114)	(0.204)	
Intercept 3	-0.273***	-0.147	-0.105		-0.341***	-0.197*	-0.271	
	(0.057)	(0.112)	(0.202)		(0.06)	(0.111)	(0.209)	
Estimation method	IVOprobit	IVOprobit	IVOprobit	2SLS	IVOprobit	IVOprobit	IVOprobit	2SLS
Demographic controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Ethnic group dummies	No	No	Yes	Yes	No	No	Yes	Yes
Observations	1058	1057	1057	1057	1166	1165	1165	1165
Loglikelihood	-1453.516	-1448.075	-1417.789		-1716.473	-1710.389	-1677.577	
Durbin statistic				4.652**				4.593**
Wu-Hausman statistic				4.535**				4.488**
F statistic (first-stage)				170.021***				53.635***

Note: *ϕ is the dependent variable, Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10. Only the 2nd-stage regressions have been reported. Demographic control variables are the age and gender of the respondents.*

In model 5 – the baseline model – I shifted the focus of the analysis to Muslim self-identification. Muslim self-identification was significant at the one percent level and carried the expected negative sign. This suggests that Muslim self-identification has a negative effect on concern about farmer-herder conflicts. This result is robust to the inclusion of the demographic control variables (model 6), dummy variables for all the ethnic groups (model 7), and 2SLS regression as an alternative estimation method (model 8).[11]

[11] I estimated additional models where I controlled for the degree to which the respondents were exposed to pastoral conflict and the climatic condition – temperature – around their dwellings. I deliberately did not include these control variables in my main results because they are potentially endogenous. Table A3 in the appendix reports the results of the models where I included these additional control variables.

Robustness check

Table 5: Muslim domination/self-identification and concern about farmer-herder conflicts II

Concern$^{\phi}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Muslim domination	-0.103***	-0.103***	-0.292***	-0.499***				
	(0.028)	(0.028)	(0.094)	(0.137)				
Muslim self-identification					-0.124***	-0.123***	-0.425***	-0.581***
					(0.03)	(0.03)	(0.149)	(0.141)
Constant	0.923***	0.906***	1.05***	1.3***	0.935***	0.923***	1.176***	1.375***
	(0.016)	(0.031)	(0.09)	(0.156)	(0.017)	(0.03)	(0.142)	(0.149)
Estimation method	2SLS	2SLS	2SLS	IVProbit	2SLS	2SLS	2SLS	IVProbit
Demographic controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Ethnic group dummies	No	No	Yes	No	No	No	Yes	No
Observations	1058	1057	1057	1057	1166	1165	1165	1165
Log likelihood				-759.469				-957.495
Durbin statistic	5.833**	5.852**	9.195***		9.548***	9.662***	9.667***	
Wu-Hausman statistic	5.848**	5.857**	9.003***		9.603***	9.7001***	9.488***	
F statistic (first-stage)	1084.22***	1076.18***	170.021***		777.37***	771.631***	53.635***	

Note: *ϕ is the dependent variable, Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10. Only the 2nd-stage regressions have been reported. Demographic control variables are the age and gender of the respondents.*

It is possible that the results reported in Table 4 are influenced by how the dependent variable was measured. I estimated some additional models where I rather used the binary measure for concern about farmer-herder conflicts as the dependent variable. The results are reported in table 5. Models 1 to 4 focus on Muslim domination, while models 5 to 9 focus on Muslim self-identification. Also, I treated all the variables as continuous and estimated the models using 2SLS, except for models 4 and 8 where I took the binary nature of the dependent variable into account and thus estimated the model using instrumental variable probit (IVProbit) regression.

In model 1 – the baseline model – Muslim domination still carried the expected negative sign and was significant at the one percent level. This finding is robust to the inclusion of the demographic control variables (model 2), dummies for the ethnic group of all the respondents (model 3), as well as an alternative estimation method (model 4). In model 5, I shifted the focus of the analysis to Muslim self-identification. Muslim self-identification was significant at the one percent level in the baseline model and carried the expected negative sign. This result is also robust to the inclusion of the demographic control variables (model 6), dummy variables for the ethnic group of all the respondents (model 7), as well as an alternative estimation method (model 8).

4.0. Conclusion

This study examined the effect of Muslim domination and Muslim self-identification on concern about farmer-herder conflicts using econometric techniques and representative data for Nigeria. The instrumental variable regression results showed that Muslim domination – a scenario where the number of Muslims residing in an LGA exceeds the number of Christians – had a negative effect on concern about farmer-herder conflict. The analysis also showed that Muslims were less concerned about farmer-herder conflicts than their Christian counterparts. A plausible mechanism behind these findings is that the common religion of Islam shared by the nomadic Fulani herders and the Muslim sedentary population makes it easier for conflicts over land and water resources to be resolved amicably without any recourse to violence. These results are robust to different estimation methods and an alternative operationalization of concern about farmer-herder conflicts.

