Ethnic Geography and the Colonial Design of Administrative Units in Sub-Sahara Africa

Unpublished Working Paper

Carl Müller-Crepon*

November 11, 2025

Abstract

Subnational administrative units are fundamental to territorial states and their political topography, but we know little on how their borders are designed. I argue that indirect rulers engage in preservation by ethnically aligning administrative borders, which empowers peripheral actors. In contrast, centralizing governments disrupt ethnic groups and their ability for collective action by splitting groups (dismemberment) and/or creating diverse units (suffocation). I test this argument by studying colonial administrative unit designs in Sub-Sahara Africa. I contrast indirect with more direct colonial rule and use new historical data on administrative borders and ethnic geography. Modelling subnational borders with a probabilistic spatial partition model, I find strong positive associations with ethnic boundaries. These effects are stronger under indirect British compared to more direct French rule, which realized more extensive ethnic dismemberment but not suffocation. The paper sheds light on colonial administrative unit designs, thus highlighting the potential for unit endogeneity more broadly.

Keywords: Administrative geography; Ethnicity; Colonialism; African politics; Computational Methods; GIS

---

*Department of Government, London School of Economics and Political Science. c.a.muller-crepon@lse.ac.uk. I thank Laia Balcells, Sören Henn, Moritz Marbach, Mateo Montenegro and Yannick Pengl, as well as seminar participants at LSE, IPERG at the Universitat de Barcelona, University College London, and at the 2024 Interdisciplinary Workshop on Identity and Politics at IAST/TSE and the 2024 EPSA Conference and 2024 APSA Annual Meeting for very helpful comments and Elise Doumerge, Victoria Puglia, Jakob Schram, Jonathan Seel, and Daryna Sudachek for excellent research assistance. This project has received funding from the British Academy through grant SRG21\210081.

The design of administrative units is fundamental to states' political geography. Where administrative borders are drawn determines the number, shape, and demography of subnational governance units. The choice between few or many, ethnically homogeneous or diverse administrative units is far from innocuous. It affects, for example, local development (Alesina and Zhuravskaya 2011; Grossman, Pierskalla and Dean 2017), state capacity (Henn 2023; Müller-Crepon 2021), as well as violent conflict (Cunningham and Weidmann 2010; Juon 2024). While the design of regions and districts is thus inherently political, empirical political science literature mostly treats them as exogenously given (Soifer 2019). This paper addresses this gap with a focus on the ethnic underpinnings of colonial administrative geographies in Sub-Saharan Africa. Studying administrative unit design with new data and methods, I contribute to understanding the origins of political topographies, in particular in Africa.

A small literature examines administrative geographies as politically determined, focusing primarily on their proliferation. Following up on Green (2010), this literature examines the political drivers of unit splits along preexisting lower-level borders (see also Grossman and Lewis 2014; Hassan 2016; Resnick 2017). However, the literature's focus on relatively marginal changes of administrative geographies leaves unexplored the causes of the more fundamental *overall* partitioning of state territories into administrative units.[1] Two main factors can account for this oversight. First, we lack explicit theories of administrative unit design. Second, any test of related arguments must overcome thorny problems in modeling the determinants of administrative partitionings as neither the number nor shapes of units are known ex ante. I address the first problem by theorizing administrative divisions as strategic choices made in response to ethnic geographies. Newly collected data analyzed with a probabilistic spatial partition model allow me to test the observable implications.

I argue that governments can draw administrative borders to either facilitate or disrupt ethnic groups which harbor significant collective action potential arising from their often-strong social networks and political institutions. Administrative

[1] Note that the design of subnational borders is different from that of interstate borders (see, e.g., Paine, Qiu and Ricart-Huguet 2024).

unit designs can *preserve* ethnic groups, their networks and institutions by aligning administrative borders with their geography. This facilitates schemes of indirect governance but prevents centralized governance. In contrast to preservation, centralizing governments can disrupt ethnic groups in two ways. Borders that cut through their settlement areas can *dismember* groups while designing diverse units can *suffocate* them.[2] Both strategies disrupt ethnic networks and institutions and lower groups' ability for collective action. While requiring greater investment by the state, these strategies consolidate political power and centralize governance.

My empirical analysis tests this argument with a focus on colonial rule in Sub-Saharan Africa. I compare the effect of ethnic geography on administrative unit designs under relatively decentralized, indirect British rule with its impact under more centralized, direct French rule. To do so, I combine three innovations in empirical measurement and methods.

First, I measure administrative partitionings and their change as the main outcome of interest. I therefore collect administrative maps from across British and French colonies throughout the colonial period. These show the evolution of territorial governance from few, imprecisely designed administrative units towards the late-colonial setup of districts, cercles, and regions which partially persisted until today.

Second, I present new data on historical ethnic geography which remedy the low resolution and likely reverse causality in Murdock's (1959) data on ethnic settlement areas. The new measure of ethnic geography is based on 49 newly digitized ethnic maps produced in the first half of the 20th century. While less comprehensive in coverage of the African continent than Murdock (1959), the data improve on spatial detail, approximation of local ethnic diversity, and reflection of uncertainty over relevant ethnic groupings. Additionally, maps from the early colonial period allow me to investigate subsequent administrative border *changes* and mitigate the risk of reverse causality.

Third, I model the effect of ethnic geography on administrative borders using the Probabilistic Spatial Partition Model (PSPM) developed by Müller-Crepon,

[2]The labels of dismemberment and suffocation have been first introduced by Geertz (1963) and used by Englebert, Tarango and Carter (2002) with regard to interstate borders.

Schvitz and Cederman (2025). The PSPM models administrative units as the partitioning of a spatial network of points. Encoding covariates on the network's edges, the model estimates the effect of ethnic boundaries on administrative borders conditional on confounding spatial features (e.g., rivers or watersheds) that may cause both. Moving beyond the original model, I present new estimators that capture the effects of macro-level strategies of ethnic *dismemberment* and *suffocation*. The extended model helps to empirically separate these two negatively correlated, yet theoretically and empirically distinct strategies.

The empirical results support the main argument. I find that ethnic boundaries are significantly associated with a substantively higher probability of district borders and border change in British colonies. Ethnic boundaries are weakly associated with the borders of French colonial cercles and do not explain their change over time. These results are robust to the inclusion of a lagged dependent variable which accounts for important sources of reverse causality bias and permutations of the empirical strategy. Distinguishing between ethnic dismemberment and suffocation, I find that the British engaged in significantly less dismemberment than the French, with no significant difference in the degree of suffocation. Lastly, I draw on on post-colonial data on administrative borders and show long-term persistence of the ethno-geographic roots of administrative units in former British as compared to French colonies.

Ethnic geography and the design of administrative units

With the exception of the literature on administrative unit proliferation, political scientists mostly treat administrative divisions as relatively stable political institutions.[3] Yet, once understood as the outcome of political choices, questions arise on the strategies of partitioning state territories into administrative units of an ex ante unknown number and shape.

The theoretical point of departure is the claim that the spatial decentralization

[3]There is, however, a (small) literature on states' size and shape (e.g. Alesina and Spolaore 2005, 1997; Friedman 1977; Müller-Crepon, Schvitz and Cederman 2025). Note that subnational borders can affect new interstate borders as these often follow pre-existing administrative ones (Carter and Goemans 2011).

of administrations is a "dual use" governance tool. On the one hand, decentralized governance units aid the state in bridging the spatial gap between its center and the population. However, administrative units can also facilitate collective action among peripheral populations either due to a continuous influence of pre-existing actors or, more dynamically, by aiding the mobilization of society. Importantly, whether decentralized governance units are *structurally* predisposed to serve the center or periphery hinges on their congruence with local socio-political topographies, in particular ethnic geography.[4] As a result, the balance of power between the center and periphery affects how administrative borders are drawn: Where local populations and elites enjoy a power advantage and states rule indirectly, administrative divisions are drawn along ethnic lines. Where states are stronger and rule directly, units will be designed to break pre-existing institutions and prevent local mobilization against the state. While empowering the state in the long-run, such misalignment is costly in the short-run as it disrupts local governance arrangements.

The creation of administrative outposts is a crucial instrument by which territorial states' increase their "infrastructural power" (Mann 1984). Decreasing the physical distance between state agents and the population, administrative decentralization facilitates greater and more spread-out control of, extraction of taxes from, and provision of services to citizens. As a result, most states' administrations are spatially organized with hierarchically nested administrative tiers reaching down from the center to local populations. While there are decreasing or even negative returns to administrative fragmentation (Grossman, Pierskalla and Dean 2017), larger states tend to have more units arranged in more extensive hierarchies.

At the same time, a large literature highlights the promise of administrative decentralization to empower local populations by increasing citizens' control of local policies and thus better aligning governance supply and demand (Tommasi and Weinschelbaum 2007; Grossman, Pierskalla and Dean 2017). Such empowerment is dependent on local capacities for collective action, which is crucially shaped by ethnicity for at least two reasons. First, due to general homophily, ge-

[4]This is similar to other administrative design characteristics such as local selection mechanisms of state agents, prerogatives over budgets and policies, and control over local public services. See Oates (1999) and related literature.

ographic concentration and segregation, as well as common language use, ethnic social networks facilitate information sharing as a crucial precondition for collective action (Larson and Lewis 2017). Second, ethnic groups oftentimes harbour distinct political institutions that facilitate intra-group coordination (e.g. Fortes and Evans-Pritchard 1940). Even where political institutions lack geographic scale as in acephalous ethnic groups, these institutions bear greater similarity within groups than across them, which facilitates political integration and mobilization under a common roof.[5]

As a result, empirical literature finds that the benefits of decentralization materialize in units that are spatially congruent with socio-political institutions (Wilfahrt 2022), in particular ethnically homogeneous divisions (Alesina, Baqir and Easterly 1999; Miguel and Gugerty 2005; Habyarimana et al. 2007). Beyond mobilizing for better governance and public services, the capacity of peripheral collective action can be used to counter the central government more broadly. The design of ethnically delineated administrative units has thus been linked to successful secessions (Roeder 2012; Griffiths 2016), lower political stability and generalized social trust (Alesina, Easterly and Matuszeski 2011), as well as stronger ethnic identities (Robinson 2020; Müller-Crepon 2025).

Building on the ambiguous effect of administrative borders, we can delineate two distinct administrative designs of administrative units: one preserving ethnic groups and the other disrupting them through spatial misalignment, using administrative borders to dismember and/or suffocate their communities (Figure 1).

The first strategy of *preservation* aligns the borders of administrative units with the geography of ethnic groups. In particular when coupled with the cooptation of local elites, designs that create relatively homogeneous administrative divisions allow states to quickly and effectively build their reach on the cheap. This comes at the cost of maintaining or even strengthening local capacity for collective action and sharing power and revenue with local elites. The result is a fragmentation of states' institutional landscape which can hamper state-wide governance.

More disruptive, but expensive, are conscious administrative designs that un-

[5]See, e.g., classical anthropological literature (Fortes and Evans-Pritchard 1940) and evidence on institutional and linguistic coevolution (Currie and Mace 2009).

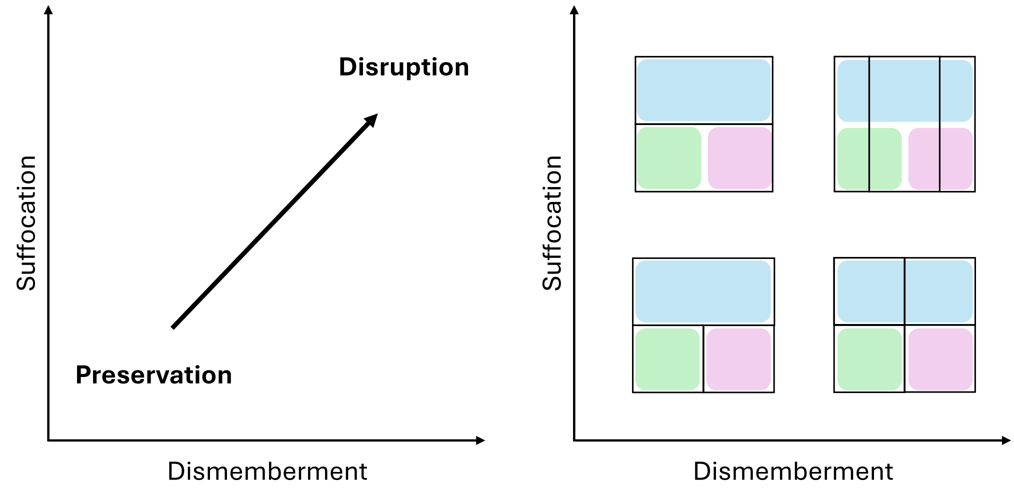
dermine the functioning of ethnic groups, their social networks and institutions through strategies of *dismemberment* and *suffocation* (see also Geertz 1963; Englebert, Tarango and Carter 2002). In an attempt to break the organization of local societies, governments can impose administrative borders that partition groups such that they are dismembered across multiple units. This disrupts groups' internal organization and mobilization capacity. Alternatively, states can suffocate competing powers and prevent the rise of future ones by creating diverse administrative units that include several groups. The resulting units will be internally divided, which reduces their usefulness as vehicles for mobilization and increases central governments' ability to rewire local society. However, the governance of internally fragmented units is relatively inefficient, as administrators have to respond to varied local circumstances.

Governments' likely trade the potential long-term benefits of disruption off against the potentially steep short-term cost of local resistance and inefficiencies in local governance. Centralizing governments then choose the mix of dismemberment and suffocation based on the geographic feasibility and costs of either strategy. As conceptualized in Figure 1, combining dismemberment and suffocation likely yields maximal disruption. Yet, either method on its own weakens ethnic groups and might therefore be sufficiently disruptive to achieve a targeted level of state centralization.This is particularly important as both strategies cannot always be easily combined: Suffocation tends to come with larger units, while dismemberment is fostered by smaller units. As a result, combining dismemberment and suffocation tends to yield less compact units.[6] The resulting impracticabilities suggest that dismemberment and suffocation might be substitutive strategies for disruption.

States' institutions underlying constraints affect the degree to which administrative units are designed in (mis)alignment with ethnic geography. Administrative preservation of ethnic groups is congruent and indeed complementary to strategies of indirect rule and a comparatively weak central state:[7] The cooptation of preexist-

[6]The extent of this effect depends on the compactness of pre-existing institutional units.

