

After forever: Pre-colonial states and civil conflict

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Abstract

This paper examines the relationship between the presence of pre-colonial states and post cold war civil conflict, and finds a significant overall conflict inducing effect to pre-colonial states at the local level. However, I argue this effect is conditional on the relationship between the pre-colonial and post-independence states, as captured/proxied by the distance from the pre-colonial state to the post-independence capital. I find that higher levels of pre-colonial state presence are conflict reducing in areas surrounding modern capital cities, consistent with greater continuity of traditions and institutions associated with statehood that are inherently conflict reducing. While in areas further away from the post-independence capital higher levels of pre-colonial statehood is conflict inducing, where state legacies can leave/produce/provide powerful symbols of independence useful for mobilization, and regional elite networks with the potential to violently resist state expansion into their sphere of influence. Additionally, the paper introduces the Geo-ISD data set, which dynamically maps the borders of 82 independent states in Africa in the 1800-1914 period.

Keywords— Conflict, civil war, pre-colonial states, GIS, ZINB, historical state entities

1 Introduction

Only a handful of recent studies have looked at how independent pre-colonial African polities have shaped post independence conflict, despite their simultaneous or immediately preceding existence. Within this emerging literature, the effect of pre-colonial states on civil conflict appears contradictory. While some find a conflict inducing effect due to differences between ethnic groups with and without histories of statehood (Englebert et al., 2002; Paine, 2019), others find a conflict reducing effect from institutions inherited from these states (Depetris-Chauvin, 2016; Wig, 2016).

This paper addresses this puzzle by arguing that the effect of pre-colonial states on civil conflict, at the local level, is determined by the relationship between the pre-colonial and post-independence states. On the one hand, the degree to which one or more pre-colonial states forms the basis of the post-independence state. And, on the other hand, if pre-colonial states form the basis of regional competitors to the post-independence state. I argue that this can be [proxied] by the distance to the post-independence capital. Close to capitals, high levels of pre-colonial state presence reflects a degree of continuation of rule, providing legitimacy and institutions that are inherently peace inducing. Conversely, low levels of state presence reflect a lack of foundation for the modern state, and is an indication of capitals created by and for colonial administration. Outside capital areas the story is reversed. In such/these areas pre-colonial states leave behind powerful symbols of independence useful for mobilization, as well as regional elite networks with the potential to violently resist state expansion into their sphere of influence.

Nigeria provides an illustrative example of some of these [mechanisms]. Northern Nigeria is [dominated by] the two former empires of the Sokoto Caliphate (and its [twin/sibling state] Adamawa) and Borno (also referred to as Kanem-Borno)[see figure X, when it gets here], which form the basis of the Muslim-North-Christian-South division of the country. The North has seen a lot of state based violence in the post-cold war period. Boko Haram, who has been responsible for the majority of this violence, draw their inspiration and legitimacy from the jihad which led to the establishment of the Sokoto Caliphate, and seek to implement this style of caliphate the current Borno state (Pieri and Zenn, 2016). To the South, the capital of Lagos lies within the borders of multiple pre-colonial Yoruba states such as Oyo [and? Are there multiple?]. In contrast to the North the areas surrounding Lagos have seen no state-based violence in the post-cold war period. [Tensions between the North and the South were also at the core of the 1967-70 civil war, but that falls outside sample period.]

To test the overall effect of pre-colonial state presence on local levels of state-based violence, as well as how this relationship is moderated by distance to the post-independence capital, I introduce new and innovative data on pre-colonial statehood in Africa. The data leverages variations in how both primary and secondary sources conceptualized and mapped statehood, to go beyond the Cartesian model of mapping states, and provide a topographical measure of historical state presence. Instead of a uniform measure of states' territories with 'hard' boundaries, I propose one

of gradually dissipating state presence outside core areas and fuzzy borders. Additionally, the data covers more states than comparative data sets, without compromising on the inclusion criteria for statehood. Finally, it geocodes individual pre-colonial states, as opposed to aggregating to current administrative levels or ties to settlement patterns of related ethnic groups, both of which introduce issues of post treatment bias [footnote elaboration].

The paper finds that there is a significant overall conflict inducing effect of pre-colonial states. However, this effect is conditioned on the distance to current capitals. In line with theoretical expectations I find a substantial conflict reducing effect at moderate levels of pre-colonial statehood near post-independence capitals, from an initially high level of conflict in cases of no, or very low levels of statehood. I find that low levels of pre-colonial state presence are conflict reducing in areas remote to post-independence capitals, while high levels of state presence are conflict inducing.

2 The legacies of pre-colonial states

[Literature section]

Despite the emerging literature on the impacts of traditional and pre-colonial states and institutions, the nature of the relationship between such legacies and conflict remains disputed. According to a game theoretical perspective like that of Fearon (1995), pre-colonial institutions should be conflict reducing. Groups who interact with the (modern) state through (traditional or otherwise) institutions reduce the uncertainty of future behaviour relative to groups who bargain through individuals, who are inherently more unpredictable and more prone to spoilers (Wig, 2016). Additionally, institutions are able to make credible commitments by putting restraints on their leaders through imposing violation costs. If a leader reneges on a commitment ratified by an institution, it reduces the legitimacy of the institutions and thus other laws passed by it. Pre-colonial or traditional institutions could also be conflict reducing by improving local state capacity, which could have a direct effect on the states ability to impose and preserve order as well as an indirect effect through economic development (Depetris-Chauvin, 2016), and better public goods provision (Wilfahrt, 2021).

On the other hand, authors like Englebert et al. (2002) and Alesina et al. (2011) have emphasized how countries as a whole are affected by multiple pre-colonial state. Englebert et al. (2002) argues that colonial boundaries that bundled together multiple ethnic groups with different historical experiences of political organization, led to a ‘suffocation’ effect. In such an environment, post-independent states found it difficult to create a sense of nationality, cohesion or solidarity among its population, leading to higher levels of conflict (Englebert et al., 2002). This argument ties in to the larger literature on ‘artificial states’, which argues that many states, in Africa in particular, are artificial in the sense that their boundaries do not reflect the underlying topography of statehood (Alesina et al., 2011). This artificiality has been linked to lower levels of economic development, presumably working in part through increased ethnic tensions and conflict (Alesina et al., 2011). In

this view, both having no pre-colonial states, as well as having more than one, could be considered artificial.¹

In cases where there are multiple groups with similar claims to pre-colonial independence, this can make conflict a rational option for the state². Choosing to accommodate one claims-making group in such an environment could lead to further claims by similar groups (Walter, 2009). This makes the option of punishing any group who makes demands relatively cheaper, and thus makes conflict a more likely outcome (Wishman and Butcher, TBD).

Ethnic groups with a history of statecraft, are likely to have an over sized share of power in government (Wucherpfennig et al., 2016). This can come about through indirect colonial rule, which preferred to leaving existing power structures intact, or by seizure from less politically experienced groups following independence (Paine, 2019). When faced with a trade off between including strong rivals³ in government and risking coups, and excluding them and risking civil conflict, rulers generally avoid risk of coup (Paine, 2019; Powell, 2014; Roessler, 2011).⁴ Paine (2019) predicts that pre-colonial state groups are more likely to be in such a situation due to commitment issues vis-a-vis other groups, and thus are more often engaged in civil conflicts. This also ties in with the substantial literature on the conflict inducing impact of horizontal inequalities (Cederman et al., 2011).