These results highlight the need for religion to be considered in the analysis of farmer-herder conflicts in Nigeria. Its neglect prevents a holistic examination of the conflict and conceals some potentially insightful mechanisms that might be crucial in understanding the conflict better and possibly resolving it. Moreover, solutions could sometimes be found in the places where we are least willing to look. The results also highlight the need for policymakers to direct more effort towards fostering inter-religious trust among Christians and Muslims in Nigeria. Once trust is established, it then becomes much easier for disputes over land and water resources to be resolved peaceably.

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Appendix

Table A1: Marginal effects at the mean for model 2 in Table 2

Concern$^{\phi}$	Not concerned at all	Not concerned	Somewhat concerned	Very concerned
	(1)	(2)	(3)	(4)
Muslim domination	0.015**	0.016**	0.031**	-0.063**
	(0.007)	(0.008)	(0.014)	(0.029)
Age	-0.001**	-0.001**	-0.001**	0.003**
	(0.00)	(0.00)	(0.001)	(0.001)
Gender	0.016**	0.018**	0.034**	-0.068**
	(0.007)	(0.008)	(0.014)	(0.028)

Note: *ϕ is the dependent variable, *** p<0.01, ** p<0.05, * p<0.10. Numbers in parenthesis below the response categories are the ordinal values assigned to them.*

Table A2: Marginal effects at the mean for model 6 in Table 2

Concern$^{\phi}$	Not concerned at all	Not concerned	Somewhat concerned	Very concerned
	(1)	(2)	(3)	(4)
Muslim self-identification	0.02***	0.022***	0.042***	-0.085***
	(0.007)	(0.007)	(0.014)	(0.027)
Age	-0.001**	-0.001**	-0.001**	0.003**
	(0.00)	(0.00)	(0.001)	(0.001)
Gender	0.015**	0.017**	0.031**	-0.063**
	(0.007)	(0.007)	(0.014)	(0.027)

Note: *ϕ is the dependent variable, *** p<0.01, ** p<0.05, * p<0.10. Numbers in parenthesis below the response categories are the ordinal values assigned to them.*

Table A3: Regression models with additional control variables

Concern$^{\phi}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Muslim domination	-0.235**	-0.343*	-0.546**			
	(0.11)	(0.207)	(0.261)			
Muslim self-identification				-0.34***	-0.561**	-0.935**
				(0.116)	(0.219)	(0.423)
Temperature (2016)	0.03	-0.028	0.047	0.039	-0.013	0.076
	(0.047)	(0.054)	(0.041)	(0.046)	(0.052)	(0.047)
Pastoral conflict (30km)	0.008	0.004	0.002	0.007	0.003	0.002
	(0.005)	(0.009)	(0.006)	(0.005)	(0.009)	(0.006)
Constant			2.331**			1.865*
			(1.072)			(1.11)
Intercept 1	-0.814	-2.401		-0.603	-2.166	
	(1.305)	(1.51)		(1.26)	(1.442)	
Intercept 2	-0.299	-1.874		-0.087	-1.64	
	(1.306)	(1.511)		(1.261)	(1.444)	
Intercept 3	0.71	-0.833		0.905	-0.618	
	(1.306)	(1.512)		(1.261)	(1.444)	
Estimation method	IVOprobit	IVOprobit	2SLS	IVOprobit	IVOprobit	2SLS
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic group dummies	No	Yes	Yes	No	Yes	Yes
Observations	1057	1057	1057	1165	1165	1165
Loglikelihood	-1446.789	-1417.43		-1709.305	-1677.473	
Durbin statistic			3.948**			4.023**
Wu-Hausman statistic			3.839*			3.923**
F statistic (first-stage)			138.379***			39.646***

Note: *ϕ is the dependent variable, Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.10. Only the 2nd-stage regressions have been reported. Demographic control variables are the age and gender of the respondents.*

I deliberately refrained from adding temperature and exposure to pastoral conflicts into the main results reported in the paper because they are potentially endogenous. For instance, the adverse effects of climate change like rising temperatures could deplete vegetation and dry-up water sources, leading to increased conflicts over land and water resources, which in turn could lead to increased concern about farmer-herder conflicts. Conversely, people who are concerned about farmer-herder conflicts might be those who reside in areas that are exposed to high temperature. Exposure to pastoral conflict could also make people more concerned about farmer-herder conflict. Conversely, people who are concerned about farmer-herder conflicts may be those who are exposed to pastoral conflicts. The two-way relationship in both cases highlights the problem of reverse causality.