[7]What does, then, account for the choice between direct and indirect rule? While classical account focus on external warfare as driver of centralization (Tilly 1990, ch. 4), factors internal to governments, such as their capacity and ideology, as well as local factors likely play a role too (e.g. Müller-



(a) Schematic relationship (b) Schematic map

Figure 1: Preservation, dismemberment and suffocation
Note: In (b), ethnic settlement areas in color and administrative borders in black.

ing political institutions to build state reach works best if their social foundations and territorial expanse remain intact and spatially consistent with the new state units. Even where groups are only weakly organized, ethnically aligned administrative divisions can augment groups' internal organization and facilitate their integration into the state. Any imposed territorial discontinuities through either dismemberment or suffocation lead to a change in local governance arrangements. This contravenes indirect rulers' credo of "if it ain't broke, don't fix it" (Gerring et al. 2011, p. 385) and creates costs the relatively weak center is unable to bear:

Preservation: *Indirect rule increases the alignment of administrative borders with ethnic geography compared to direct rule.*

In contrast, strong states use direct rule to break and replace local governance arrangements. This is aided by disruptive administrative designs that dismember and/or suffocate ethnic groups, their social networks and institutions. Akin to dynamics of "divide and rule", strategies of dismemberment and suffocation produce political tensions and conflict within and between groups, thereby limiting collective action capacities and facilitating the imposition of rule by the center.

Crepon 2020).

Dismemberment: *Direct rule increases the division of ethnic groups by administrative borders compared to indirect rule.*

Suffocation: *Direct rule increases the internal division of administrative units by ethnic boundaries compared to indirect rule.*

In general, it is important to note that the strategic incentives for (in)directly ruling governments to align administrative border with ethnic geographies or not exist irrespective of other administrative unit design choices such as units' average size and compactness. While various design aspects are interrelated for practical reasons, they are not fully co-determined. Relatedly, my theoretical argument explains only one source of variation in administrative unit designs. Concerns beyond ethnicity and (in)direct rule shape administrative designs, in particular administrative, physical, and resource exigencies. For example, administrative efficiency will favor compact units that are smaller in densely populated areas. The physics of transportation underlying states' territorial reach increase the chance that administrative borders run along rivers and mountain-ridges. And states' revenue imperatives likely leads them to place more and smaller units into resource-rich areas. While the following abstracts from such parallel sources of district designs, but the empirical discussion returns to them as far as they risk biasing the analysis.

British and French colonial administrative unit designs

I turn to British and French rule over large parts of Sub-Saharan Africa to investigate my argument that indirect rule leads to ethnically aligned administrative borders, while direct rule produces administrative borders designed to disrupt ethnic groups. The following contextualizes my theoretical argument in the relevant historical literature. In particular, I discuss the spatial character ethnic groups and pre-colonial political institutions, their encounter with rigid European conceptions of bounded territoriality, and differences between more indirect British and direct French colonial rule.

Understanding ethnic administrative unit designs in Africa does not only shed light on colonial strategies of rule and their ethno-political legacies (Ali et al. 2019). The continent also promises three advantages over studying administrative border design elsewhere.[8] First, territorial statehood was imposed by the colonizers on the continent comparatively late at the turn of the 19th century (Paine, Qiu and Ricart-Huguet 2024). This implies that we can study administrative borders as a governance revolution occurring over a few decades rather than as the longer process it was elsewhere. Second, while local actors clearly constrained and shaped colonial policies, the general French-British difference in (in)direct rule originated in the empires' ideology and overall capabilities rather than within colonies (Müller-Crepon 2020).[9] This is, again, different to historical shifts from indirect to direct rule driven by strategic center-periphery interactions (Tilly 1990; Hechter 1975). Third, the comparative overall haphazardness of colonial border designs (Herbst 2000)[10] facilitates the study of administrative borders within colonial empires. Elsewhere, selection bias complicates analyses as some subnational borders over time become state borders (Carter and Goemans 2011).

While focusing on Sub-Sahara Africa, I expect the theoretical argument to capture patterns of subnational unit designs elsewhere. For example, post-unification Germany in 1871 remained administratively divided along the borders of the comparatively powerful kingdoms in the South. This contrasts with the redrawing of administrative borders in post-unification unitary Italy which did not follow pre-existing political borders (cf. Ziblatt 2004, 2006). A similar contrast consists in the drawing of new borders in post-revolution France and Russia. The former case featured an almost grid-like homogeneous design with few compromises. In contrast, substate borders in Russia under Lenin cut across pre-existing units but were roughly aligned with the prevailing ethnic geography (e.g., Hirsch 2000). While I expect the findings to travel to other cases of internal or externally imposed governance revolutions, the generalizability of the empirical findings remains speculative until empirically tested.

[8] Note that there are also disadvantages, in particular in data availability.

[9] The general difference of course masks variation within empires (Lawrence and Sajid 2025).

[10] But see recent evidence by Paine, Qiu and Ricart-Huguet (2024) that the ultimate location of colonies' borders was often shaped by local interests and geographic conditions.

Political topographies, territoriality, and the introduction of borders

Defining the state and its subordinate administrative divisions via its territory demarcated by borders is integral to our contemporary idea of statehood (e.g., Mann 1984; Weber 1919). Yet, the use of widthless lines to territorially bound political entities is a fundamentally modern phenomenon that "was virtually unknown in most places in Africa during the period before the European partition" (Asiwaju 1983, p. 45). Instead, frontier zones characterized the spaces between the political cores of states where they existed, mirroring the absence of interstate competition over abundant and sparsely populated territory (Herbst 2000; Wilfahrt 2025).

Not dissimilar to premodern Europe (Ruggie 1983), precolonial rule oftentimes featured spatially overlapping and non-aligned jurisdiction over territory and people, with control over people being more valuable than control over territory (Herbst 2000; Wilks 1975). In practice, this implied strong political control over the core areas of states and only irregular and weak reach into their peripheries. The power of rulers was thus radiating outwards, gradually ranging from tight control in the center, via tributary rule, to mere raiding of peripheries. The rarity of precolonial maps only underscores the absence of demarcated boundaries (Herbst 2000). Evidently, the concept of territorially bounded political entities was even more foreign to acephalous societies where political power was not centralized. After all, the political boundary comes only to life as a separating line between political entities (Kristof 1959).

The prevailing diversity of political topographies changed rapidly with the colonial conquest in the late 19th and early 20th century. Not only did the European conquerors carve up the continent into empires and colonies, but partitioned their colonies into administrative units to create the basic infrastructure needed to establish "effective control." Thus shifting from rule over people to territorial rule, the elements of the hierarchical governance chain – the "thin white line" (Kirk-Greene 1980) – presided over whoever happened to reside in their territorial unit. The creation of non-overlapping and neatly bounded administrative division – regions, districts, and subdistricts – was thus as much of a governance revolution as the drawing of international borders. Both replaced the precolonial variety of governance arrangements with sharp lines that delimited the territorial scope of states and their subnational entities across the entire African landmass (see Asiwaju 1983).

To make matters worse, the introduction of the concept of bounded, non-overlapping units extended to the colonial conceptualization of ethnic geography. Historiographies describe the predominant colonial mindset as expecting individuals to be nested in tribes, "discrete, bounded groups, whose distribution could be captured on an ethnic map" (Young 1985, p. 74). Incidentally, this understanding of ethnic geography – and the production of ethnic maps based on it – was intimately linked to ethno-nationalist discourses that colonizers brought from Europe (Berman 1998).

Yet, the idea of geographically fixed, bounded, and non-overlapping groups met a reality where multiple groups often settled in the same environmental niche, as for example pastoralists and sedentary agriculturalists inhabiting the same savanna (Cohen and Middleton 1970, p. 11). Even the identification of groups themselves sometimes proved difficult, in particular where identities and associated loyalties were "complex, flexible and amorphous, sometimes overlapping, sometimes complementary, and did not add up to clearly demarcated tribes" (Lentz 1995, p. 317, Southall 1970). Consequently, ethnic groups as perceived by colonial governments did not correspond neatly to political entities, which in turn often included ethnic minorities among their populations (e.g. Colson 1960; Wilfahrt 2022).

While there was often no one-to-one correspondence between ethnic groups and precolonial institutions, the anthropological literature highlights that cultural groups tended to have distinctive political institutions, in particular but not only in cases with centralized political authorities (e.g. Fortes and Evans-Pritchard 1940). For example, ethnic minorities ruled by a larger state often received special political treatment (e.g. Colson 1960; Wilfahrt 2022), indicating institutional differentiation along ethnic lines. As Ochonu (2014) shows for the case of Hausa governance over non-Muslim ethnic groups in the Nigerian middle-belt, (British) colonial rulers often built on these precolonial ethno-political topographies. Even acephalous ethnic groups feature more institutional homogeneity within than between groups. In turn, the creation of aligned administrative units around acephalous groups can effectively creates group-level political organization and contribute to their identity formation (MacArthur 2012, 2013)

Strategies of local rule: British versus French styles

For British colonies in particular, there is ample case study evidence that colonial administrators often aimed at drawing district boundaries along the 'tribal' boundaries they perceived. Because the dominant strategy of indirect rule declared 'tribes' as 'natural' social units of local governance, ethnic settlement areas or "tribal homelands" were destined to become administrative units (e.g., Asiwaju 1970; Crowder 1968; Miles 1994; Spear 2003).

While the British application of indirect rule is widely known, its impact on administrative unit design is not precisely documented. Writing on the internal borders of the British Gold Coast, today's Ghana, Lentz (2006, p. 53) notes that the colonial government was able to make administrative borders roughly but not fully consistent with the prevailing, complex, and fuzzy ethnic geography. Instead, pragmatism coupled with administrative and geographic exigencies ultimately determined the precise location of borders (see also Howard 2005). Yet, Sharpe (1986) describes how local chronicles were used in Northern Nigeria to determine ruling elites, their groups, and delimit administrative areas. Evidencing similar bottom-up processes, local populations and elites in the Gold Coast at times successfully mobilized for border change that would increase the alignment between social and administrative geographies (Bening 1999). While Müller-Crepon (2020) notes that British rule was more direct in pre-colonially acephalous groups without centralized institutions due to creation of new subnational governments, the resulting governance arrangements where nevertheless ethnicized by grouping coethnic areas with similar local institutions together into a common administrative unit.

The historical case of French colonies is different for their more centralized governance. Although French administrations relied on local intermediaries as well, they tended to crush pre-existing institutions, replace them with more uniform institutions of their own making, and hand less power to local rulers (e.g., Cohen 1971; Conklin 1997; Crowder 1964; Müller-Crepon 2020). This strategy of direct rule likely originated in the higher level of administrative capacity available to the French and their preference for more centralized governance, following a Republican blueprint that despised hereditary and other forms of traditional rule (see, e.g. Müller-Crepon 2020).

Strategies of administrative unit designs among French governments are again less studied. The available evidence at least partially points towards a more fundamental disregard of precolonial ethno-political geographies. Pourtier (1989, p. 288) notes for the case of Gabon the French goal of establishing a tight administrative hierarchy modeled after Republican France that directly opposed tribalism and did not regard ethnic geography. Bernier (1976) similarly concludes that French colonial *cercles* did not have roots in ethnic or institutional geography, at least not at the end of the colonial period. This pattern has also been noted by Crowder (1968, p. 175) across French West Africa (see also Suret-Canale 1966; Guillaume 1999). In contrast, Lefebvre (2019) for the case of Niger notes that the colonial administration did indeed, presumably because of their weakness, aim at harnessing the social power of local elites and therefore modeled administrative units after their reach.

Yet, the evidence cited above is based on relatively few cases which may not generalize. The case studies also do not typically account for potentially biasing influence of geographic features that simultaneously affect ethno-political geographies and colonial administrative borders. Given the impossibility of a perfect alignment between fuzzy ethnic topographies and sharp administrative borders, to what extent colonizers chose to (avoid) ethnic dismemberment and suffocation.

Observable implications

Clear expectations arise from the theoretical argument, its application to British and French (in)direct rule, and the suggestive historical evidence. In particular, I expect that ethnic boundaries caused the drawing of aligned administrative borders in British colonies, yielding high levels of preservation of ethnic groups and their social networks and institutions. Consequently, and conditional on districts' average size, I expect relatively low levels of dismemberment and suffocation. The effect of ethnic boundaries should be smaller if not absent in French colonies where disruption of ethnic groups was the theoretically expected strategy. Because extensive dismemberment and suffocation might be strategic substitutes, it is ex ante unclear what mix of increased administrative dismemberment and suffocation drives this disruption.

It is important to note the temporal dynamics of the increasing administrative partitioning of colonial territories. At the most basic level, the number of administrative units tended to steadily increase in lockstep with the expansion of the colonial state apparatus. But the redrawing of administrative borders could also be driven by bottom-up pressures such as those in Nigeria and the Gold Coast as well as top-down decisions by colonial governments driven by learning from failures and information accumulation. In line with the theoretical argument, I therefore expect ethnic geography to shape administrative border changes in British colonies more than in French colonies.

Historical data on administrative and ethnic geographies

I test whether colonial governments aligned administrative geographies with prevailing ethnic geographies using newly digitized ethnographic and administrative maps from the colonial period. The following presents the spatial data structure and the main variables of interest, providing the grounds for introducing the Probabilistic Spatial Partition Model (PSPM) thereafter.

Colonial state territories as planar graphs

The approach to modeling administrative borders follows Müller-Crepon, Schvitz and Cederman (2025) in understanding geographic space as a planar network of points. The network approach discretizes the otherwise infinite number of possible outcomes. Through the PSPM, it accounts for spatial interdependencies and observed covariates, thereby improving previous approaches to inferring the causes of spatial partitionings.

The structure of the main graph takes into account geographic area and the heavily skewed population distribution of the African continent.[11]. I do so by spatially sampling the graph's vertices with a probability proportional to the natural logarithm of local population counts estimated for the year 1880 by Goldewijk, Beusen and Janssen (2010).[12] The edges of the planar network are derived through a Delaunay triangulation, which connects points closest to each other without creating overlapping edges.[13] I sample 400 vertices per million square kilometers, which yields an average edge-length of approximately 50 kilometers. Figure 2 plots the full graph and Figure 5 shows more detail for subgraph of the Gold Coast (Ghana). Appendix A.10 shows robustness of the main results to varying spatial graph structures.