Apart from institutions, pre-colonial states potentially leave behind symbols of sovereignty and elite networks (Wishman and Butcher, TBD). Past independence has become an important ingredient in most separatist struggles, and is used by conflict entrepreneurs to overcome collective action problems⁵, as well as to provide a basis for ethnic claims making by referring to past violations of sovereignty (Ahram, 2019; Shelef, 2016). Vertical elite networks⁶ are useful for mobilization, and elites tend to have expectations of being included in government, have substantial regional autonomy, or both (Wishman and Butcher, TBD). Recent work by Ying (2020) indicates that civil conflict tends to occur when the state increases its presence in areas that it has hitherto not been present, i.e. when it challenges the autonomy of regional elites. For example, in Ethiopia, the Afar Liberation Front was originally formed by the sultan of the former pre-colonial state of Awsa, when the Dirge regime tried to depose the sultan (Shehim, 1985; Hanfare, 2011). In Libya the Cyraneica Liberation Army demonstrates both the symbolic mechanism as well as the elite networks, as its

¹At least when these states were incorporated into the current boundaries by external force (such as colonizers), as opposed to ‘indigenously’ (as for example the 100+ states of Germany being unified by Prussia).

²Conflict is otherwise assumed to be the outcome of miscalculations due to information problems in most game theory models.

³‘Strong rivals’ refer to rival (ethnic) groups who would be capable of punishing the ruling group for exclusion.

⁴Note that in some cases the ruler is forced to include the rival group, for example in cases of split dominion, when the colonial power split the responsibility of the civil and military administration between different ethnic groups (Paine, 2019).

⁵As exemplified by Boko Haram’s use of the Sokoto caliphate and Kanem Bornu referred to in section 1.

⁶The vertical orientation of these networks stem from the vertical power structures typical of states.

name refers to a short lived kingdom in Eastern Libya, and the group elected a descendent of the former king as their leader (Ahram, 2019). [Should I mention that this example falls just outside the sample period?]

[Include resistance to Western influences/institutions?]

3 Determining mechanisms

[This section is a first draft rewrite]

Summarising the literature it is evident that pre-colonial states could have either conflict inducing or conflict reducing effects. While the literature points to mechanisms that are both conflict inducing and conflict reducing, most of these mechanisms are not mutually exclusive at the local level. I argue that the final outcome for local levels of state based violence, is determined by which of these mechanisms are active, which is in turn determined by the local level of pre-colonial state presence, and the relationship between the pre-colonial and the post-independence states.

3.1 State capacity

The contribution of pre-colonial states to post-independence state capacity is unlikely to be uniform. Once again Nigeria serves an interesting example. Despite the post-independence capital Lagos being on the southern coast, in the years following independence ‘Northerners’ wielded a disproportionate share of power. This was evident and from the location of numerous development projects and military installations, to the grievance of ‘Southerners’ (Bates, 2008). While ‘Northerners’ dominated the political system, that system was not in any way based on their own institutions, which were still relatively intact in both Sokoto and Borno (both of which had been ruled indirectly by the British). Eventually, the distance between the levers of power and their base of support proved too great, as evidenced by the Nigerian civil war (Biafra secession) which was largely a revolt against the Muslim/‘Northerner’ domination of government. The conflict ended in a number of coups with an end to this domination.

A counter example of this is Ghana, where the post-independence capital of Accra lies on the fringes of the pre-colonial state of Ashanti. Following independence Ashanti reached a power sharing agreement with the government [source on this Charles?], and while Ghana has suffered several coups and non-state conflicts, there has been little state-based violence.

I argue that, while groups with ties to pre-colonial states are likely to have greater representation in post-independence government (Paine, 2019), only those states with close geographical/physical proximity to the capital is likely to contribute to national level institutions or legitimacy. In other words, at the local level the state capacity mechanism (whereby pre-colonial state presence is negatively correlated with conflict), should only work in areas close to the post-independence capital. Further away from the capital this mechanism only works if the pre-colonial state in a

given area has contributed to the post-independence state institutions or legitimacy, which is most likely only true of pre-colonial states close to the post-independence capital. Given that state presence is assumed to be highest around a core area of state control and gradually fade toward its peripheries, the likelihood that high levels of pre-colonial state presence are from the “legacy” group decreases. As a result, the potential positive effect of such areas is likely to be “crowded out” by the non-contribution of states like Borno and Sokoto.

3.2 Artificiality

There have been multiple attempts at measuring the degree to which states can be called artificial. Most notably as the ‘squigglyness’ or straightness of its borders, or the spread (standard deviation) of the pre-colonial political centralization of its constituent ethnic groups. The core concept these measures attempt to capture is the degree of correspondence between the pre-colonial, or historical, topography of statehood. To what degree do current boundaries reflect an endogenous historical process. Pre-colonial state presence can be a measure of the local level of state artificiality. Low levels of pre-colonial state presence would correspond with some degree of artificiality, but especially so in and around the post-independence capital. High levels of pre-colonial state presence could either reflect more, or less, artificiality, depending on whether that presence is from a pre-colonial state whose position within the post-independence state is the result of a historically endogenous process, or not. In other words, is the origin of the state presence from a/the pre-colonial state that the post-independence state is a continuation of, from a pre-colonial state that was incorporated into that state (endogenous historical process), or from a pre-colonial state that is within the post-independence boundaries as a result of some exogenous historical process (such as colonization or international mandate/agreement)? According to the same logic as in the state capacity mechanism, state artificiality predicts a inverse relationship between pre-colonial state presence and state-based violence in capital-adjacent areas. For areas further away from the post-independence capital however, high levels of pre-colonial state presence, rather than represent non-contribution, would be an indication of more artificiality, and thus more conflict.

[State capacity is closely linked with how artificial a state is. While this has not yet been examined explicitly, the assumption is that more artificial states are less capable.]

3.3 Credible bargaining

If it is true that pre-colonial states provide local institutions that can lend credibility to commitments, and thus contribute to conflict prevention and conflict resolution, then it follows that pre-colonial state presence should be conflict reducing at the local level irrespective of the relationship to the post-independence state. [It could still be different at the national level, but that might not be relevant for this paper.]

	Low distance to capital	High distance to capital
High state presence	State capacity, artificial states, credible commitments	Artificial states, elite networks, symbols, Credible commitments
Low state presence	Artificial states, state capacity	Artificial states ⁷

Table 1: Conflict inducing predictions in red, conflict reducing predictions in blue.

3.4 Symbols of past sovereignty

If pre-colonial states provide symbols of past sovereignty that are useful for overcoming collective action problems and mobilize against the government. These symbols should only matter for conflict when they represent a potential competitor to the post-independence state. Again, given the logic that the relationship between the pre-colonial and post-independence state can be [proxied] by the distance to the post-independence capital, this mechanism predicts more conflict in high pre-colonial state presence areas far from the capital.

3.5 Elite networks

As with symbols of past sovereignty, local elite networks should not influence local levels of state-based violence, unless they form local power bases in opposition to the government. Areas with high levels of pre-colonial state presence far from the capital should therefore be more prone to elite networks, with roots in a pre-colonial state, using organized violence to resist the central government.

3.6 Summarising predictions

Table 1 summarises the theoretical predictions/expectations the effect of pre-colonial state presence on local levels state-based violence grouped by distance to capital is illuminating. By grouping the mechanisms in this way, it becomes clear that the only [contradiction] that remains in the literature is what to expect in areas of high levels of pre-colonial state presence far from the capital.

Accordingly this paper will test the general relationship between pre-colonial state presence and local levels of state-based violence, before testing the relationship conditional on the distance to post-independence capital.

H₁: Higher levels of pre-colonial state presence increase local levels of state-based violence.

H_{2a}: Higher levels of pre-colonial state presence decrease local levels of state-based violence in areas close to the post-independence capital.

H_{2b}: Higher levels of pre-colonial state presence increase local levels of state-based violence in areas far from the post-independence capital.

H_{2c}: Lower levels of pre-colonial state presence increase local levels of state-based violence in areas close to the post-independence capital.