To mitigate this problem, I lagged both temperature and exposure to pastoral conflicts before adding them to the model. I considered the mean annual temperature around the dwellings of the respondents for the year 2016 – since the dependent variable is measured in 2017. Moreover, while developing the measure for exposure to pastoral conflicts, I considered

only incidents that occurred between 1997 to 2016. The start date of 1997 was used because the ACLED data is available starting from that year. The cut-off of 2016 also lags the variable. Table 3 reports the results of the models where I have included the additional control variables. I focused on Muslim domination in models 1 to 3, and Muslim self-identification in models 4 to 6. The results are consistent with those reported in the main text.

Description of the two additional variables

Temperature: This measures the mean temperature around the dwellings of the respondents for the year 2016 in degree Celsius. I obtained the temperature data from the Climatic Research Unit (CRU) at the University of East Anglia (Harris et al. 2020). The temperature data is in 55km x 55km grid cells, with each cell having a unique temperature value.

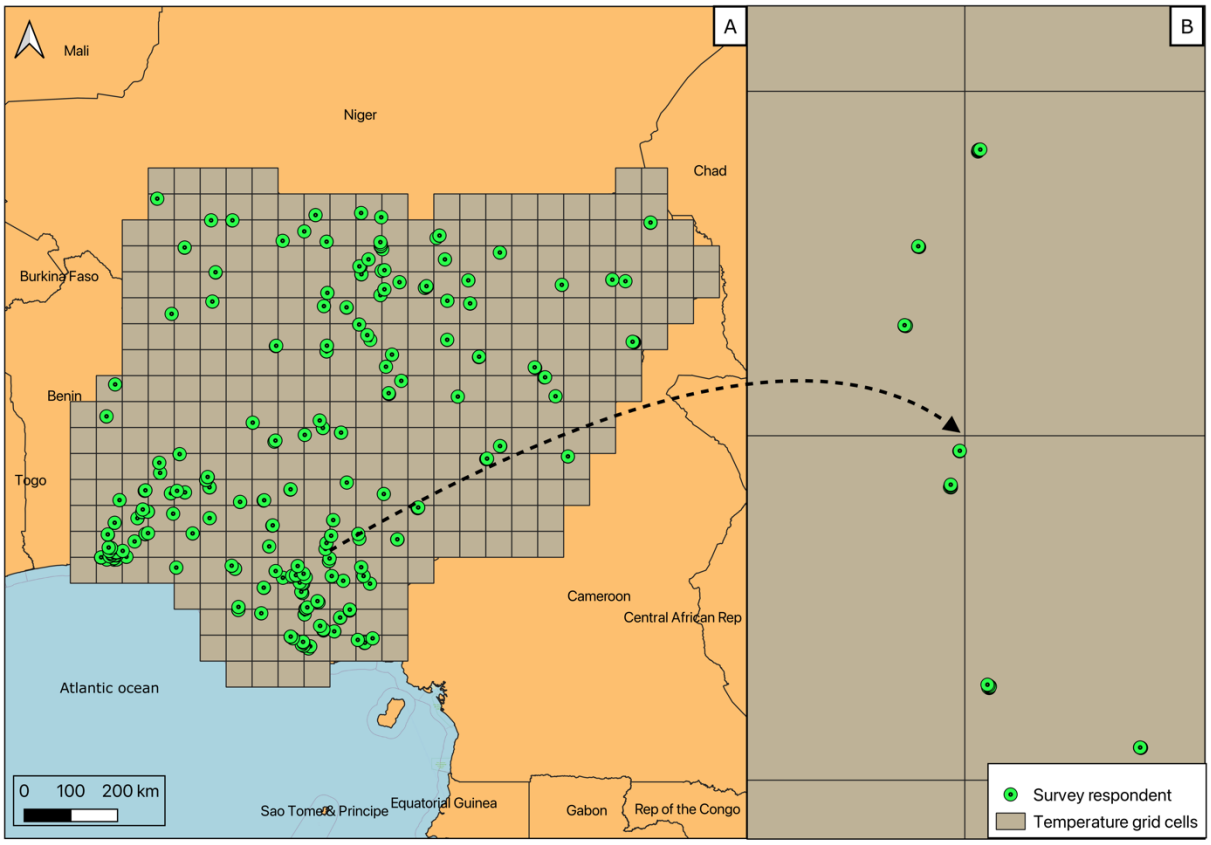

Figure A1: Measuring exposure to pastoral conflict

Note: Panel A shows the geolocations of all the survey respondents, as well as the 55km x 55km temperature grid cells across Nigeria. Panel B zooms in to show a better depiction of the geolocations of the respondents within the 55km x 55km temperature grid cells.