After constructing one graph for the entire continent, I cut the same into the British and French empires. Doing so avoids spatial overlap between the two samples. Throughout, I assess all intra-empire administrative borders of districts and cercles, including those that coincide with borders between colonies, since these were often changed and likely follow similar strategic concerns as administrative borders within colonies.[14]

Administrative geographies

To measure administrative borders, I extend the spatial and temporal coverage of existing data from British (Müller-Crepon 2020) and French sources (Huillery 2010). For the main analysis, I focus on British districts and French *cercles*.[15] Administrative borders have been changed with relative frequency (e.g. Bening 1999; Wilfahrt 2022), refining them over time. Beyond cross-section information, the panel data is particularly useful for studying border change with a lagged dependent variable model which addresses concerns over reverse causality.

The data collection aimed at mapping British and French administrative geogra-

[11] Population density and administrative units' size are negatively correlated.

[12] I add a constant of one.

[13] Mathematically, the triangulation connects pairs of vertices with a common boundary in a Voronoi tesselation around them. I only allow for non-overlapping edges as they prevent non-contiguous partitions in the partition model.

[14] Appendix A.6 shows consistent results when dropping all cross-colony edges.

[15] French cercles are on average larger than British districts but smaller than British regions, for which no equivalent exists in French colonial Africa. British regions are the subject of an additional robustness check (see Appendix Table A3).

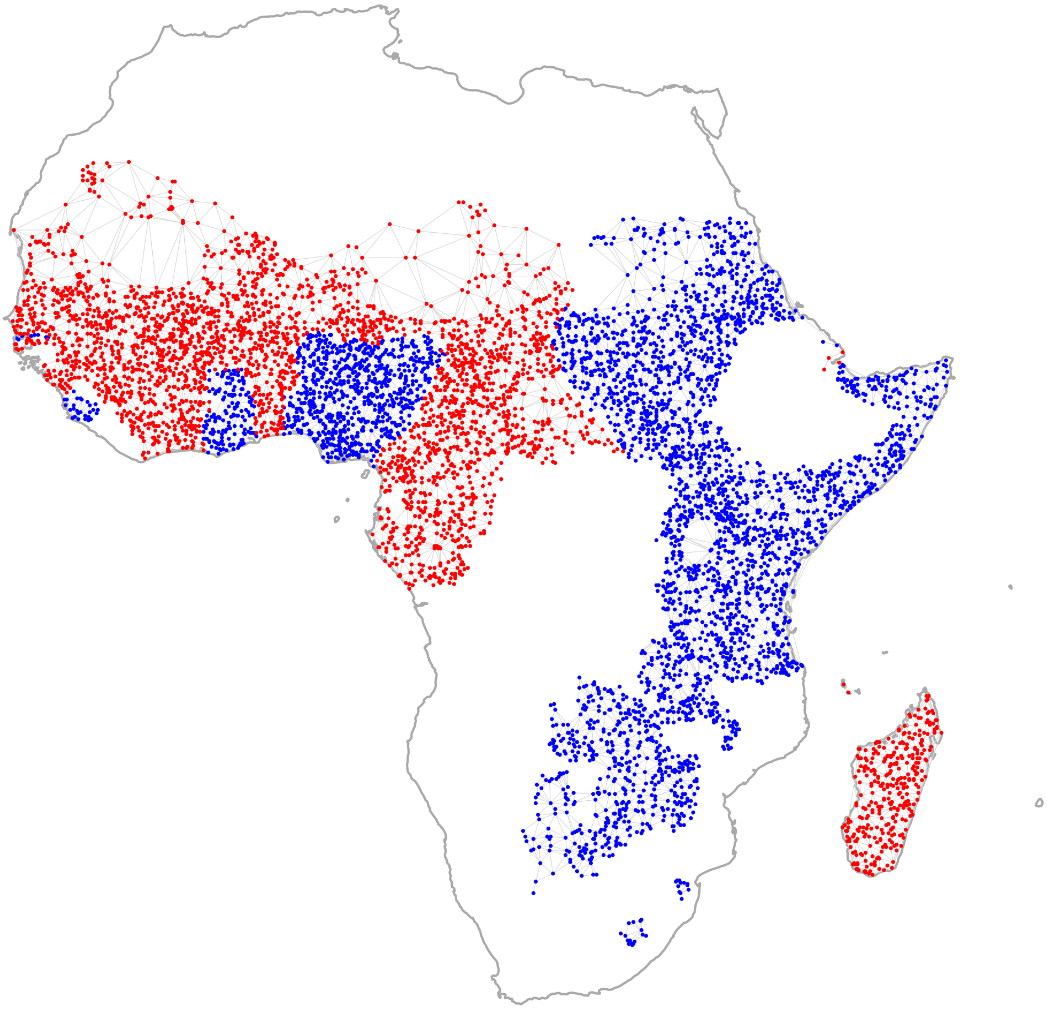
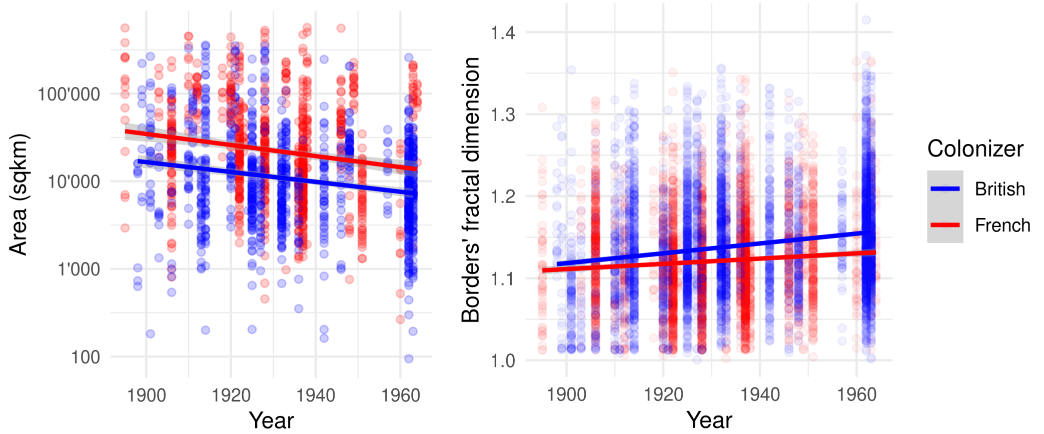


Figure 2: Former British and French colonies as planar graphs



(a) Size of administrative units over time

(b) Fractal dimension of administrative borders over time
Note: The fractal dimension of straight borders is 1. Its value increases towards two for very squiggly lines.

Figure 3: The refinement of colonial administrative partitionings over time

phies in the early (ca. 1900-1920), mid (ca. 1920-1940), and late (1940-independence) colonial periods. In total, I have with the help of my research assistants digitized 53 new administrative maps. Joined with the existing data, the final database spans 82 unique colony-years in 26 colonies with a total of 1'858 administrative units.

The data clearly shows an iterative process of refining administrative units in the British and French colonies, not unlike that of higher-level colonial borders (Paine, Qiu and Ricart-Huguet 2024). As shown in Figure 3, units' average size roughly halves over time due to a parallel doubling of the number of administrative units. At the same time, borders 'squiggliness,' or fractal dimension, increases steadily as borders are drawn with increasing knowledge of social and natural geography.[16] Because French colonies cover more desert areas that are barely populated, their administrative borders are, on average, straighter.

Because the full data covers some colony-periods multiple times and others not at all, the analysis draws on a trimmed version of the dataset. It uses only one map per period, dropping colony-periods without coverage (see Figure 4). I define periods' start and end years flexible (±3 years) to maximize coverage. In additional analyses that explore the persistent effects of ethnic geography post-independence, I employ the time-series of post-colonial regional borders from Müller-Crepon

[16]I compute borders' fractal dimension which is 1 for straight lines and approaches 2 for squiggly lines (Alesina, Easterly and Matuszeski 2011).

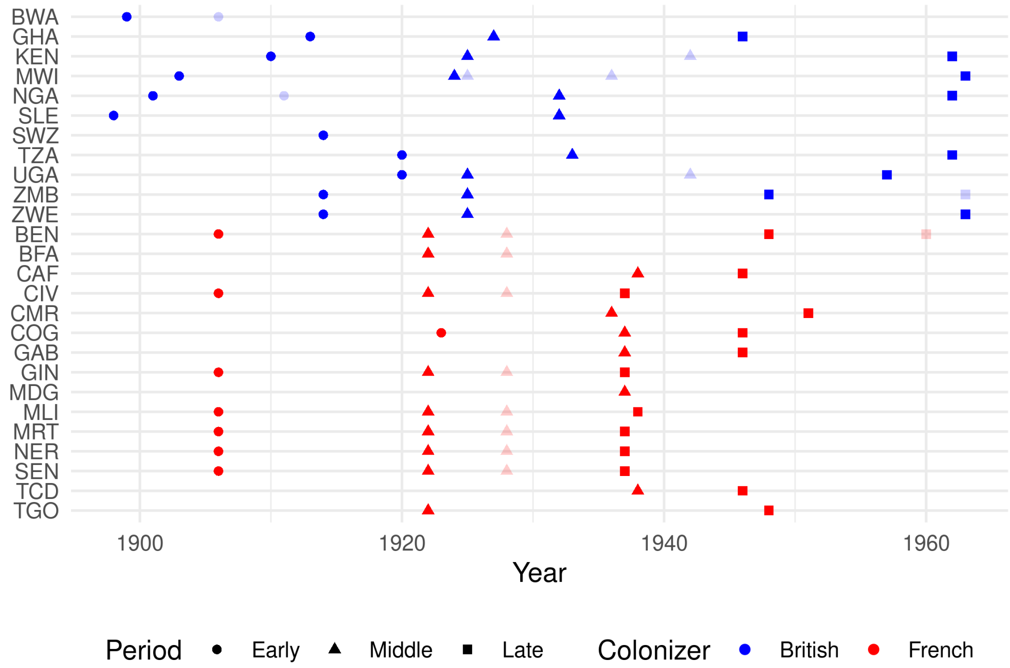


Figure 4: Administrative data used in the main analysis by colony and year. Transparent dots denote data that is dropped to avoid duplicate coverage of colony-periods.

(2021).[17]

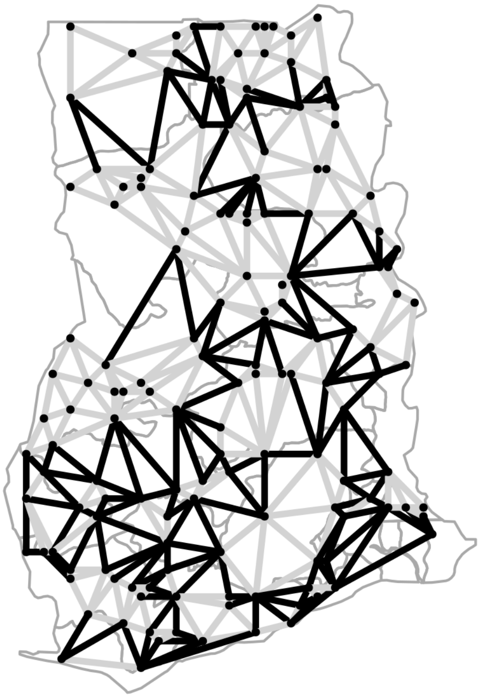
I intersect the data from every colony-period with the main graph introduced above. As the main outcome of the analysis shown in Figure 5b, I code the administrative unit within which every node falls. At the level of edges, I code whether an edge, in a given period, crosses an administrative boundary or not.

Historical ethnic geography

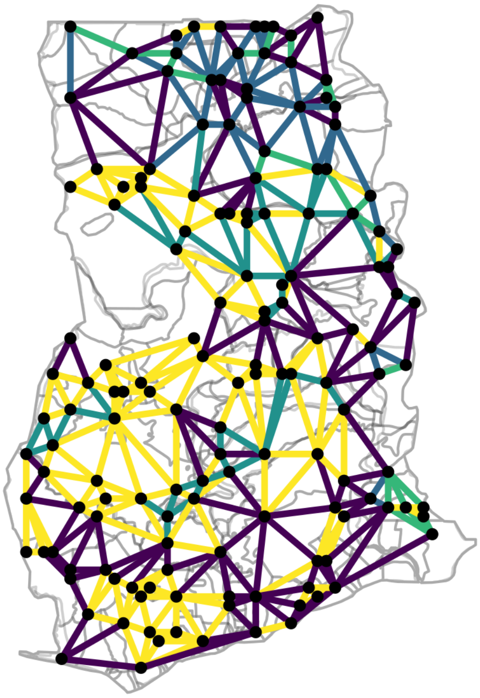
While colonial administrative borders are comparatively well-documented on maps that were crucial for the functioning of the colonial state, data on ethnic geographies is scarcer and of worse quality. Even more importantly, ethnographic maps are affected by the colonial conceptualization of ethnicity itself.

First, as noted above, the boundaries of groups themselves were oftentimes fuzzy, with mutually unintelligible languages separated by dialect continua, further complicating the "ethnic grouping problem" which highlights the importance

[17]Unfortunately, post-colonial data does not exist at the level of districts before 1990.



(a) Outcome: District borders



(b) Ethnic boundaries from colonial ethnographic maps

Note: Ethnic settlement polygons from six and points from one map in grey.

Figure 5: Data illustration: British Gold Coast (today's Ghana).

Note: Darker edges denote edges that cross district borders in (a) and greater ethnic differences in (b). The measure in (b) is computed as the fraction of maps that cover a given area on which an edge crosses an ethnic boundary, while discounting ethnic settlement areas that overlap on the same map.

of the choice of granularity at which groups are conceptualized (Posner 2004). Second, groups often settled and continue to live in a spatially interspersed manner (Lentz 1995). Third, individuals' interethnic heritage and frequent multilingualism further complicates measurement (Buzasi 2016). A fourth problem consists in historical reverse causality biases by which administrative borders shaped (perceptions of) ethnic groups and their geography (e.g. Müller-Crepon 2025; Singh and Vom Hau 2016).

While clearly important, the above concerns should not deflect from the fact that individuals across Sub-Sahara Africa spoke and still speak a vast diversity of languages, which differ to varying degrees and cluster geographically. In other words, categorical classifications of ethnic groups tend to be more informative in the center of groups' main settlement regions and less so in the linguistic and geographical space between them. The approach to measuring ethnic geography employed in this paper builds on this understanding while aiming to address the problems identified above. In particular, a collection of 49 newly digitized historical ethnographic maps drawn throughout the colonial period overcomes some of the problems associated with existing data on ethnic geography.