[Does this structuring cause too much repetition of the literature? I.e. two lit.rews?]

3.7 Pre-colonial states

Before testing the proposed relationships empirically, I need to clarify the key concept of ‘pre-colonial states’. For the purpose of this paper I follow the definition of ‘state’ used by the International Systems Data (ISD) v2 (Butcher and Griffiths, 2020) as a political entity with a population of at least 10,000, which has autonomy over a specific territory and sovereignty that is either uncontested or acknowledged by relevant international actors (Butcher and Griffiths, 2020)⁸. By this definition the ISD v2 identifies 109 pre-colonial states in Africa during the 1800-1914 period, of which 82 are included in the data used for this paper. This is a heterogeneous group of political entities along most metrics. In size they range from small city states like Harar (today part of Ethiopia), to empires like the Sokoto Caliphate. In political organization they range from loose federations (for example Oyo (Law, 1977)) to relatively centralized kingdoms (Abyssinia/Ethiopia, Buganda, or Zulu).

While smaller states might have been relatively mono-ethnic, larger states were often multi-ethnic, although often politically dominated by one group. While the geographic scope of the paper is Africa, pre-colonial states do include settler states, as long as they were independent. In other words Liberia, the Boer Republics and eventually South Africa are included. Based on the relationship with regional powers, some states ‘come and go’ as sovereign entities. Examples of this include the North African states in their relationship with the Ottoman empire, or Zinder (Sultanate of Damagaram), a city state on the periphery of the Bornu empire, at times nominally subject, de facto subject, or fully independent of Bornu.

While it is difficult to generalize about what this heterogeneous group of states usually were, they were not modern states as we think of states today. For one, there were (to my knowledge) no police forces nor welfare states in the way we think of them today.⁹ Bureaucracies and state apparatus, while at times existing and relatively centralized, were rarely large in size. Nor did any of them have international boundaries in the sense that countries do today (with the exception of some European settler states toward the end of the 19th century).

In other words, states were ‘shallow’ relative to today. For most of the population, for most of

⁸For a more in depth discussion of the definition of and criteria for statehood that the ISD is based on, see Butcher and Griffiths (2017).

⁹Although some Islamic welfare systems may have existed in Sokoto (Buba, 2018) and other Muslim states (Weiss, 2002).

the time, the state was embodied by a local representative (chief, bureaucrat, imam, lord etc.), often with some level of judicial and tax responsibility and wide autonomy. Nominal subjugation and local self rule was also wide spread. For example, the kingdom of Wadai/Bergoo (in Chad) did not have a civil government, but had a royal council (fásher) and a vertical network of political organization running down through regions, to provinces to tribes and villages (Barth, 1857). Tax (diván) rates differed on the basis of prosperity of the area, individual political standing, ethnic affiliation and religious holidays etc., but were generally more uniform in the central provinces. In the surrounding provinces tribute was paid by the province as a whole, reflecting the decreasing reach of the Wadai state. Immediately outside that control, lay the neighboring kingdom of Baghirmi. Who at least in some periods, paid tribute to Wadai while retaining its sovereignty (Barth, 1857).

Despite their relatively shallow state structures, there is ample evidence that many pre-colonial states left marks that were felt long after they were colonized, also in Africa. For example, Pre-colonial states left behind traditional political institutions (Beall et al., 2005; Holzinger et al., 2020; Neupert-Wentz et al., 2021; Ubink, 2008). These institutions have at times acted as mediators between ethnic groups and the central state (Boone, 2014; Englebert et al., 2002), and have been an important sources of legitimacy for current institutions (Wig, 2016)¹⁰. Nevertheless, some have argued that pre-colonial states have represented competitors to the central state as well (Herbst, 2014). There is also a growing literature on the role of pre-colonial states and institutions in long term economic development (Michalopoulos and Papaioannou, 2018; Acemoglu et al., 2014; Gennaioli and Rainer, 2007; Bockstette et al., 2002; Wilfahrt, 2021).

4 The Geo-ISD

The availability of reliable data has been a persistent problem in the literature on pre-colonial states. The Murdock (1967) map of ethnic groups and their corresponding ‘jurisdictional hierarchy’ index of political organization is one of the most frequently used data sources for constructing per-ethnic-group measures of statehood. However, this data has a number of issues (as enumerated by Michalopoulos and Papaioannou (2018)), such as lack of potential overlap between ethnic groups, static borders, relatively short time span and a lack of within-group variation, and misrepresentation in cases where state control and ethnic settlement patterns do not align. An example of this is the Mossi and the Mossi states in Burkina Faso, where about half of the area with majority Mossi population lies outside the historical presence of the Mossi states (primarily Ouagadougou), and about half the area of the state is outside majority Mossi settlements. A further disadvantage of this approach is that by using ethnic groups (and not states) as a starting point, there is a substantial potential for missingness (as not all states are easily tied to a specific ethnic group). For example, Paine (2019), despite using a ‘low bar’ for statehood and consulting numerous sources,

¹⁰According to Mamdani (2018) colonial authorities also felt the need to legitimize their rule through ties to pre-colonial institutions, at times went as far as to invent pre-colonial roots.

only codes 28 groups in Sub-Saharan Africa as having ties to a pre-colonial state.¹¹ Using a similar approach Wig (2016) identifies 45 state groups in the same region. Using the State Antiquity Index (Bockstette and Putterman, 2012) as a starting point, Depetris-Chauvin (2016) avoids the limitation of only including states with clear ties to ethnic groups. Nevertheless, his data only includes 54 states in the 1800-1850+ period, as compared to 104 in the ISD version 2, despite using less strict criteria for statehood. Additionally, aggregating experiences of statehood to the country level is potentially problematic. The problem is twofold. First, as discussed in the section 3.1, experiences are unlikely to accumulate uniformly to the country level. State antiquities tries to address this with a weighting scheme, but it only solves differences in how centralised states were, how long they ruled and whether they were indigenous to the country. Second, aggregating to current boundaries raises endogeneity concerns, as even in Africa boundaries are in large part a result of the borders of old states.

This paper introduces the Geo-ISD, which geocodes the borders of independent African states in the ISD v2 (Butcher and Griffiths, 2020). The ISD v2 picks up a large number of states that are missed by similar data sets, while avoiding the use of arbitrary criteria for statehood such as recognition by European powers (Butcher and Griffiths, 2020). The Geo-ISD introduces an innovative method for going beyond the Cartesian model of representing states as a flat, uniform sovereign territory, by capturing the topographical historical presence of pre-colonial states. In this way the Geo-ISD addresses some of the weaknesses of the existing geocoded data, namely the number of states identified, static borders across time, lack of overlapping or contested rule, and implied uniformity in state control across territory.

The Geo-ISD uses historically contemporary maps, as close to the primary sources as possible. That contain the borders of states, to determine the presence of different states. Shapes of the states included in the ISD v2 for the given year, that were depicted in the map were traced in QGIS. For example, Bornou would be included, but not the neighboring Howssa in Figure 1, as the shape drawn could potentially refer to either the Haussa ethnic group (a common occurrence in these maps) or the multiple Houssa states, neither of which qualify as states in the ISD in that year. This process was repeated for all the maps included in the [David Rumsey project](#) data base of historical maps, matching the region of Africa in the period 1800 to 1914. The start date was chosen due to the limitations of the ISD v2 which only extends back to 1816 (but includes the founding date of states going further back), and the fact that the quality of contemporaneous maps becomes substantially worse prior to the nineteenth century (Bassett, 1994). To control for some of the potential biases of relying on maps drawn a long time ago, and by non indigenous (mostly Western) mapmakers,¹² the same process was repeated using historical atlases compiled by later historians (several of which were also consulted by Depetris-Chauvin (2016) and Paine (2019)). The result was over 3400 polygons (state-shape-years) covering the period 1800 to 1914 for continental

¹¹This is partially also a result of the criteria of ‘independence on the eve of colonization’.