To determine the temperature around the dwellings of the respondents, I assigned to each of them the temperature of the grid cell within which they reside as shown in figure A1.

Pastoral conflict: This measures the total number of pastoral conflicts within the 30km buffer around the respondents' dwellings that caused at least one fatality. Because I am particularly interested in the cumulative effect of conflict exposure, I considered all the conflicts within the 30km buffer from 1997 to 2016. Moreover, some studies have shown the capacity for past conflict to influence behavior in the present. The conflict data was obtained from the Armed Conflict Location and Events Database (ACLED) (Raleigh et al., 2010).

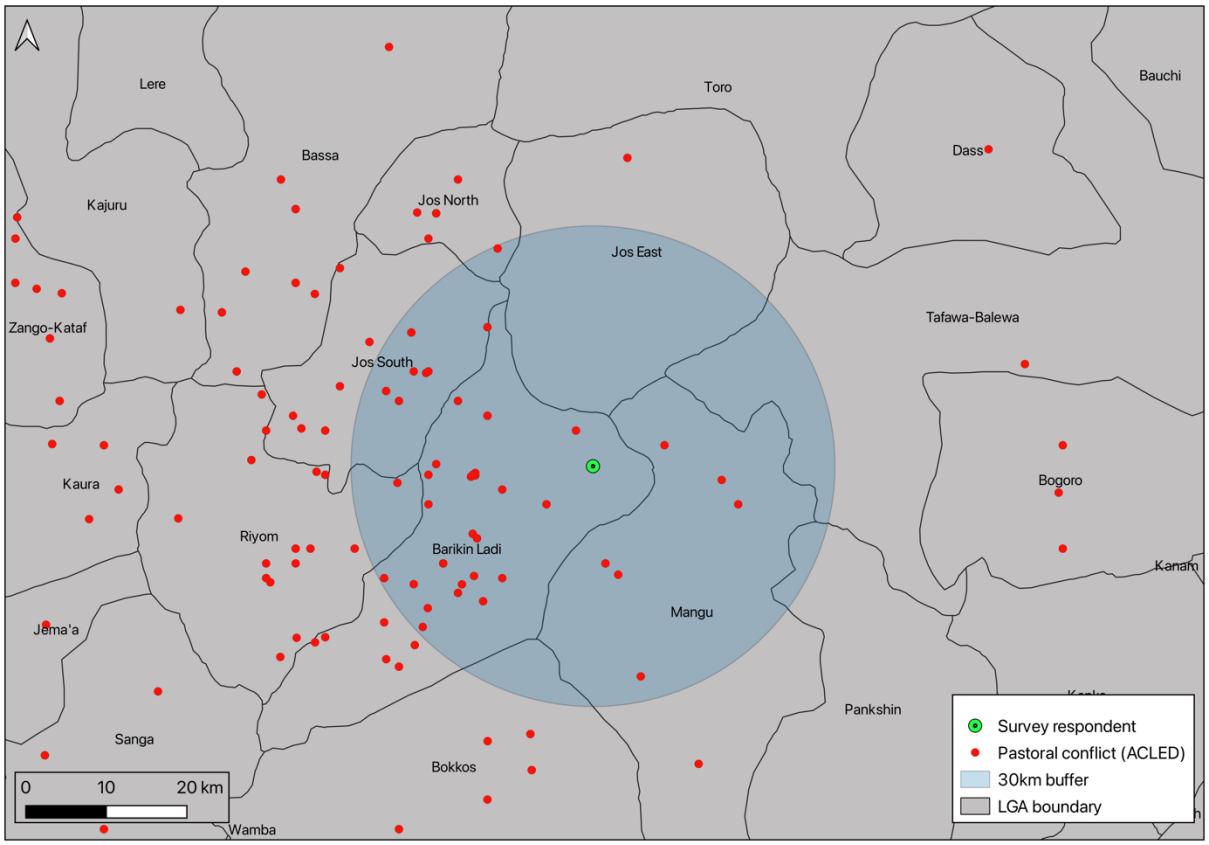

Figure A2: Measuring exposure to pastoral conflict

Note: The figure shows the geolocation of a hypothetical respondent, the geolocations of the pastoral conflicts, the 30km buffer around the respondent's dwelling, and the local government area (LGA) administrative boundaries.

Figure A2 visualizes the measure for exposure to pastoral conflicts. Buffers are a more efficient way of measuring exposure to pastoral conflicts than the LGA administrative boundaries because it is possible for incidents in a contiguous LGA to be closer to a respondent's dwelling than those within the particular LGA where he or she resides.

Table A4: Descriptive statistics for the additional control variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Temperature	1311	27.603	0.94	23.617	30.183

Pastoral conflict (1 fatal) (30km)	1311	2.423	7.902	0	59

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