In the following, I first discuss problems relating to the quality and timing of the widely-used ethnographic map by George Murdock (1959). These limit the map's usefulness for explaining administrative borders. I then present a new collection of colonial ethnographic maps. They are of higher quality, together capture local ethnic mixing and uncertainty, and allow for analyzing administrative border changes occurring *after* their date of production thus mitigating reverse causality.

Murdock's classic map of ethnic groups and its shortcomings: The ethnic map produced by Murdock (1959) is based on earlier secondary sources, was digitized by Nunn and Wantchekon (2011), and has been very influential in the burgeoning quantitative historical literature on the continent. The map shows the approximate settlement areas of 842 ethnic groups across the whole continent. Yet, while its coverage is extensive, it features three important drawbacks. First, the map is of low resolution (1:10 million or 1cm = 100km) which leads to low spatial detail.Second, Murdock depicted groups' settlement areas as non-overlapping, neatly bounded, and shaped smoothly and regularly. This suggests either significant noise or, worse, bias in measurement of ethnic boundaries. Lastly, it is unclear how Murdock triaged between potentially diverging information on relevant ethnic groupings and their geography from secondary sources. The latter two caveats point to the danger of reverse causality by which administrative regions might have influenced Murdock's mapping of ethnic geographies.

Murdock's map has the advantage of full and relatively uniform coverage of all of Africa, which makes it suitable for many research designs that do not rely on high spatial precision in the mapping of ethnic groups. Yet for explaining administrative borders, the map's low resolution, lack of detail, and risk of reverse causality motivate a new collection of ethnographic maps that predate Murdock's summary map.

Colonial ethnographic maps: The new collection of ethnographic maps from across Sub-Sahara Africa combines 49 newly digitized historical maps. The resulting measure of ethnic boundaries captures the information on ethnic geographies and the uncertainties and ambiguities associated with it at the time when administrative borders were drawn.

The maps were found through a systematic search in online map repositories and major library catalogues.[18] All maps were produced prior to that of Murdock (1959). Most maps follow the typical "polygon-style" also used by Murdock, though many depict ethnic settlement areas as overlapping. A few maps depict uncertainty directly by showing the names of some ethnic groups without any spatial delimiters, thus denoting fuzzy and unbounded ethnic settlement areas. As visible in Figure 5b, the maps have a much higher resolution than the one by Murdock, since they focus on regions, and more often even on (parts of) single colonies.

The main drawback of using historical ethnographic maps as sources to measure ethnic geography consists in potentially biased measurement. Given the maps' potential impact on policy making, diverging colonial ideologies might have produced maps to justify, for example, administrative unit designs, thus introducing

[18] Search terms include ethnic*, language, ethnographic, and similar. Libraries include the Bodleian Library at the University of Oxford, British Library, Library of Congress, and the Bibliothèque Nationale de France.

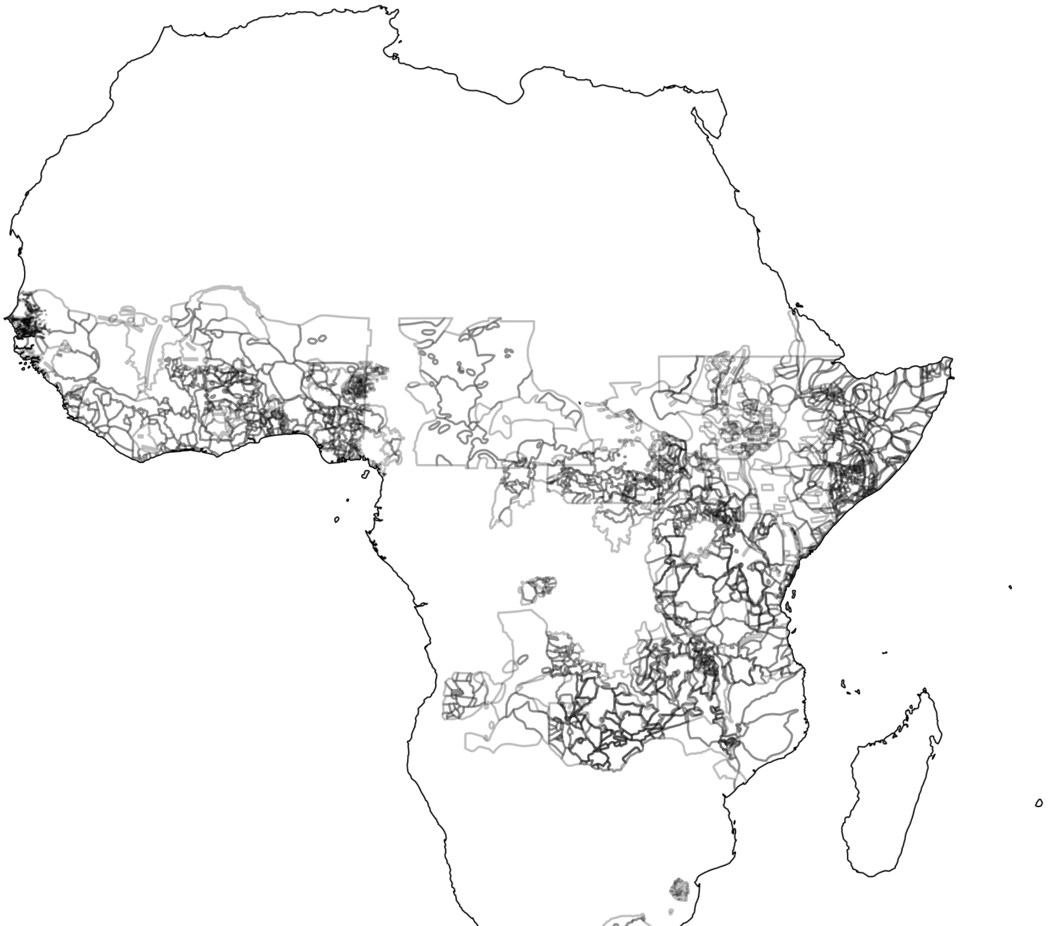


Figure 6: Ethnic settlement areas from 49 historical ethnic maps

the risk of reverse causality and omitted variable bias (cf. Lawrence and Sajid 2025). A dedicated empirical strategy explained in more detail below addresses this issue by using temporally lagged ethnic maps to explain border changes.

In sum then, the digitization of this ethnographic data allows for capturing local ethnic diversity and colonial ethnographers' uncertainty about ethnic groupings and their geographies. I encode this information on the graph by computing for each edge the fraction of maps on which an edge crosses an ethnic boundary (see Figure 5b). Where groups are depicted only as "limitless" labels, I associate vertices only with a group if it falls on the label.

Probabilistic Spatial Partition Model

I use a recently developed Probabilistic Spatial Partition Model (PSPM) to estimate the effect of ethnic geography on the partitioning of the spatial graph into administrative units. The model, presented in detail by Müller-Crepon, Schvitz and Cederman (2025), captures the realization probability of any partitioning $P = p_i$ among all possible contiguous partitionings $\mathbb{P}$ of a graph as a Boltzman distribution

$$Pr(P = p_i) = \frac{e^{-\epsilon_i}}{\sum_{i=1}^{|\mathbb{P}|} e^{-\epsilon_i}}, \tag{1}$$

where the likelihood of a given partitioning p_i decreases with the total "energy" ϵ_i associated with it. The PSPM encodes the explanatory factors of partitioning p_i as functions that contribute to its energy ϵ_i and estimates associated effect parameters.

I proceed in two steps. I first follow Müller-Crepon, Schvitz and Cederman (2025) and use edge-level predictors to test how far ethnic boundaries explain administrative borders as an overall measure of ethnic preservation. Second, I introduce new macro-level predictors to distinguish between ethnic dismemberment and suffocation. The following introduces both approaches.

Modeling preservation as edge-level effects of ethnic boundaries

Following Müller-Crepon, Schvitz and Cederman (2025), I first model a partitionings' energy ϵ_i as depending on the realization of attractive and repulsive forces

$\epsilon_{j,k}$ on the edges between all nodes $j, k \in L$:

$$\epsilon_i = \sum_{j,k \in L} \mathbb{1}_{j,k}(u)\, \epsilon_{j,k}, \tag{2}$$

$$\epsilon_{j,k} = \beta_0 + \beta_1\, \textsf{ethnic boundary}_{j,k} + \delta\, \mathbf{x}_{j,k}, \tag{3}$$

As denoted by the indicator $\mathbb{1}_{j,k}(u)$ in Eq. 2, edges' energy $\epsilon_{j,k}$ is only realized if vertices j and k are part of the same administrative unit u and 0 otherwise. If realized, $\epsilon_{j,k}$ is determined by the constant β_0 which accounts for the average size and compactness of units, the effect of ethnic boundaries β_1, as well as the effects of covariates $\mathbf{x}_{j,k}$ captured by the parameter vector δ.

The coefficients denote repulsive forces if positive and attractive forces if negative. They are estimated similarly to typical regression coefficients. I expect a positive coefficient for ethnic boundaries in British colonies which is larger than that obtained from the French sample. Importantly, larger repulsive effects of ethnic boundaries suggest greater overall preservation: the absence of ethnic dismemberment and suffocation. Ethnic boundaries have a maximal effect if all ethnic boundaries align with a district border and no district border cuts through an ethnic group.

In the baseline specification, covariates $\mathbf{x}_{j,k}$ capture potential joint determinants of administrative borders and ethnic geography that relate to alternative origins of administrative borders. In particular, I include edges' length (km, logged), the size of the largest river and watershed they cross, their average elevation, as well as the average population density (Goldewijk, Beusen and Janssen 2010) and distance to the coast of the two vertices they connect (both logged). The baseline specification pools across all three periods. For ease of estimation and implementation, I estimate the models separately for the French and British samples throughout.

The main inferential risk of the baseline analysis consists in reverse causality. In particular, in the apt words of Lawrence and Sajid (2025, p. 968), ideological commitment to colonial policies of (in)direct rule might well have "necessitated that local conditions be interpreted and represented in ways that made colonial administrators' policy prescriptions seem legitimate and feasible." In other words, the creation of administrative units likely had a direct effect on ethnographic maps which might simply go on to pretend that administrative border align with ethnic geography (see also Posner 2005; Müller-Crepon 2025).

A lagged dependent variable (LDV) specification addresses this risk of reverse causality and omitted variable bias by adding a lagged dependent variable that captures administrative boundaries in $t-1$. In addition, for the LDV model, I adjust the ethnic boundary measure such that it is only based on ethnic maps drawn in years prior to the observation of administrative borders in $t-1$. Because of the scarcity of early ethnographic maps, the LDV model can only be estimated for the late colonial period, with administrative borders mapped in the mid-colonial period as the lagged dependent variable. Early ethnographic maps are available for West Africa in 1924, French Equatorial Africa in 1914,[19] and British East and Central Africa in 1943.[20]

Through the parameter coefficients, the PSPM estimates the contribution of each variable to the overall potential energy of edges to maximize the likelihood of observing the realized partitioning of colonies into administrative units. I use the model and estimator developed by Müller-Crepon, Schvitz and Cederman (2025), which estimates parameters via a maximum composite likelihood approach and derives standard errors from a parametric bootstrap.[21]

Ethnic dismemberment and suffocation as macro-level predictors

The *edge-level* characteristics in the main specification cannot distinguish whether ethnic alignment of administrative borders is driven by the absence of ethnic dismemberment, suffocation, or both. Such an analysis requires predictors situated at higher levels of analysis. I therefore extend the parametrization of partition-

[19]The results maybe biased by the inclusion of this very early and likely imprecise map. Dropping French Equatorial Africa does, however, not change the results of the LDV model, see Appendix Table A1.

[20]For Kenya and Uganda, the ethnic map (1943) was drawn the year *after* administrative borders are observed (1942). No administrative border changes are known to the author for that year and dropping the two cases from the analysis does not change the results, see Appendix Table A1.

[21]Using the `pspm` R-package (Müller-Crepon, Schvitz and Cederman 2025) with 160 bootstrap iterations and a burnin period of 10. Appendix A.1 evidences stable results with fewer or more burnin periods.

ings "energy" ϵ_i (Eq. 2) with functions that operate across sets of vertices.[22] In the present case, this is the extent to which a partitioning p_i dismembers groups $g \in G$ so that they are internally fragmented by the borders of units $u \in U_i$ and suffocates groups in ethnically heterogenous units:

$$\epsilon_i = \gamma_1 \,\textsf{dismemberment}(G, U_i) + \gamma_2 \,\textsf{suffocation}(G, U_i) + \sum_{j,k \in L} \mathbb{1}_{j,k}(u)\epsilon_{j,k} \tag{4}$$

where the degree of suffocation and dismemberment of partitioning p_i is computed as Herfindahl-Hirschman indices aggregated across groups $g \in G$ and districts $u \in U_i$ weighted according to the number of nodes they comprise (w_g and w_u).[23]

$$\textsf{dismemberment}(G, U_i) = \sum_{g \in G} \left(w_g \left(1 - \sum_{u \in U_i} \left(\frac{g_u}{g} \right)^2 \right) \right). \tag{5}$$

$\textsf{dismemberment}(G, U_i)$ is computed based on the fractionalization of groups g spread across districts u in which they reside with proportions g/g_u. Dismemberment is 0 if each group is fully contained within one district (irrespective of its ethnic diversity). It increases as groups are split into ever more parts by administrative units. A *negative* γ_1 in Eq. 4 then suggests that districts are drawn to explicitly dismember groups, since the respective decrease in the overall energy ϵ of a partitioning increases its chance of realization. In turn, a *positive* γ_1-estimate would suggest that district designs leave groups less divided than expected.

Suffocation is similarly defined as

$$\textsf{suffocation}(G, U_i) = \sum_{u \in U_i} \left(w_u \left(1 - \sum_{g \in G} \left(\frac{u_g}{u} \right)^2 \right) \right), \tag{6}$$

$\textsf{suffocation}(G, U_i)$ is 0 if every district u is fully ethnically homogeneous. This is the case if the proportion of a district that belongs to any one group u_g/u is either 0 or 1. Suffocation increases as districts become more ethnically diverse. Accordingly,

[22] Note that such parameters have potential applications beyond this study. For example, in the gerrymandering literature (e.g. Katz, King and Rosenblatt 2020) the logic of cracking and packing has not been explicitly tested with account of potential covariates.