¹²This issue is discussed further below.

Africa and Madagascar.



Figure 1: Example of georeferenced map

4.1 The mountains of Kong

The accuracy of the historical maps used to create the polygons of the Geo-ISD is a natural concern. Who typically drew these maps? Based on what sources? For what purposes? And with what level of technical accuracy?

Most of the maps from the David Rumsey project were from atlases published for commercial purposes by individuals or small publishing companies specializing in this type of publications. Most are from English or American atlases, but French, Italian, German and other sources are included as well. The maps were based on a combination of existing maps updated with ‘the latest sources’ (a fact frequently boasted in the title of the atlas), which for the majority of the period meant explorers or geographers on missions from their respective geographical societies.¹³ In the words of Stone (1995, 47-48): ‘Cartography in Africa [in the 19th century] is still a mix of measurement, less accurate observations, word of mouth, previous maps and sources, educated guesses and pure conjecture. Nevertheless a distinct improvement on the maps of previous periods.’. Because of this, I expect two types of errors: errors resulting from measurement, and bias resulting

¹³Later maps additionally draw on the work of military surveyors, but as far as I have been able to tell the majority are still based primarily on the work of explorers and past maps.

from misconceptions (deliberate or not) of what constituted the borders of a polity at the time. I also expect errors to be replicated by other maps, before eventually being corrected. One example of this is the nonexistent Mountains of Kong, which can be seen in Figure 1 as the mountain range stretching across most of the continent from East to West. These mountains were replicated for the better part of the nineteenth century before eventually being wiped from the map (Bassett and Porter, 1991).

While the quote above might lead one to expect considerable measurement error, by my estimate this error only amounts to 36.9km on average for the shapes included in the GeoISD. This estimate is based on the estimated mean distance of the coastline in the maps to the real coastline, along the borders of the states that were traced. This captures measurement error explicitly, because regardless of where states did or did not extend their control, the coastline in the map should line up with the real coastline. This means that there are often multiple estimates for each map, reflecting how the accuracy is better in some places than in others. If this difference was above 100km, the maps were deemed too inaccurate and excluded from the sample. Error estimates for states that lay inland were not included, because consistently matching features from the maps to real geographical features was not feasible other than when using the coastline, which provides a visible line of comparison. Additionally, this type of error only adds noise, because it is equally likely to err in one direction or the other. Thus it should not affect coefficient estimates, but could potentially affect standard error estimates.

Although I have not been able to find sources discussing specifically how cartographers determined the borders of different polities, it is probable that they in large part relied on local verbal sources (word of mouth). An example of this can be glimpsed in the exchange where the explorer Mungo Park effectively dubbed the mountains of Kong.¹⁴ Or from when expeditions such as Park’s were escorted by representatives of the rulers of the various polities they passed through, until reaching *frontier towns*, where they would be met by representative of the next ruler (Park et al., 2015). In the maps resulting from such encounters, both their sources as well as the cartographers themselves could have introduced bias to the resulting maps. Sources were likely to be rulers or their representatives, with incentives for aggrandisement. The explorers and cartographers on their part represented European rulers with an eye toward colonial expansion. It less clear how this would affect the resulting borders drawn. One potential bias would be to exaggerate the domains of your own governments prospective colonies, and vice versa. Another possibility is that colonial cartographers under reported state sizes to declare ‘terra nullius’. However, I did not observe any systematic differences between the maps based on their nationality.¹⁵ In fact, their colonial am-

¹⁴‘I gained the summit of a hill, from whence I had an extensive view of the country. Towards the south-east, appeared some very distant mountains, which I had formerly seen from an eminence near Marraboo, where the people informed me, that these mountains were situated in a large and powerful kingdom called Kong; the sovereign of which could raise a much greater army than the King of Bambarra.’ (Park et al., 2015, CHAPTER XVIII).

¹⁵If drawing borders was driven by colonial ambitions, there should be observable differences between the

bitions could just as easily have promoted accuracy, as any potential military expedition would benefit from accurate information (Bassett, 1994).

4.2 A topographical representation of the state

At the very least there should be heterogeneity in the conceptualization of territoriality. What determines where a given source (or the cartographer in the second instance) draws the borders of a polity, or how this would vary with their respective conceptualization of states, polities and ethnic groups, is impossible to determine. However, thanks to (usually) having multiple maps for each state, the variation can be leveraged to create a measure of the *degree* to which a state had a presence in a given area over the time period as a whole. When maps disagreed on where the various borders were, I interpret this as either true variation across time, or as an indication of the ambiguity of where a given state had nominal or real control. In the areas where all the maps agree, one could be quite sure that the given polity had real presence. While in areas where only one map indicated that the state was present, this could either be wrong, an indication of nominal as opposed to more real presence or some other form of limited presence. The coding process of looking at hundreds of maps strengthened this initial intuition, and the resulting figures of state presence drawn from the complete data lends it further credence. Figure 2 demonstrates how the estimate of the Libyan state's presence gradually faded into the desert, that the Benghazi/Cyreneica region was not always or fully under the control of Tripoli, and that it had even more tenuous hold on the Fezzan region to the south. [Should be changed to Nigeria].

The resulting data can be compiled in different ways, to provide different insights. For the analysis in this paper I rely on a measure of 'state presence', similar in concept to that of 'state history' introduced by Depetris-Chauvin (2016).¹⁶ I measure 'state presence' as the number of state-shape-years that indicate that a state was present in a cell, counting only those of the state most often present in that cell. If a cell contains 40 shapes of the Sokoto Caliphate and 7 shapes of Borno, only the Sokoto shapes are counted. Including the Borno shapes would risk over counting, as it most likely does not represent additional state presence, but rather overlapping or contested sovereignty.

different colonial powers in line with their differing colonial ambitions.

¹⁶The main difference between these measures is that 'state history' is measured in 2 by 2 decimal degree grid cells, only includes Sub Saharan Africa, includes fewer states despite going further back in time, usually only includes one shape per state, which implies static borders and uniform presence throughout the territory.

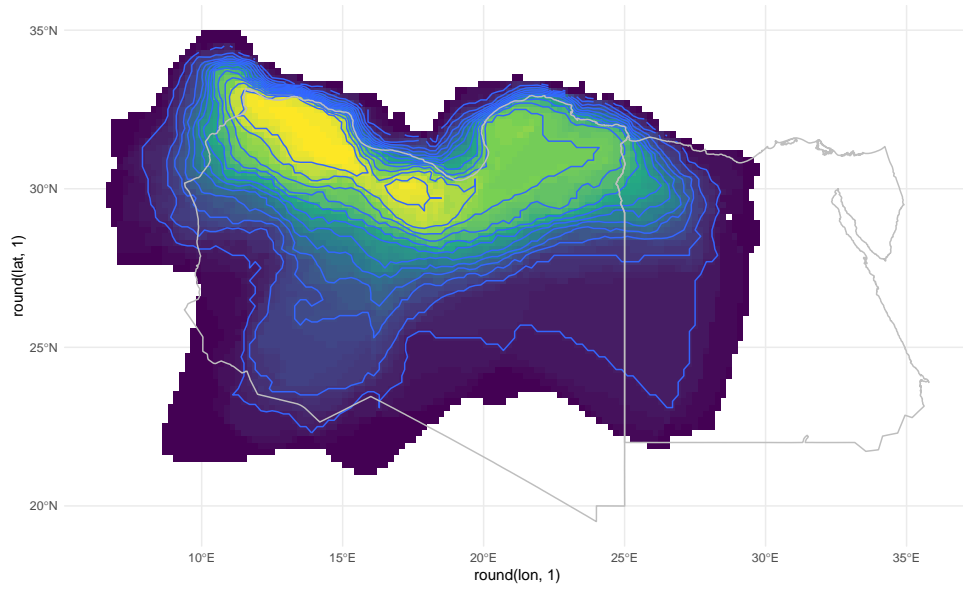


Figure 2: The historical state presence of Libyan state of Tripoli. Current borders of Libya and Egypt in red.

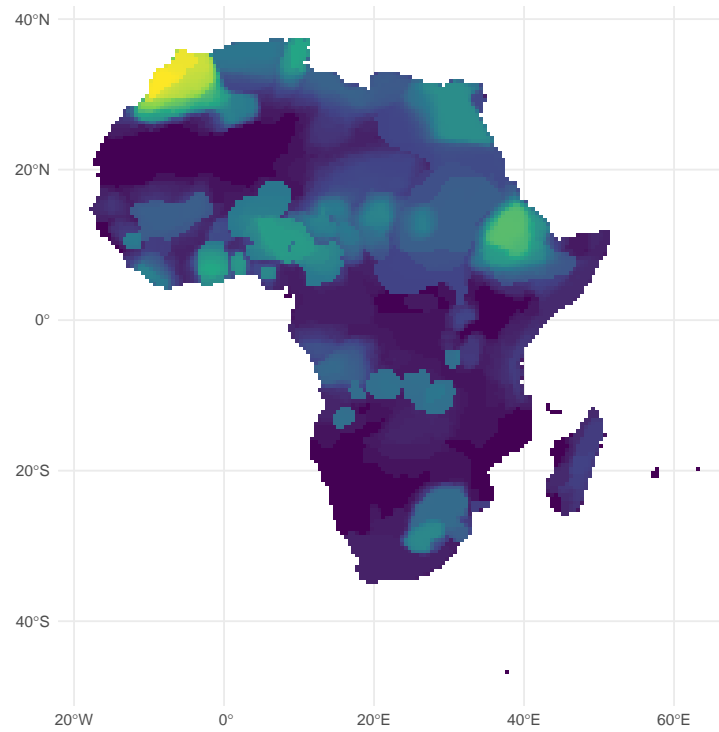


Figure 3: State presence (sqrt transformed) with interpolated years based on historical atlases.

5 Research design

5.1 Dependent variable

The units of analysis are PRIO 0.5 by 0.5 decimal degree grid cells with a non-zero population density in 1600,¹⁷ which equals about 55 by 55km at the equator (Tollefsen et al., 2012). Due to the explanatory variable being time-invariant, the analysis is a cross section. The main dependent variable is state based conflict related fatalities per grid cell over the period 1989-2020, from the GED project (Sundberg and Melander, 2013). This is a measure of the overall level of conflict in the post cold war period. The start date of 1989 was dictated by availability rather than chosen by design, as it likely biases against finding results (positive or negative), because the mechanisms discussed in the theory section should have a more powerful effect closer to independence and would fade in relative importance with the passing of time.

As an alternative to combat related fatalities, I also ran models using the count of state based conflict events. This captures much of the same general level of conflict during the period as the fatalities measure does, but the focus is slightly different. Fatalities more so captures the severity of conflict, whereas the number of conflict events more so captures the frequency of conflict. This would be the difference between few, or short, but highly lethal conflicts, versus lengthy conflict of relatively low intensity, or recurring conflicts. I do not expect there to be a substantial difference in the results from these measures based on the theory presented above.

5.2 Independent variables

Because I do not expect the relationship between pre-colonial state presence and civil conflict to be linear, and because the data is heavily skewed, the variable is square root transformed. While log transformation is more often employed in the previous literature, the variable contains zeros. This is usually solved by adding a constant to all values. However, this could potentially introduce bias, and complicates the interpretation of the results (Ekwaru and Veugelers, 2018). I therefore present the more conservative approach of using a square root transformation for the main models.¹⁸ This has the benefit of not having to add a constant, but produces a less evenly distributed variable.

The main explanatory variable is an interaction between pre-colonial state presence (square root transformed) and distance to capital (log transformed). The theoretical expectation is that pre-colonial state presence is conflict reducing in areas close to the post independence capital, and conflict inducing in more remote areas. In other words that the effect of pre-colonial state presence is moderated by distance to capital. Distance to capital is log transformed because I do

¹⁷This primarily excludes the Sahara and Kalahari deserts.

¹⁸In addition to the square root transformed version of the main independent variable, I also ran models using the more common log transformation. The results remained substantially the same, but with larger effect sizes.

not anticipate a linear effect. Because the variable is measured by distance from the center of each grid cell to a point indicating the capital, there are no zeros and log transformation can be done without adding a constant. Distance to capital is sourced from the PRIO-grid data set, but originally from Weidmann et al. (2010).

As a further robustness check I also ran models using a measure of state presence that sums if there were any maps that included a state in a grid-cell-year (as a sum of yearly dummies). In other words, this could be at most 214, and is more a measure of the maximum *extent* of state presence, and is less accurate in terms of variations in depth. The benefit of this measure is that it avoids some of the potential over representation of countries frequently mapped by Europeans, such as the North African states (due to proximity). As with the main measure of state presence, only the shapes of the state that was most present in that grid cell throughout the sample period were traced. Results remain substantially the same for all specifications.

5.3 Controls

Because the treatment variable in this case predates the outcome by a long period of time, there is a substantial risk of introducing post treatment bias when including control variables. In choosing which control variables to include, I try to balanced a trade off between potential post treatment bias and omitted variable bias.

Mountains facilitate early state formation by providing protection and limiting the exit options of sedentary farmers (Carneiro, 1988). Mountainous terrain has also been linked with civil conflict by providing shelter for rebel groups (Hegre and Sambanis, 2006), although this relationship is debated (Buhaug and Gates, 2002). The data is from the PRIO-grid data set, but originally from Blyth et al. (2002), and measures the percentage of the cell with mountainous terrain based on elevation, slope and local elevation range.

Water is essential for state formation. States typically formed either around coastal cities, close to navigable rivers or by the shores of great lakes. People still tend to live next to a source of water, thus this acts as a proxy for population density, and fighting usually happens where there are (at least some) people. The data on water as a percentage of the grid surface is from the PRIO-grid data set, but originally from the European Space Agency (Bontemps et al., 2009).

Distance to the coast could affect both state presence and conflict in a number of ways. First, as stated above, states were more likely form along the coast as it connected cities and people. A special case for Africa is also the existence of slave raiding/trading states that formed along the eastern and western coasts of the continent. These state's *raison d'être* was raiding slaves from tribes and peoples inland and selling them to coastal traders (European in the West and Arab in the east). Nunn (2008) argues that this state of affairs left legacies of mistrust and antagonism, which has resulted in increased levels of current day conflict. Distance to the coast could also be related to the measure of state presence through the fact that our measure is based on European

observations (maps), which undoubtedly had better coverage along the coast, especially for the earlier periods. Distance to the coast could further be related to conflict through lower levels of economic development inland. The distance to coast data is from Wessel and Smith (1996). The variable was log transformed to account for a non-linear relationship.

As with water, barren terrain could be a (negative) pre-condition for state building as well as proxy for later population densities, and thus could correlate with both state presence and levels of conflict. The data is from Bontemps et al. (2009).

The states of North Africa are overrepresented in the Geo-ISD data, due to the geographical proximity, and the accompanying historical familiarity to European map makers. This affects Morocco most particularly, as can be seen in Figure 3. The reason this affects Morocco in particular is that the remaining North African states were under Ottoman suzerainty for much of the period. If North Africa is also more or less conflict prone than the rest of Africa on average, the inflated values of state presence would bias the estimated coefficients. Accordingly, I included a dummy variable for the region of North Africa.