[23] Using these absolute weights mirrors the modeling of effects of edge-level predictors as the *sum* over all edges.

a *negative* γ_2 in Eq. 4 would signal that units are designed to suffocate groups, since the respective decrease in the overall energy ϵ increases a partitionings chance of realization. In turn, a positive coefficient γ_2 would suggest that administrative units are ethnically more homogeneous than expected.

Note that a coefficient of zero for the dismemberment and suffocation variables would entail no statistical association of ethnic geography with administrative partitioning. In effect, such a drawing of administrative borders without reference to ethnic geography would entail substantive dismemberment and suffocation. Moving below zero would entail district design with more dismemberment and suffocation than expected from (conditionally) random unit designs. Because 0 might thus be a relatively low bar for both indicators, I also test whether estimates for the British and French empires differ from each other. I expect dismemberment and suffocation to be less likely in British colonies, which should yield larger *positive* γ parameters than the French colonies.

Macro-level predictors such as those developed here are powerful in the extent to which they can be tailored to a theoretical argument. Yet, this precision comes with difficulties in modeling potential omitted variables, which could modeled in an essentially limitless set of supra-edge predictors. Avoiding potentially arbitrary choices and complex computational procedures, I here simply control for the edge-level covariates used in the baseline analysis. These geographic factors have, most likely, a mostly local effect. The lagged-dependent variable for the LDV specification furthermore accounts for the effects of further omitted variables, including time-invariant effects of stable supra-edge predictors.

Since the $\mathsf{dismemberment}(U_i, G)$ and $\mathsf{suffocation}(U_i, G)$ predictors are based on a categorical measurement of ethnic geography,[24] I draw on the earliest available ethno-graphic maps for Central (1914), West (1924), and East (1943) Africa to estimate the γ parameters in Eq. 4. I continue to rely on the same composite maximum likelihood estimator with parametrically bootstrapped standard errors as Müller-Crepon, Schvitz and Cederman (2025).[25]

[24] I abstain from implementing a version that averages across maps which would add significant complexity to estimation and interpretation.

[25] In comparison to the main analysis, I extend the burnin period of the sampler underlying the bootstrap to 50 periods. This avoids unstable standard errors, see Appendix B.1.

The varying effects of ethnic geography on administrative borders

The results from estimating the PSPM indicate that district borders where designed in relative congruence with ethnic geography in the British colonies. In turn, the borders of French *cercles* do not correlate systematically with ethnic boundaries. This differences is driven by greater levels of ethnic dismemberment in French compared to British colonies, with no significant difference in ethnic suffocation. Additional results show that colonial legacies in the effects of ethnic boundaries on administrative affect administrative borders until today. Results of robustness checks are available in the Appendix and and discussed alongside the main results.

Preservation: The effect of ethnic boundaries

Looking first descriptively at the raw data, Table 1 shows the (joint) incidence of ethnic boundaries and administrative borders by colonial empire. Overall, 44% of edges in British colonies cross ethnic boundaries, compared to 50% in French colonies. Similarly balanced, edges cross district borders at a rate of 35% in British, as compared to 32% in French colonies. Despite these similarities, the British sample features a much higher coincidence of ethnic and district boundaries. In British colonies, edges that cross ethnic boundaries are 28 percentage points more likely to also cross a district border (22.7 vs. 50.5%). This difference amounts to only 9 percentage points in French colonies (27.6 vs 36.5%).

Table 1: Ethnic boundaries and administrative borders at the edge-level, in %

	District border					
Ethnic	British			French		
boundary	all	0	1	all	0	1
all	100	65.0	35.0	100	68.0	32.0
0	56.0	77.3	22.7	50.4	72.4	27.6
1	44.0	49.5	50.5	49.6	63.5	36.5

Displays average district border status by rounded ethnic boundary value.

Table 2 shows the main PSPM estimates using the baseline and LDV specification. Looking first at the British colonies, we see a consistent and precisely es-

Table 2: Ethnic boundaries and administrative borders in British and French colonies

	British		French	
	(1)	(2)	(3)	(4)
Constant	-9.94^{*}	-9.12^{*}	-10.07^{*}	-6.48^{*}
	$[-10.70; -9.24]$	$[-10.49; -6.99]$	$[-10.81; -9.10]$	$[-8.05; -2.87]$
Ethnic boundary	0.47^{*}	0.38^{*}	0.14^{*}	0.02
	$[0.40; 0.53]$	$[0.25; 0.54]$	$[0.07; 0.21]$	$[-0.22; 0.25]$
Lagged dep. var.		0.81^{*}		1.06^{*}
		$[0.73; 0.97]$		$[0.89; 1.24]$
Controls	yes	yes	yes	yes
No. of vertices	11664	1662	10084	1010
No. of edges	31576	4493	27760	2584
No. of units	1466	247	876	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

timated effect of ethnic boundaries on the probability that two vertices are separated by district borders. For fully independent, so-called "bridge" edges which can change whether they cross a district border or not irrespective of all other edges, ethnic boundaries are associated with a hazard ratio of 1.60 [1.49, 1.70] in the baseline model and 1.46 [1.29, 1.71] in the LDV specification. Setting all covariates to their median values, ethnic boundaries in British colonies are associated with an increase of the chance of a bridge egde being crossed by a border by 10 percentage points from 24.6 [23.9, 26.1] to 34.3 [33.7, 36.4] percent in the baseline spcification. In the LDV model with a median lagged dependent variable of 0, the effect of ethnic boundaries amounts to an increase of 7 percentage points from 19.1 [16.7, 21.6] to 25.6 [22.7, 29.0] percent. Note that interdependence between non-bridge edges tends to increase effect sizes as ethnic boundaries cross strings of connected edges. Most of the effect of ethnic boundaries in the LDV model is driven by the emergence of new administrative borders along ethnic boundaries and less so by greater stability of already existing ones (see Appendix Table A2).

Patterns in the set of French colonies look different with a much smaller and unstable effect associated with ethnic boundaries. While the ethnic boundaries show a association with *cercle* borders in the baseline specification, this finding is not robust to the inclusion of the lagged dependent variable. In the former, the hazard ratio for bridge-edges associated with ethnic boundaries amount to 1.15 [1.08, 1.23] but decreases to a statistically and substantively insignificant 1.02 [0.80, 1.28] in the

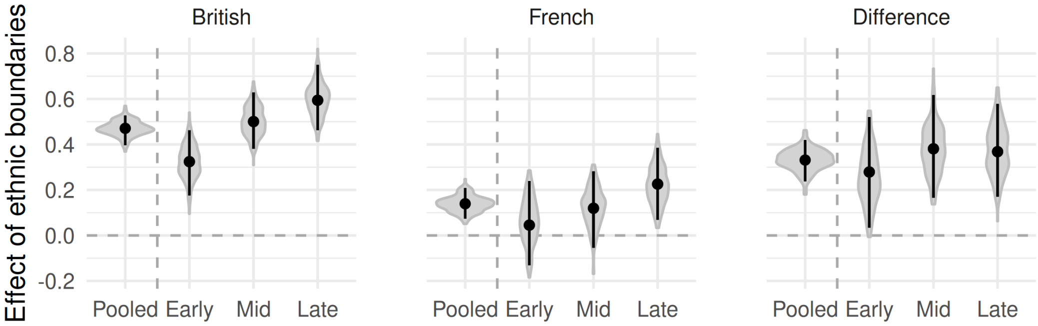


Figure 7: Baseline effect of ethnic boundaries on colonial administrative borders by measurement period

Note: Results from the baseline specification for the pooled and period-wise samples. 95% Confidence intervals and estimate distributions result from a parametric bootstrap with 160 iterations.

LDV specification.

Figure 7 disaggregates the results from baseline Models 1 and 3 in Table 2 into the three measurement periods of colonial administrative borders.[26] The results show that the association between ethnic boundaries and administrative borders becomes stronger for the British and French colonies over time, yet at differing levels. While the association is substantive, increasing, and statistically significant for British colonies throughout, it only becomes statistically significant in the French parts of Africa in the late colonial period. The small and insignificant results from the LDV model (4) in Table 2 suggests that this increase might be due to bias from reverse causality by which administrative borders have affected the drawing of later ethnic maps. The increase in the cross-sectional effects of ethnic boundaries also suggests that the results are not driven by information-poor border designs using ethnicity as a heuristic shortcut to gauge political loyalties. If that were the case, we would expect the effect to dissipate over time as knowledge grew.

Estimated effects of the control variables in models that exclude measures of ethnic geography conform with qualitative evidence on the influence of geographic features on the design of administrative units in the colonial period (see Appendix A.7). In particular, rivers (but not watersheds) are frequent causes of district borders which are additionally more often drawn in densely populated areas. Average

[26]The LDV results can not be disaggregated, since they are based on only on changes between the mid and late colonial period.

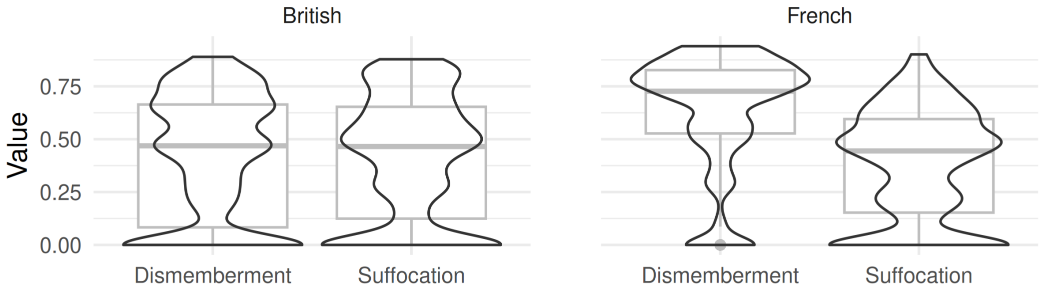
population density along edges is positively affected with the likelihood of them being crossed by administrative borders, indicating smaller units in more densely populated areas.

Additional analyses show robustness to dropping and extending the vector of control variables (Appendix A.7). Importantly, estimating a linear model in Appendix A.11 allows for including vertex-level fixed effects. The stable results show that the main effect of ethnic boundaries is not explained by any local vertex-level characteristics such as, for example, the identity of an ethnic group, the presence of resources, or other non-relational geographic or climatic variables. Further evidence against reverse causality from endogenous identity formation beyond the LDV comes from the finding of similarly sized effects for small and large linguistic distances across ethnic boundaries (Appendix A.4).

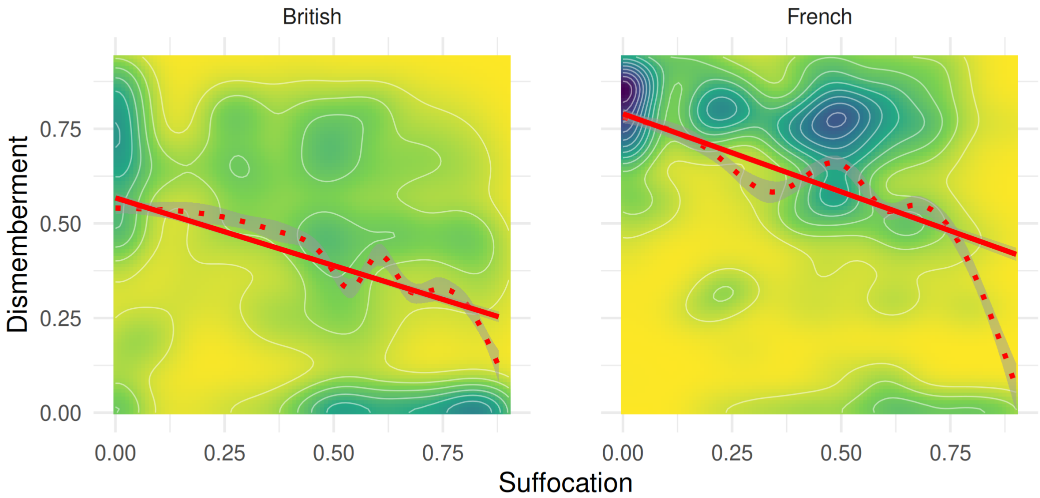
An important confounder of ethnic boundaries might consist in the centralization of precolonial political institutions, in particular since stronger precolonial states might have successfully assimilated local ethnic minorities into a common identity (Chlouba 2025). I capture this dynamic with a precolonial stateness index based on data on precolonial states from Paine (2019) and Wilfahrt (2025). Consistent with previous evidence on (in)direct rule (Müller-Crepon 2020), precolonial statehood is significantly associated with larger districts in British but not French colonies. However, this does not reduce the estimated effects of ethnic boundaries.

Disruption through dismemberment or suffocation?

Analyzing the effects of dismemberment and suffocation of ethnic groups separately allows for gaining additional insights into the mode of disruption in cases where administrative borders do not align closely with ethnic boundaries. Descriptively, Figure 8 shows two substantive patterns in the incidence of dismemberment and suffocation. First, in (a), it appears that French colonies feature a 50 percent higher average level of ethnic dismemberment than British colonies (mean of 0.72 vs 0.47) but a similar level of suffocation (mean of 0.44 vs 0.47). Second, panel (b) plots the joint distribution of dismemberment and suffocation. In line with the idea of them being strategic substitutes for reasons of practicability, they tend to



(a) Distribution of dismemberment and suffocation by empire



(b) Joint distribution of dismemberment and suffocation by empire

Figure 8: Dismemberment and suffocation at the vertex-level across periods
Note: Red straight (dotted) lines result from a linear (LOESS) model.

be negatively correlated: at least empirically, dismemberment and suffocation are most often applied to different areas and groups. However, French colonies feature many more particularly disruptive instances of combined dismemberment and suffocation than British colonies.

The results from the extended partition model in Table 3 underline significant differences between the degree to which administrative units dismember ethnic groups in the British and French empires. For the British sample, I find a large positive estimate of γ_1 in Eq. 4, supporting the argument that dismemberment decreases partitionings' realization probability by increasing their energy ϵ_i. Featuring low levels of dismemberment, British administrative units thus left ethnic groups less divided than one would expect conditionally on edge-level covariates. More specifically, decreasing the average dismemberment of ethnic groups by .25

in a toy example of 10 vertices would more than double its odds. This effect slightly increases when adding the lagged dependent variable in Model 2. The French sample, in contrast shows a small cross-sectional estimate for dismemberment in Model 3 which turns negative (but statistically insignificant) when adding the lagged dependent variable in Model 4. These results suggest that ethnic groups are as dismembered as one would expect from administrative unit designs influenced solely by the covariates.