Population density is added due to the theoretical expectation that it could be a confounding variable. There are few accurate measures of population densities that predate most of the states in the Geo-ISD. The best available estimates come from the HYDE project (Goldewijk et al., 2016), and I use the estimates from 1600.

Distance to international boundaries could be related to state presence because, despite their reputation, African borders were not drawn completely at random (or along meridian lines). For example, the boundary between northern Nigeria and Niger were based on the extent of the Sokoto Caliphate and the neighboring Kanem-Bornu (or just Bornu) empire (Hiribarren, 2017). Proximity to an international boundary has also been found to predict conflict (Buhaug and Gates, 2002). I use the measure included in the PRIO grid data, which is originally from Weidmann et al. (2010).

5.4 Modelling

To account for the potential post treatment bias (vis-a-vis potential omitted variable bias) controls were added step wise with increasing potential for post treatment bias. The baseline model only includes geographic variables, which should safely pre-date any states and thus be free of post-treatment bias. Subsequent models add controls according to likelihood of introducing post treatment bias.

To account for the dependent variable being count data (count of deaths (fatalities) and count of conflict events (state based)) all model specifications reported below are negative binomial regressions or zero inflated negative binomial regressions. A fitness test for whether negative binomial or Poisson regression is most appropriate, was conducted and confirmed that negative binomial produced a better fit than Poisson.

The dependent variable contains excess zeros (8937 zeros relative to 100 counts of 1 fatality, the

second most frequent outcome). Additionally, I cannot be sure that the main independent variable affects the likelihood of there being any fatalities in a cell (or if it remains a zero), the same way it might influence the severity of conflict once a cell has seen at least one fatality. I therefore employ a zero inflated negative binomial model. The first step of this two step approach is a logit that models the likelihood that a cell experiences conflict. I used the same set of controls as I do not expect any of them to exclusively affect conflict severity, nor do I expect their relation to the main independent variable to be substantially different for an onset model. The second step is a negative binomial estimation of conflict severity, or the number of fatalities/events in a cell that has seen at least one fatality/event.

Given what is known about spatial diffusion of conflict, there is reason to suspect some spatial autocorrelation. However, controlling for this would introduce a source of post treatment bias. [why?] Nevertheless, as an additional robustness check I ran some models with queen pattern spatial lags. Most of these models did not converge, but those that did remained substantially similar to the main models.

5.5 Testing the mechanism

Testing the proposed mechanisms explicitly would require data on where elite networks and institutions have survived from pre-colonial states, or data on rebel groups use of symbols invoking past statehood. Collecting such data lies outside the scope of this paper. Fortunately, the differences in the approach to colonial governance between Britain and France could provide a proxy for the elite networks and institutions mechanisms. France generally sought (more successfully in some cases than in others) to fully incorporate and rule their colonies directly, dismantling existing institutions and avoiding a reliance on native administrators (Blanton et al., 2001). Britain, on the other hand, pursued a strategy of indirect rule, preferring to leave local rulers to administer their own territories, and relying on their own institutions to do so (Blanton et al., 2001). Former British colonies should therefore be more likely to have preserved the elite networks and institutions that could be used to mobilize against the state. I therefor ran all the models including controls for former French and British colonies. [Theory implies interaction, but three-way interactions are a impossible to interpret, perhaps better to re-run main models on French and British sub samples.] In these models, the North Africa control had to be dropped because most of North Africa were French colonies at some point and models would not converge with both included.

[Territorial disputes far from the capital and government disputes close to capital?]

6 Results

Despite the data on conflict starting nearly three decades after most of Africa achieved independence (at which point the effects of pre-colonial state presence on conflict should be most pronounced),

there is a significant and positive direct effect of state presence on conflict (.11, SE = .01 and .10, SE = .01 in the main models). This effect is robust and stable across all models (see Table 3 and Table 5). All controls have the expected signs except distance to coast in Table 5, using state based conflict events as the dependent variable. However, the coefficient indicates a substantially negligible effect, and the statistical significance might be more a reflection of the large number of observations (9492) rather than any underlying causality. The second model in Table 3 indicates that North Africa has experienced more conflict fatalities than the rest of Africa comparatively. However, this effect becomes smaller and is no longer significant at the $p < .01$ level after controlling for population density in 1600, suggesting at least part of the effect could be due to higher levels of population density.

However, the results of the interaction models reveal a more nuanced picture. As seen in Table 4 and Table 6, when adding the interaction term between state presence and distance to capital, state presence has a conflict reducing effect, albeit a non-significant effect in the fatalities models. All control variables behave as expected, and similarly as in the non interaction models. Unsurprisingly, distance to capital (log) is negative, as there is generally less conflict close to capital cities. The interaction term is significant and positive across all model specifications, in line with the theoretical expectations.

In terms of substantial effects Figure 4, which models the predictions of the second stage ZINB model included in Table 8, provides a more intuitive interpretation of the interaction between state presence and how it affects the severity state based conflict. State presence is negatively correlated with both conflict measures close to the capital, but becomes positive and significant further away from the capital. This is in line with an interpretation that state presence can be conflict reducing in those areas where it makes a territory less artificial, by providing institutions and elite networks on which to build a state. In cases where there is no state presence in capital areas, the model predicts an additional 406 fatalities from state based conflict. The effect drops rapidly as state presence increases. On the other hand, in areas with no experience of statehood that are far from the capital, the model predicts almost no additional fatalities (similar to high levels of state presence in/around the capital). However, as state presence increases, so does predicted fatalities. For a mean plus one standard deviations level of pre-colonial state presence of 138, the main model predicts an additional 250+ [find exact] fatalities. While this is not a test of the specific mechanisms outlined in the theory section, the results do indicate that symbols, elite networks or some other legacy of pre-colonial statehood raises the scope of conflict in areas remote to the capital.

The results of the models including controls for French and British colonies (see Table 8) are interesting in that the predicted increase in conflict severity in capital areas without prior experience of statehood is at 991 additional fatalities. The signs of the colonial controls are as expected. However, the conflict inducing effect of being a former British colony is only significant on conflict onset (the first stage logit model). Similarly, the conflict reducing effect of being a former French colony is only significant in terms of reducing conflict severity (second stage negative binomial

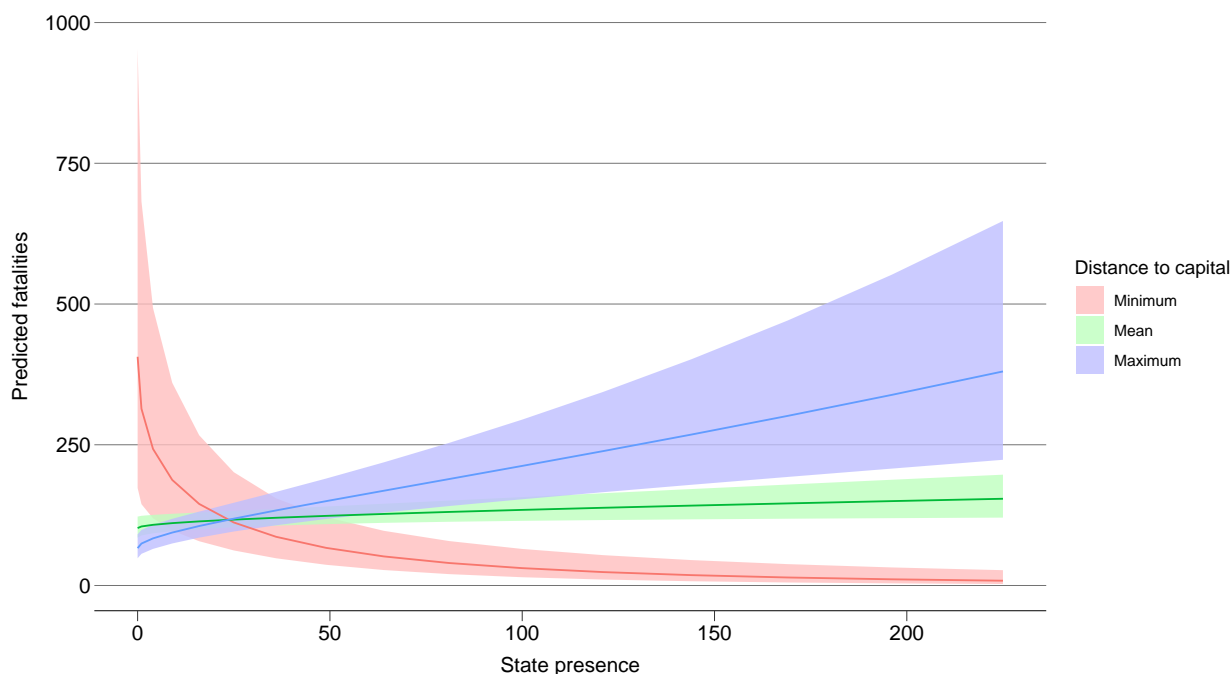


Figure 4

count model). These results can not be interpreted with any certainty, but do perhaps suggest that French style governance left stronger central government that were better equipped to limit the scope of conflicts, while the British tradition of indirect rule left a larger number of potential rivals to the central government. [This needs to be adjusted according to results of sub sample model results] [Results of territorial and governmental conflict]

6.1 Alternative explanations

An alternative interpretation of the results could be that this is a story of more coherent ethnic groups being more likely to be associated with states, and more likely to (perhaps better able to) challenge the government when situated far from the capital. However, getting closer to the real causality requires untangling, for each case, if a given conflict is related to an ethnic group's ties to a pre-colonial state or not. This lies outside the scope of this paper, if it is even possible.

Another interpretation that is not controlled for in this paper is the possibility that past conflict drives both state creation and current conflict. However, data on past conflict is meager, especially so for Africa. To my knowledge the Brecke (1999) data set is the most complete. Even so, it relies on written histories of which there is little for pre-colonial sub-Saharan Africa. What is worse, the missing will be considerably biased because kings and states are far more likely to chronicle their warfare in the form of written records. [Icing: use data Charles got for the other data]

7 Conclusion

Drawing on the emerging literature on pre-colonial states (Paine, 2019; Depetris-Chauvin, 2016), institutions (Wig, 2016; Englebert et al., 2002; Michalopoulos and Papaioannou, 2018) and civil conflict, and on newly compiled data, this paper re-examined the relationship between pre-colonial states and civil conflict. I find a general conflict inducing effect of pre-colonial state presence on local levels of state-based conflict. However, I also find support for a conflict reducing effect of pre-colonial state presence, but this is conditioned on the relationship between the pre-colonial state(s) and the post-independence state, as [proxied] by the distance to the post-independence capital. On the other hand, I find strong evidence for a conflict inducing effect, particularly in areas far from the post-independence capital. These results are robust to alternative measurements and model specifications.

These findings have a few important implications. First, they demonstrate that pre-colonial states can be a blessing or a curse depending on whether they form the basis of the modern state or a point of opposition to it. Second, that local political histories matter, and should be taken into consideration by policymakers and scholars alike. Finally, these results suggests that wherever colonizers left novel constellations of pre-existing polities, they unknowingly sowed the seeds of future conflict. More research using global data is needed to test whether general trends for Africa hold outside that continent as well. [Somewhere in this section fit in the prediction that there is potential for violence in places where the central government has not yet extended its reach into areas with high degree of pre-colonial state presence, most notably in Puntland, Somalia.]

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Appendix

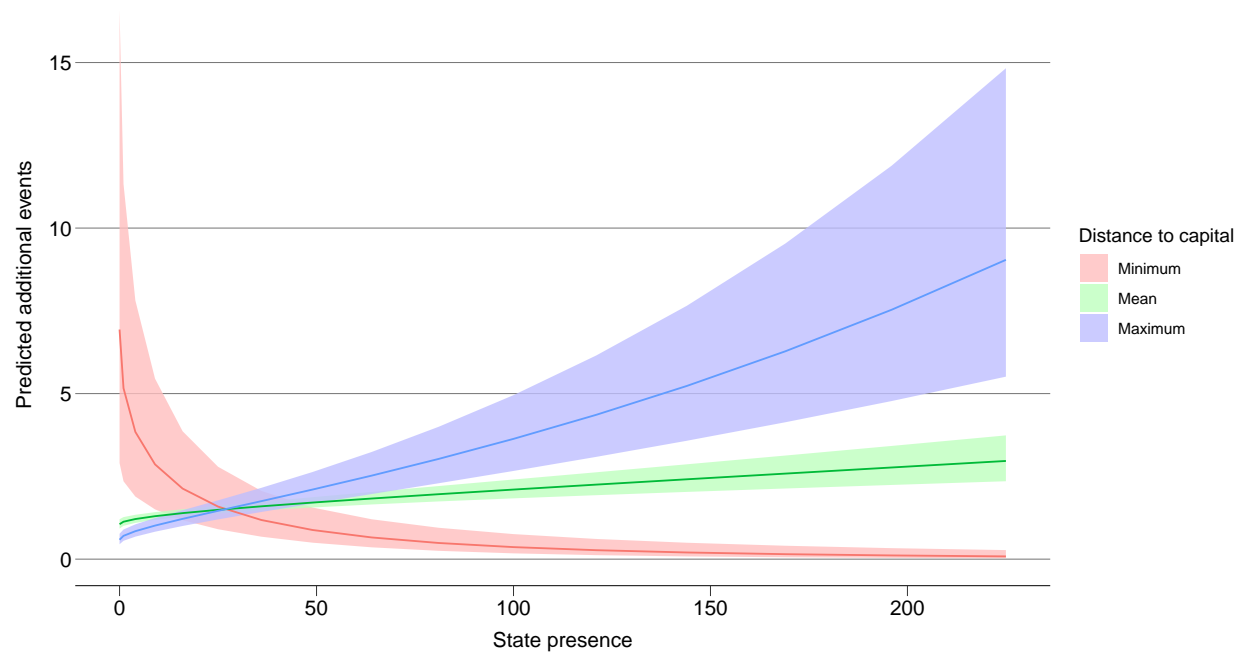


Figure 5: Predicted conflict events per state presence, grouped by distance to capital.

Table 2: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Fatalities	10,652	45.8	883.1	0	0	0	79,920
Conflict events	10,652	2.4	27.0	0	0	0	1,940
State presence	10,652	50.2	88.1	0	2	62	629
Distance to boundary	10,652	138.1	122.6	0.003	39.6	200.7	668.0
Distance to capital	10,652	671.3	411.0	3.7	338.0	956.2	2,482.5
Barren	10,652	32.7	44.4	0	0	97.9	100
Mountainous	10,492	0.1	0.3	0.0	0.0	0.1	1.0
Water	10,652	4.8	17.7	0.0	0.0	0.1	100.0
Distance to coast	10,652	599,064.4	460,732.6	0	185,784.8	956,404.4	1,761,700
popd	10,559	2.5	9.9	0.0	0.1	2.1	447.9