Table 3: Ethnic dismemberment or suffocation?

	British		French	
	(1)	(2)	(3)	(4)
Constant	-9.72^{*}	-8.94^{*}	-10.55^{*}	-6.54^{*}
	$[-10.71; -8.46]$	$[-10.19; -6.54]$	$[-11.29; -8.84]$	$[-7.83; -2.45]$
Dismemberment	0.32^{*}	0.44^{*}	0.04	-0.15
	$[0.18; 0.43]$	$[0.18; 0.68]$	$[-0.14; 0.21]$	$[-0.55; 0.29]$
Suffocation	0.44^{*}	0.27^{*}	0.31^{*}	0.27
	$[0.33; 0.59]$	$[0.09; 0.50]$	$[0.16; 0.46]$	$[-0.03; 0.58]$
Lagged dep. var.		0.81^{*}		1.06^{*}
		$[0.68; 0.97]$		$[0.92; 1.29]$
Controls	yes	yes	yes	yes
No. of vertices	5209	1662	4030	1010
No. of edges	14042	4493	10566	2584
No. of units	681	247	428	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

Second, I find only small and statistically insignificant differences between the suffocation of groups in the British and French samples. In both empires, administrative units were designed with low levels of suffocation conditional on edge-level covariates. The baseline estimate of suffocation is positive and only 25 percent smaller in the French than in the British sample. Adding the lagged dependent variable slightly decreases both estimates. In substantive terms, the estimate in the British Model 1 suggests that lowering suffocation by increasing the ethnic homogeneity of districts that cover a set of ten nodes by .25 increases a partitioning's odds of realization by a factor of three.

These results are robust to dropping all or including additional covariates as well as when accounting for precolonial statehood (Appendix B). When only modeling either dismemberment or suffocation in separate models, estimates roughly double in the British (but not French) sample (Appendix B.2). This suggests a relatively strong negative correlation between both parameters. The same negative correlation also surfaces when shifting the exact location of the spatial graph to assess robustness to the design of the graph (Appendix B.6). While the British results are robust to such shifts, the exercise shows that, for French colonies, Table 3 tends to overestimate the extent of dismemberment and underestimate the degree of ethic suffocation. Averaging across 100 shifts, the results show not only more ethnic dismemberment but also more suffocation in French than British colonies.

In sum, these results suggest that the alignment of administrative borders with ethnic boundaries in British colonies is driven by districts featuring low levels of ethnic dismemberment and suffocation. In turn, French colonial cercles feature significantly more ethnic dismemberment while effects of ethnic suffocation are sensitive to the precise location of the spatial graph.

Post-colonial effect persistence and change

An additional analysis that employs the full panel of post-colonial *regional* borders (Müller-Crepon 2021) across former British and French colonies shows long-lasting persistence of the patterns of colonial administrative designs described above. Figure 9 shows the results of the baseline and LDV specifications[27] estimated for bi-decadal time periods as well as the pooled post-colonial data.

The results from the baseline model clearly show the differing levels of ethnic alignment former British and French colonies gain their independence with. With coefficients similar in size to those in the main analysis, administrative borders are significantly more in line with ethnic boundaries in countries gaining independence from the British as compared to the French empire. Over the years however, this difference in colonial legacies does not change much in size. This is because administrative border changes in former British *and* French colonies tend to, on average, follow ethnic boundaries. This is evidenced by the positive and statistically significant effect of ethnic boundaries in the LDV specification for the pooled samples which does not differ between countries with a French and British colo-

[27]The post-colonial LDV specification uses all colonial ethno-graphic maps to measure ethnic boundaries. Lagged dependent variables consist in regional borders in $t-1$ and the average occurrence of colonial district borders.

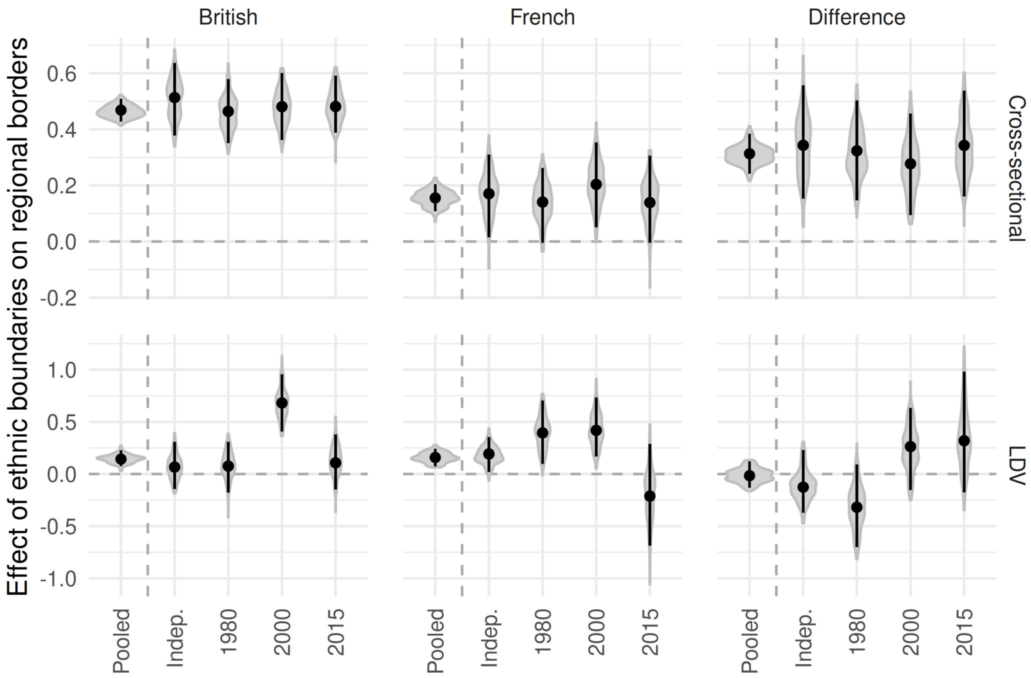


Figure 9: Effect of ethnic boundaries on the partitioning of post-colonial states into administrative regions

Note: Results from the baseline and LDV specification for pooled and bi-decadal samples. The LDV model includes an indicator for the presence of colonial borders in additional to the lagged dependent variable. 95% Confidence intervals and estimate distributions result from a parametric bootstrap with 160 iterations.

nial past. Yet, when breaking down the effect into the different time periods, we observe that such ethnic alignments occur with significant temporal variation.

Discussion and conclusion

The partitioning of states' territories into administrative units is a crucial feature of territorial states with important outcomes on, among others, ethnic politics, economic development, and political stability. Going beyond previous literature that focuses on unit change, this paper has investigated the strategies underlying initial designs of administrative geographies. Administrative units can be drawn to algin with ethnic groups, their social networks and political institutions, thereby preserving groups' internal functioning. Or, administrative borders can be aimed at disrupting societies, dismembering groups through administrative division and/or suffocating them by creating diverse units. While the first strategy is cheap to implement, it leaves political power decentralized. The second approach, in turn, is more costly in the short run but centralizes power at the expense of local society and its elites.

I have tested this argument by analyzing administrative unit designs in British and French colonies in Sub-Sahara Africa. While the British had a comparatively decentralized style of indirect rule, the French, for ideological and material reasons, used more direct rule to centralize power. My results show that the design of administrative units differed accordingly. Using newly collected data on administrative borders and employing ethnic geography, the results show that British colonial governments tended to design administrative units along ethnic boundaries, preserving ethnic groups by avoiding both dismemberment and suffocation. In turn, administrative borders in French colonies do not robustly correlate with ethnic boundaries, with the main difference to British designs consisting in comparatively high levels of administrative dismemberment of ethnic groups.

Taken together with findings on the effects of administrative units on ethnic groups' geography (Müller-Crepon 2025),[28] these findings point towards a dynamic co-development of administrative units and ethnic groups. The mindset of particularly British colonial rulers distributed power roughly along initially fuzzy ethnic lines and indirectly ruled through prevailing or newly invented "traditional" institutions. This led to a crystallization of identities along borders drawn, as well as demands to change unit designs along sharpened ethnic lines (Grossman and Lewis 2014), in turn likely strengthening ethnic identities. This dynamic alignment of administrative geographies and ethnic identities is fundamentally driven by ethnicized governance through neatly bounded and non-overlapping territorial divisions.

Yet, beyond one-sided evidence, this dynamic alignment between administrative units and ethnic groups remains empirically poorly understood. In addition to this article's highlighting of general effects of ethnic geography on unit borders, mechanisms that could explain variation within empires should receive more attention. Further research should also examine alternative drivers of unit designs,

[28]Note that the present results does not invalidate the research design or findings in Müller-Crepon (2025), which rely on local variation at administrative borders in a regression discontinuity design, including at straight borders drawn in an as-if-random manner *at the local level*.

such as colonial resource extraction or post-colonial state building. Lastly, future studies could study implications of endogenous unit designs for post-colonial politics and the importance of regional and ethnic cleavages (e.g., Boone 2024; Huber 2012).

More generally, my findings show that comparative research should take seriously the historical endogeneity of administrative units and the caveats it produces for comparative analyses. As more and more analyses are carried out at the subnational level (Pepinsky 2019), administrative units gain increasing prominence as units of analysis, often for the simple reason that they act as 'measurement containers' for the data produced by states and other actors. My findings on the colonial and ethnic origins of administrative units shows that they are endogenous to political processes in comparable ways as other attributes of states and their capacity (Suryanarayan 2024). Going beyond the commonly referenced Modifiable Areal Unit Problem (e.g., Lee, Rogers and Soifer 2025), this introduces the risk of endogeneity bias. To avoid such biases, analysts should account for the joint impact of units' origins on the causes and their consequences they study.

References

Alesina, Alberto and Ekaterina Zhuravskaya. 2011. "Segregation and the quality of government in a cross-section of countries." *American Economic Review* 101(5):1872–1911.

Alesina, Alberto and Enrico Spolaore. 1997. "On the number and size of nations." *The Quarterly Journal of Economics* 112(4):1027–1056.

Alesina, Alberto and Enrico Spolaore. 2005. *The size of nations*. Cambridge, MA: MIT Press.

Alesina, Alberto, Reza Baqir and William Easterly. 1999. "Public goods and ethnic divisions." *Quarterly Journal of Economics* 114(4):1243–1284.

Alesina, Alberto, William Easterly and Janina Matuszeski. 2011. "Artificial states." *Journal of the European Economic Association* 9(2):246–277.

Ali, Merima, Odd-Helge Fjeldstad, Boqian Jiang and Abdulaziz B. Shifa. 2019. "Colonial Legacy, State-building and the Salience of Ethnicity in Sub-saharan Africa." *Economic Journal* 129(619):1048–1081.

Asiwaju, Anthony I. 1970. The Aleketu of Ketu and the Onimek of Meko: The Changing Status of two Yoruba Rulers under French and British rule. In *West African Chiefs. Their Changing Status under Colonial Rule and Independence*, ed. Michael Crowder and Obaro Ikime. Ile-Ife: University of Ife Press pp. 134–161.

Asiwaju, Anthony I. 1983. "The Concept of Frontier in the Setting of States in Precolonial Africa." *Présence Africaine* 127:43.

Bening, R Bagulo. 1999. *Ghana: regional boundaries and national integration*. Ghana University Press.

Berman, Bruce J. 1998. "Ethnicitiy, Patronage, and the African State: The Politics of Uncivil Nationalism." *African Affairs* 388(97):305–341.

Bernier, Jacques. 1976. "La formation territoriale du Sénégal." *Cahiers de géographie du Québec* 20(51):447–477.

Boone, Catherine. 2024. *Inequality and political cleavage in Africa: Regionalism by design*. Cambridge University Press.

Buzasi, Katalin. 2016. "Linguistic situation in twenty sub-Saharan African countries: A survey-based approach." *African Studies* 75(3):358–380.

Carter, David B and Hein E Goemans. 2011. “The making of the territorial order: New borders and the emergence of interstate conflict.” *International Organization* 65(2):275–309.

Chlouba, Vladimir. 2025. “The Precolonial Origins of African Nationalism.” *Comparative Political Studies* p. 00104140251328030.

Cohen, Ronald and John Middleton. 1970. *From Tribe to Nation in Africa: studies in incorporation processes*. Chandler Pub. Co.

Cohen, William B. 1971. *Rulers of Empire: the French Colonial Service in Africa*. Stanford: Hoover Institution Press.

Colson, Elizabeth. 1960. African Society at the Time of the Scramble.

Conklin, Alice L. 1997. *A Mission to Civilize. The Republican Idea of Empire in France and West Africa, 1895–1930.* Stanford: Stanford University Press.

Crowder, M. 1964. “Indirect rule: French and British style.” *Africa: Journal of the International African Institute* 34(3):197–205.

Crowder, Michael. 1968. *West Africa under Colonial Rule*. London: Hutchinson.

Cunningham, Kathleen Gallagher and Nils B. Weidmann. 2010. “Shared Space: Ethnic Groups, State Accommodation, and Localized Conflict.” *International Studies Quarterly* 54(4):1035–1054.

Currie, Thomas E and Ruth Mace. 2009. “Political complexity predicts the spread of ethnolinguistic groups.” *Proceedings of the National Academy of Sciences of the United States of America* 106(18):7339–7344.

Englebert, Pierre, Stacy Tarango and Matthew Carter. 2002. “Dismemberment and suffocation: A contribution to the debate on African boundaries.” *Comparative Political Studies* 35(10):1093–1118.

Fortes, Meyer and Edward E. Evans-Pritchard, eds. 1940. *African Political Systems*. 1958 ed. Oxford: Oxford University Press.

Friedman, David. 1977. “A Theory of the Size and Shape of Nations.” *Journal of political economy* 85(1):59–77.

Geertz, Clifford. 1963. “The integrative revolution: primordial sentiments and civil politics in the new states.” *Old societies and new states: The quest for modernity in Asia and Africa* pp. 105–157.

Gerring, John, Daniel Ziblatt, Johan van Gorp and Julián Arévalo. 2011. “An Institutional Theory of Direct and Indirect Rule.” *World Politics* 63(3):377–433.

Goldewijk, Kees Klein, Arthur Beusen and Peter Janssen. 2010. "Long-term dynamic modeling of global population and built-up area in a spatially explicit way: HYDE 3.1." *The Holocene* 2010(1):1–9.

Green, Elliott D. 2010. "Patronage, district creation, and reform in Uganda." *Studies in Comparative International Development* 45(1):83–103.

Griffiths, Ryan D. 2016. *The Age of Secession: The International and Domestic Determinants of State Birth*. Cambridge: Cambridge University Press.

Grossman, Guy, Jan H. Pierskalla and Emma Boswell Dean. 2017. "Government Fragmentation and Public Goods Provision." *Journal Of Politics* 79(3):823–839.

Grossman, Guy and Janet I Lewis. 2014. "Administrative unit proliferation." *American Political Science Review* 108(1):196–217.

Guillaume, P. 1999. *Le Monde colonial: XIXe-XXe siècle*. Coll. U Armand Colin.
URL: *https://books.google.fr/books?id=QoAdHAAACAAJ*

Habyarimana, James, Macartan Humphreys, Daniel N. Posner and Jeremy M. Weinstein. 2007. "Why Does Ethnic Diversity Undermine Public Goods Provision?" *American Political Science Review* 101(04):709–725.
URL: *http://www.journals.cambridge.org/abstract_S0003055407070499*

Hassan, Mai. 2016. "A State of Change: District Creation in Kenya after the Beginning of Multi-party Elections." *Political Research Quarterly* 69(3):510–521.

Hechter, Michael. 1975. *Internal Colonialism. The Celtic Fringe in British National Development, 1536-1966*. London: Routledge & Kegan Paul.

Henn, Soeren J. 2023. "Complements or substitutes? How institutional arrangements bind traditional authorities and the state in Africa." *American Political Science Review* 117(3):871–890.

Herbst, Jeffrey. 2000. *States and Power in Africa*. Princeton: Princeton University Press.

Hirsch, Francine. 2000. "Toward an empire of nations: border-making and the formation of Soviet national identities." *The Russian Review* 59(2):201–226.

Howard, Allen M. 2005. Nodes, Networks, Landscapes, and Regions: Reading the Social History of Tropical Africa 1700s–1920. In *The Spatial Factor in African History*. Brill pp. 21–140.

Huber, John D. 2012. "Measuring Ethnic Voting: Do Proportional Electoral Laws Politicize Ethnicity?" *American Journal of Political Science* 56(4):986–1001.

Huillery, Elise. 2010. "The impact of European settlement within French West Africa: Did precolonial prosperous areas fall behind?" *Journal of African Economies* 20(2):263–311.

Juon, Andreas. 2024. "Territorial Autonomy and the Trade-Off between Civil and Communal Violence." *American Political Science Review* pp. 1–17.

Katz, Jonathan N, Gary King and Elizabeth Rosenblatt. 2020. "Theoretical foundations and empirical evaluations of partisan fairness in district-based democracies." *American Political Science Review* 114(1):164–178.

Kirk-Greene, Anthony Hamilton Millard. 1980. "The Thin White Line: The Size of the British Colonial Service in Africa." *African Affairs* 79(314):25–44.

Kristof, Ladis K D. 1959. "The Nature of Frontiers and Boundaries." *Annals of the Association of American Geographers* 49(3):269–282.

Larson, Jennifer M and Janet I Lewis. 2017. "Ethnic networks." *American Journal of Political Science* 61(2):350–364.

Lawrence, Adria K and Fahad M Sajid. 2025. "The political origins of colonial land policy: Evidence from British India and French Algeria." *Comparative Political Studies* 58(5):963–995.

Lee, Dong Wook, Melissa Rogers and Hillel David Soifer. 2025. "The modifiable areal unit problem in political science." *Political Analysis* pp. 1–13.

Lefebvre, C. 2019. *Frontières de sable, frontières de papier: Histoire de territoires et de frontières, du jihad de Sokoto à la colonisation française du Niger, XIXe-XXe siècles*. Bibliothèque historique des pays d'Islam Éditions de la Sorbonne.
URL: *https://books.google.fr/books?id=J8C9DwAAQBAJ*

Lentz, Carola. 1995. "'Tribalism'and ethnicity in Africa." *Cah. Sci. hum* 31(2):303–328.

Lentz, Carola. 2006. *Ethnicity and the Making of History in Northern Ghana*. Edinburgh: Edinburgh University Press.

MacArthur, Julie. 2012. "The making and unmaking of African languages: oral communities and competitive linguistic work in western Kenya." *The Journal of African History* 53(2):151–172.

MacArthur, Julie. 2013. "When did the Luyia (or any other group) become a tribe?" *Canadian Journal of African Studies/La Revue canadienne des études africaines* 47(3):351–363.

Mann, Michael. 1984. "The autonomous power of the state: its origins, mechanisms and results." *European Journal of Sociology* 25(2):185–213.

Miguel, Edward and Mary Kay Gugerty. 2005. "Ethnic diversity, social sanctions, and public goods in Kenya." *Journal of public Economics* 89(11-12):2325–2368.

Miles, William F. S. 1994. *Hausaland Divided. Colonialism and Independence in Nigeria and Niger*. Ithaca: Cornell University Press.

Müller-Crepon, Carl. 2020. "Continuity or Change: (In)direct Rule in British and French Colonial Africa." *International Organization* 74(4):707–741.

Müller-Crepon, Carl. 2021. "State reach and development in Africa since the 1960s: new data and analysis." *Political Science Research and Methods* pp. 1–10.

Müller-Crepon, Carl. 2025. "Building tribes: How administrative units shaped ethnic groups in Africa." *American Journal of Political Science* 69(2):406–422.

Müller-Crepon, Carl, Guy Schvitz and Lars-Erik Cederman. 2025. "Shaping states into nations: The effects of ethnic geography on state borders." *American Journal of Political Science* 69(1):132–147.

Murdock, George Peter. 1959. *Africa. Its Peoples and Their Culture History.* New York: McGraw-Hill Book Company.

Nunn, Nathan and Leonard Wantchekon. 2011. "The slave trade and the origins of Mistrust in Africa." *American Economic Review* 101(7):3221–3252.

Oates, Wallace E. 1999. "An Essay on Fiscal Federalism." *Journal of Economic Literature* 37(3):1120–1149.

Ochonu, Moses E. 2014. *Colonialism by Proxy: Hausa imperial agents and Middle Belt consciousness in Nigeria*. Indiana University Press.

Paine, Jack. 2019. "Ethnic Violence in Africa: Destructive Legacies of Pre-Colonial States." *International Organization* 73(3):645–683.

Paine, Jack, Xiaoyan Qiu and Joan Ricart-Huguet. 2024. "Endogenous Colonial Borders: Precolonial States and Geography in the Partition of Africa." *American Political Science Review, FirstView* .

Pepinsky, Thomas B. 2019. "The return of the single-country study." *Annual Review of Political Science* 22(1):187–203.

Posner, Daniel N. 2004. "The Political Salience of Cultural Difference: Why Chewas and Tumbukas Are Allies in Zambia and Adversaries in Malawi." *The American Political Science Review* 98(4):529–545.

Posner, Daniel N. 2005. *Institutions and Ethnic Politics in Africa*. Cambridge: Cambridge University Press.

Pourtier, Roland. 1989. "Les États et le contrôle territorial en Afrique centrale : principes et pratiques." *Annales de géographie* 98(547):286–301.
URL: *https://www.persee.fr/doc/geo*$_0003 - 4010_1989_num_98_547_20907$

Resnick, Danielle. 2017. "Democracy, decentralization, and district proliferation: The case of Ghana." *Political Geography* 59:47–60.

Robinson, Amanda Lea. 2020. "Ethnic diversity, segregation and ethnocentric trust in Africa." *British Journal of Political Science* 50(1):217–239.

Roeder, Philip G. 2012. *Where nation-states come from*. Princeton University Press.

Ruggie, John Gerard. 1983. "Continuity and transformation in the world polity: Toward a neorealist synthesis." *World Politics* 35(2):261–285.

Sharpe, Barrie. 1986. "Ethnography and a regional system: Mental maps and the myth of states and tribes in north-central Nigeria." *Critique of Anthropology* 6(3):33–65.

Singh, Prerna and Matthias Vom Hau. 2016. "Ethnicity in time: Politics, history, and the relationship between ethnic diversity and public goods provision." *Comparative Political Studies* 49(10):1303–1340.

Soifer, Hillel David. 2019. Units of analysis in subnational research. In *Inside countries: Subnational research in comparative politics*, ed. Agustina Giraudy, Eduardo Moncada and Richard Snyder. Cambridge University Press pp. 92–112.

Southall, Aidan W. 1970. "The illusion of tribe." *Journal of Asian and African Studies* 5(1-2):28–50.

Spear, Thomas. 2003. "Neo-Traditionalism and the Limits of Invention in British Colonial Africa." *Journal of African History* 44(1):3–27.

Suret-Canale, Jean. 1966. "La Fin de la Chefferie En Guinee." *The Journal of African History* 7(3):459–493.

Suryanarayan, Pavithra. 2024. "Endogenous state capacity." *Annual Review of Political Science* 27.

Tilly, Charles. 1990. *Coercion, Capital, and European States, AD 990-1992*. Cambridge, MA: Blackwell.

Tommasi, Mariano and Federico Weinschelbaum. 2007. "Centralization vs. decentralization: A principal-agent analysis." *Journal of public economic theory* 9(2):369–389.

Weber, Max. 1919. *Politik als Beruf*. Berlin: Duncker & Humblot.

Wilfahrt, Martha. 2022. *Precolonial Legacies in Postcolonial Politics: Representation and Redistribution in Decentralized West Africa*. Cambridge University Press.

Wilfahrt, Martha. 2025. "A Precolonial Paradox? Rethinking Political Centralization and Its Legacies." *American Political Science Review* pp. 1–20.

Wilks, Ivor. 1975. *Asante in the ninetheenth century. The structure and evolution of political order.* Cambridge: Cambridge University Press.

Young, Crawford. 1985. Ethnicity and the Colonial and Postcolonial State in Africa. In *Ethnic Groups and the State*, ed. Paul R. Brass. London: Croom Helm pp. 57–93.

Ziblatt, Daniel. 2004. "Rethinking The Origins of Federalism: Puzzle, Theory, and Evidence from Nineteenth-Century Europe." *World Politics* 57(01):70–98.

Ziblatt, Daniel. 2006. *Structuring the State. The Formation of Italy and Germany and the Puzzle of Federalism*. Princeton: Princeton University Press.

Supplementary Material

Table of Contents

A Robustness checks on preservation: The effects of ethnic boundaries

A.1 Burnin period length for bootstrapped standard errors

To gauge the robustness of confidence intervals, Figure A1 shows results from varying the length of the burnin period of the sampler used in the parametric bootstrap. The burnin period denotes the number of rounds the sampler resamples the partitioning of the network (always based on the previous round) before a partitioning is used to reestimate the models parameters. As seen in A1, standard errors are very consistent even with a burnin period of 1 up to very long chains of 500. This shows that the use of a burnin length of 10 in the main paper is unlikely to materially affect the results.

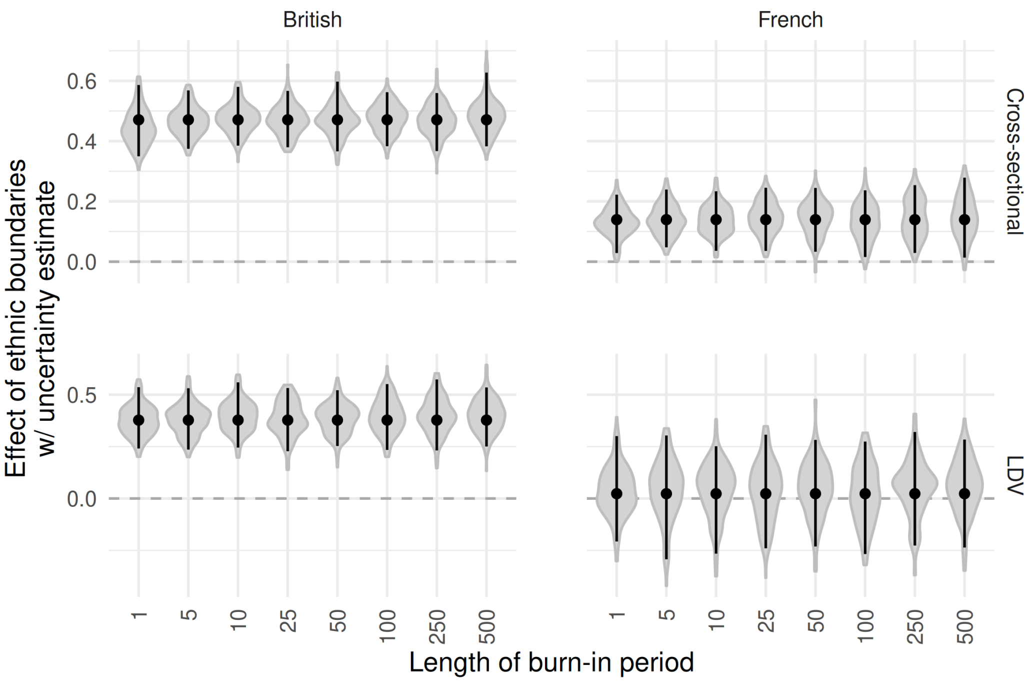


Figure A1: Effect of ethnic boundaries: Standard errors with varying burnin rate

A.2 Sample adjustments

Table A1 prsents the results for varying sample definitions. In particular, Models 1 and 2 show results of the cross-sectional baseline specification only for the parts of the French and British colonies that are also analyzed in the LDV specification. The results are consistent with the main findings, thus showing that any difference between the baseline and LDV results are not due to differences in the coverage of the underlying samples. LDV Models 3 and 4 drop Kenya/Uganda and French East Africa, respectively, since the earliest ethnic maps in the respective cases were published one year *after* the map of the lagged dependent variable. The results are consistent with the main results.