	Geography	North Africa	Population density	Distance to border
Precolonial state presence (sqrt)	0.11*** (0.01)	0.10*** (0.01)	0.10*** (0.01)	0.10*** (0.01)
Mountainous terrain	1.37*** (0.23)	1.54*** (0.23)	0.95*** (0.23)	0.91*** (0.23)
Water (%)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Barren (%)	-0.02*** (0.00)	-0.03*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Distance to coast (log)	-0.11*** (0.02)	-0.11*** (0.02)	-0.09*** (0.02)	-0.07*** (0.02)
Population density (log)			0.75*** (0.09)	0.74*** (0.09)
Distance to international boundary (log)				-0.11 (0.06)
North Africa		0.58** (0.18)	0.44* (0.18)	0.46* (0.18)
AIC	27567.25	27553.42	27484.75	27483.20
BIC	27617.36	27610.69	27549.18	27554.79
Log Likelihood	-13776.63	-13768.71	-13733.38	-13731.60
Deviance	3520.82	3522.27	3528.42	3528.71
Num. obs.	9492	9492	9492	9492

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; $p < 0.1$

Table 3: Fatalities

	Geography	North Africa	Population density	Distance to border
Precolonial state presence (sqrt)	-0.06 (0.10)	-0.11 (0.10)	-0.18 (0.10)	-0.16 (0.10)
Mountainous terrain	1.54*** (0.23)	1.74*** (0.23)	0.99*** (0.23)	0.95*** (0.23)
Water (%)	-0.00 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)
Barren (%)	-0.03*** (0.00)	-0.03*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Distance to coast (log)	-0.07** (0.02)	-0.08** (0.02)	-0.09*** (0.02)	-0.08** (0.03)
Population density (log)			0.81*** (0.09)	0.79*** (0.09)
Distance to international boundary (log)				-0.11 (0.06)
North Africa		0.57** (0.18)	0.40* (0.18)	0.42* (0.18)
Distance to capital (log)	0.06 (0.12)	-0.04 (0.12)	-0.08 (0.12)	-0.06 (0.12)
Interaction term	0.03 (0.02)	0.03* (0.02)	0.05** (0.02)	0.04** (0.02)
AIC	27605.09	27573.77	27478.52	27477.00
BIC	27669.51	27645.36	27557.26	27562.90
Log Likelihood	-13793.54	-13776.89	-13728.26	-13726.50
Deviance	3517.95	3520.87	3529.37	3529.64
Num. obs.	9492	9492	9492	9492

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; $p < 0.1$

Table 4: Fatalities * Distance to capital

	Geography	North Africa	Population density	Distance to border
Precolonial state presence (sqrt)	0.07*** (0.01)	0.05*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
Mountainous terrain	0.87*** (0.16)	0.81*** (0.16)	-0.22 (0.15)	-0.28 (0.15)
Water (%)	-0.01* (0.00)	-0.01* (0.00)	-0.01** (0.00)	-0.01*** (0.00)
Barren (%)	-0.02*** (0.00)	-0.02*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Distance to coast (log)	-0.16*** (0.02)	-0.14*** (0.02)	-0.11*** (0.02)	-0.08*** (0.02)
Population density (log)			1.00*** (0.06)	0.94*** (0.06)
Distance to international boundary (log)				-0.20*** (0.04)
North Africa		0.51*** (0.13)	0.38** (0.12)	0.47*** (0.12)
AIC	20314.22	20297.34	20007.10	19979.16
BIC	20364.33	20354.61	20071.52	20050.74
Log Likelihood	-10150.11	-10140.67	-9994.55	-9979.58
Deviance	4106.74	4112.96	4158.66	4164.26
Num. obs.	9492	9492	9492	9492

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; $p < 0.1$

Table 5: State based conflict events

	Geography	North Africa	Population density	Distance to border
Precolonial state presence (sqrt)	-0.25*** (0.07)	-0.30*** (0.07)	-0.36*** (0.06)	-0.33*** (0.06)
Mountainous terrain	0.88*** (0.15)	0.87*** (0.15)	0.01 (0.15)	-0.05 (0.15)
Water (%)	-0.01 (0.00)	-0.00 (0.00)	-0.01** (0.00)	-0.01*** (0.00)
Barren (%)	-0.02*** (0.00)	-0.02*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Distance to coast (log)	-0.13*** (0.02)	-0.09*** (0.02)	-0.12*** (0.02)	-0.09*** (0.02)
Population density (log)			1.00*** (0.06)	0.95*** (0.06)
Distance to international boundary (log)				-0.19*** (0.04)
North Africa		0.39** (0.13)	0.36** (0.12)	0.44*** (0.12)
Distance to capital (log)	-0.45*** (0.08)	-0.37*** (0.08)	-0.30*** (0.08)	-0.28*** (0.08)
Interaction term	0.05*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
AIC	20284.02	20282.75	19982.19	19957.16
BIC	20348.44	20354.33	20060.93	20043.06
Log Likelihood	-10133.01	-10131.37	-9980.09	-9966.58
Deviance	4117.11	4118.67	4168.50	4172.13
Num. obs.	9492	9492	9492	9492

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; $p < 0.1$

Table 6: Conflict events * Distance to capital

Atlas maps

Ajayi and Crowder (1985)
Flint et al. (1976)
Gailey (1967)
Kasule (1998)
McEvedy (1996)
Oliver et al. (1985)
Reid (2012)
The Times atlas of world history (1978)

Table 7: List of maps from historical atlases used in the Geo-ISD

	Model 1	Model 2	Model 3
Count model: (Intercept)	5.33*** (0.53)	3.43*** (0.55)	7.10*** (0.60)
Count model: sqrtSpAll	-0.33*** (0.07)	-0.39*** (0.07)	-0.36*** (0.07)
Count model: logCapdist	-0.28** (0.09)	-0.38*** (0.09)	-0.46*** (0.09)
Count model: mountains_mean	1.50*** (0.18)	0.13 (0.17)	1.15*** (0.19)
Count model: region3	0.59*** (0.13)		0.18 (0.14)
Count model: water_gc	0.01* (0.00)	-0.01** (0.00)	0.01* (0.00)
Count model: logCDist	0.02 (0.02)	-0.09*** (0.02)	0.07*** (0.01)
Count model: logPopd	0.83*** (0.07)	1.16*** (0.07)	0.56*** (0.07)
Count model: logBDist	-0.06 (0.05)	-0.18*** (0.04)	-0.14** (0.05)
Count model: sqrtSpAll:logCapdist	0.06*** (0.01)	0.07*** (0.01)	0.06*** (0.01)
Count model: Log(theta)	-2.51*** (0.05)	-2.58*** (0.03)	-2.43*** (0.06)
Zero model: (Intercept)	0.39 (0.96)	-11.90 (3235.61)	-0.54 (0.91)
Zero model: sqrtSpAll	-0.38 (0.21)	1.40 (136.83)	-0.16 (0.18)
Zero model: logCapdist	-0.07 (0.14)	-73.25 (701.24)	0.05 (0.13)
Zero model: mountains_mean	0.24 (0.23)	27.63 (59.19)	-0.01 (0.23)
Zero model: region3	0.45** (0.15)		0.35* (0.15)
Zero model: water_gc	0.01* (0.01)	-5.83 (20.18)	0.01* (0.01)
Zero model: logCDist	0.02 (0.02)	-6.07 (22.85)	0.02 (0.02)
Zero model: logPopd	-2.81*** (0.28)	-20.02 (46.62)	-2.50*** (0.28)
Zero model: logBDist	0.30*** (0.07)	1.12 (10.80)	0.29*** (0.06)
Zero model: sqrtSpAll:logCapdist	0.04 (0.03)	3.83 (32.32)	0.01 (0.03)
Count model: gbr			0.10 (0.15)
Count model: fra			-1.46*** (0.14)
Zero model: gbr			0.62*** (0.14)
Zero model: fra			0.20 (0.18)
AIC	42529.07	19988.38	42367.09
Log Likelihood	-21243.53	-9975.19	-21158.55
Num. obs.	9492	9492	9492

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; $p < 0.1$

Table 8: Statistical models