Table A1: Varying the sample definition

	Baseline for LDV Sample		LDV: Dropping colonies	
	1: Brit.	2: French	3: Brit.	4: French
Constant	−9.66*	−10.06*	−8.51*	−6.33*
	[−10.42; −8.41]	[−11.16; −8.10]	[−9.54; −6.13]	[−7.82; −2.49]
Ethnic boundary	0.48*	0.23*	0.37*	0.03
	[0.41; 0.57]	[0.10; 0.34]	[0.24; 0.56]	[−0.21; 0.27]
Lagged dep. var.			0.75*	1.09*
			[0.57; 0.88]	[0.95; 1.31]
Dropped	No LDV	No LDV	KEN & UGA	AEF
Controls	yes	yes	yes	yes
No. of vertices	4988	2984	1399	970
No. of edges	13489	7679	3834	2490
No. of units	620	344	193	113

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

A.3 Persistence or change

Table A2 investigates in how far the main LDV results on the effects of ethnic boundaries are due to a greater persistence of administrative borders that align with ethnic boundaries or a greater propensity of the latter to give rise to new administrative borders. To that intent, I interact the lagged dependent variable with the ethnic boundary dummy. The negative effect of the interaction term suggests that the results are mostly driven new borders that arise along ethnic boundaries and not by a great stability of ethnically aligned borders – indeed, administrative borders are not more stable if ethnically aligned (though they are generally very stable, so there might well be a ceiling effect).

Table A2: Ethnic boundaries and subnational borders: Persistence vs change

	British			French		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−9.63*	−9.06*	−9.47*	−6.41*	−6.48*	−6.42*
	[−10.43; −6.56]	[−10.33; −6.58]	[−10.50; −6.46]	[−7.92; −3.18]	[−8.13; −3.33]	[−7.83; −3.15]
Lagged dep. var. (LDV)	2.89	1.00*	2.57	−0.35	1.03*	−0.33
	[−1.49; 3.91]	[0.84; 1.21]	[−2.27; 3.72]	[−3.89; 2.20]	[0.79; 1.29]	[−4.60; 2.05]
Ethnic boundary	0.38*	0.56*	0.54*	0.01	−0.03	−0.00
	[0.27; 0.53]	[0.39; 0.79]	[0.38; 0.77]	[−0.25; 0.20]	[−0.36; 0.31]	[−0.32; 0.28]
Ethnic boundary× LDV		−0.42*	−0.36*		0.10	0.02
		[−0.75; −0.15]	[−0.69; −0.11]		[−0.33; 0.62]	[−0.41; 0.49]
Controls	yes	yes	yes	yes	yes	yes
Controls $imes$ LDV	yes	no	yes	yes	no	yes
No. of vertices	1662	1662	1662	1010	1010	1010
No. of edges	4493	4493	4493	2584	2584	2584
No. of units	247	247	247	117	117	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

A.4 Linguistic distance

The risk of reverse causality is an important reason to carefully consider the interpretation of the main results. One channel through which administrative borders can reversely affect observed ethnic geographies is by affecting which ethno-linguistic groupings among all potential groupings become socially relevant and thus worthy of drawing on a map. Yet, such social construction is likely constrained by the structure of the ethnic "raw-material" – the emergence of ethnic groupings endogenous to administrative units such as the Luhya in Kenya (MacArthur 2013) is more likely among individuals speaking closely related languages than among unrelated linguistic spaces. It follows that reverse causality should bias effects of the boundaries between linguistically closely related groups more than the effects of linguistically distinct groupings.

I therefore investigate whether effects of ethnic boundaries increase or decrease with linguistic differences between two groups (as compared to no linguistic distance, ie being in the same language group). I measure linguistic distances by linking the groups observed across all ethnic maps to the phylogenetic tree of languages available from the 16th edition of Ethnologue (Lewis 2009) using the LEDA package (Müller-Crepon, Pengl and Bormann 2021). I compute the linguistic distance between any two languages L_1 and L_2 as:

$$D_{L_1,L_{,2}} = 1 - \left(\frac{2d(w(L_1,..,O) \cap w(L_2,..,O))}{d(w(L_1,..,O)) + d(w(L_2,..,O))} \right)^{.5} \tag{A1}$$

where $d(w(L,..,O))$ is distance from a language to the tree's origin and $d(w(L_1,..,O) \cap w(L_2,..,O))$ denotes the length of the intersection of the languages' paths to the origin. Distances far away from the root of the language tree are discounted by taking the square root. As a result, two groups have a distance of 1 if they lie on different language trees and only have their origin in common, and a distance of zero if they share a linguistic dialect. If groups are associated with more than one language, I take the minimum distance between any two groups.

I find similarly sized effects on edges that cross small and large linguistic distances (Figure A2).Effects of large distances are smaller in the British LDV model, likely because such borders were drawn already by the mid-colonial period, leaving less variation to be explained when modeling modeling borders in the late colonial period. The consistent effect among edges that cross large linguistic distances suggests that the results are not exclusively due to the arbitrary invention of ethnic groups along or their disappearance within administrative borders.

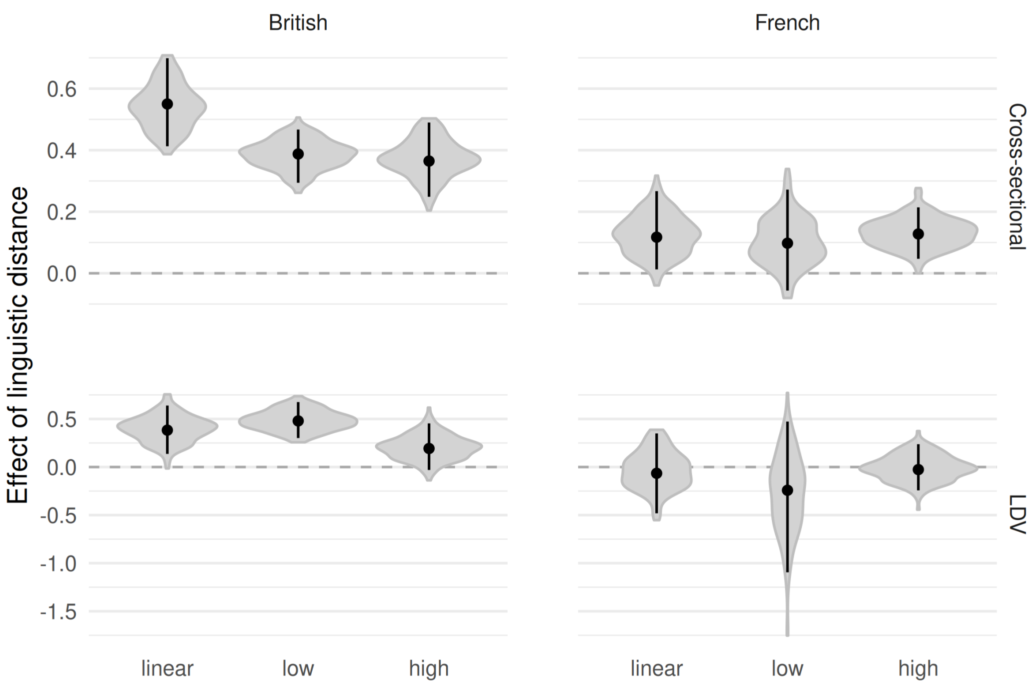


Figure A2: Effect of linguistic distances modeled linearly and binned (low/high)

Note: 95% CIs and estimate distributions result from a parametric bootstrap with 160 iterations.

A.5 Regional borders in British colonies

One potential caveat of the main analyses consists in the fact that the spatial organization of British and French colonies differed. While the British ruled through provinces and nested districts, the French *cercle* tend to be slightly larger than districts but smaller than provinces. Testing whether this difference in overall spatial organization drives the results by using British regions instead of districts as the outcome supports the baseline results as the estimated effects of ethnic boundaries on regional borders are large (Table A3, Models 1 and 2). In Models 3 and 4 I find large effects for the effect of ethnic dismemberment which lowers partitions realization probabilities with estimates twice as large as for the main district-level results. I also find smaller, somewhat more unstable results for ethnic suffocation. The latter might well be due to regions larger size, which renders them generally more heterogeneous, which might yield less stable estimates.Given the logistic structure of the model, estimated effects always relative to the size of units, captured by the baseline attraction on edges (β_0).

Table A3: Ethnic geography and regional borders in British colonies

	(1)	(2)	(3)	(4)
Constant	-9.63^{*}	-9.21^{*}	-9.49^{*}	-8.82^{*}
	$[-10.71; -7.53]$	$[-9.85; -6.01]$	$[-10.45; -7.18]$	$[-10.25; -5.10]$
Ethnic boundary	0.60^{*}	0.56^{*}		
	$[0.47; 0.71]$	$[0.35; 0.79]$		
Dismemberment			0.59^{*}	0.88^{*}
			$[0.37; 0.78]$	$[0.51; 1.19]$
Suffocation			0.38^{*}	0.18
			$[0.23; 0.63]$	$[-0.09; 0.64]$
Lagged dep. var.		0.73^{*}		0.72^{*}
		$[0.52; 1.00]$		$[0.51; 0.99]$
Controls	yes	yes	yes	yes
No. of vertices	2318	880	2142	880
No. of edges	6183	2354	5680	2354
No. of units	254	108	247	108

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

A.6 Split network by colony

Table A4 shows results from estimating the PSPM for networks that are split into individual colonies rather than empires as in the main analysis. That means, for example, that French West Africa is split into ints constitutive colonial territories (Senegal, French Sudan, Cote d'Ivoire, etc), such that the borders between them drop from the analysis. The results are very close to the main results, suggesting that intercolonial borders within the same empire do not drive the results.

Table A4: Effect of ethnic boundaries, administrative borders within colonies only

	British		French	
	(1)	(2)	(3)	(4)
Constant	-9.88^{*}	-9.11^{*}	-9.93^{*}	-6.29^{*}
	$[-10.59; -9.28]$	$[-10.03; -6.98]$	$[-10.52; -9.02]$	$[-8.52; -2.91]$
Ethnic boundary	0.44^{*}	0.37^{*}	0.13^{*}	-0.03
	$[0.37; 0.50]$	$[0.21; 0.52]$	$[0.07; 0.19]$	$[-0.29; 0.22]$
Lagged dep. var.		0.77^{*}		1.11^{*}
		$[0.63; 0.91]$		$[0.95; 1.34]$
Controls	yes	yes	yes	yes
No. of vertices	11664	1661	10078	1007
No. of edges	30714	4398	25676	2448
No. of units	1474	248	994	115

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

A.7 Control variables

To avoid spurious results due to the potentially arbitrary choice of control variables, Tables A5 and A6 show robustness to dropping all as well as extending the set of control variables for the British and French samples, respectively. Models 1 and 4 drop all controls for the baseline and LDV models. Models 2 and 5 show solely the effects of the main covariates without accounting for the effect of ethnic boundaries. Lastly, Models 3 and 6 reestimate the main models but account for additional measures that support previous arguments about the propensity of political units to be East-West oriented and further variables for the change in elevation along and edge and its ruggedness. The estimates for the effects of ethnic boundaries increase significantly without any control variables but remain substantially different between the two colonial empires. This is likely due to the exclusion of spatial features – for example rivers or elevation – that affect administrative and ethnic geographies. In turn suggesting that the baseline specification includes most important covariates, estimated effects do not differ when more covariates are added to the baseline specification. Tables A14 and A15 show equivalent results for the dismemberment and suffocation estimators for the British and French samples.

Table A5: British colonies: Effect of ethnic boundaries with varying controls

	Baseline			LDV		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−1.27*	−10.92*	−11.99*	−1.49*	−9.73*	−9.01*
	[−1.29; −1.18]	[−11.73; −9.93]	[−12.70; −9.15]	[−1.58; −1.38]	[−10.79; −7.84]	[−10.09; −5.31]
Lagged dep. var.				0.92*	0.81*	0.81*
				[0.81; 1.05]	[0.69; 0.91]	[0.70; 0.97]
Ethnic boundary	0.75*		0.47*	0.53*		0.37*
	[0.65; 0.81]		[0.38; 0.57]	[0.41; 0.69]		[0.24; 0.53]
Edge length		0.87*	0.98*		0.75*	0.71*
		[0.79; 0.94]	[0.72; 1.02]		[0.58; 0.82]	[0.33; 0.81]
River		0.98*	0.81*		1.03*	0.97*
		[0.79; 1.15]	[0.65; 1.02]		[0.75; 1.36]	[0.54; 1.50]
Watershed		0.02	0.10		−0.00	−0.03
		[−0.12; 0.15]	[−0.03; 0.22]		[−0.20; 0.27]	[−0.34; 0.17]
Elevation mean		0.03	−0.61*		0.60	0.43
		[−0.28; 0.35]	[−1.10; −0.20]		[−0.06; 1.26]	[−0.63; 1.31]
Population 1880		0.12*	0.11*		0.09*	0.08*
		[0.09; 0.13]	[0.07; 0.13]		[0.03; 0.13]	[0.02; 0.13]
Dist. coast		−0.01	0.03		−0.03	−0.08
		[−0.05; 0.03]	[−0.02; 0.08]		[−0.12; 0.04]	[−0.22; 0.02]
∆ Long.			−3.31*			−0.87
			[−3.98; −0.24]			[−1.80; 3.20]
∆ Lat.			−3.16			0.59
			[−3.73; 0.08]			[−0.89; 5.05]
∆ Elevation			1.22			1.08
			[−1.12; 2.97]			[−1.99; 3.68]
Elevation Std. Dev.			0.15			0.14
			[−0.52; 0.94]			[−1.01; 1.53]
No. of vertices	5832	7113	5832	1662	2046	1662
No. of edges	15788	20045	15788	4493	5773	4493
No. of units	733	855	733	247	261	247

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

Table A6: French colonies: Effect of ethnic boundaries with varying controls

	Baseline			LDV		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−1.22*	−9.71*	−11.75*	−1.48*	−6.05*	−5.41*
	[−1.23; −1.10]	[−10.41; −8.88]	[−12.31; −8.49]	[−1.61; −1.32]	[−7.66; −4.16]	[−7.21; −2.57]
Lagged dep. var.				1.17*	0.93*	1.07*
				[1.02; 1.35]	[0.81; 1.04]	[0.93; 1.28]
Ethnic boundary	0.39*		0.14*	0.14		0.02
	[0.28; 0.46]		[0.05; 0.24]	[−0.09; 0.37]		[−0.20; 0.28]
Edge length		0.76*	0.99*		0.51*	0.46*
		[0.69; 0.83]	[0.68; 1.07]		[0.34; 0.63]	[0.18; 0.62]
River		0.78*	0.68*		0.68*	0.65*
		[0.61; 0.91]	[0.48; 0.84]		[0.30; 1.05]	[0.15; 1.18]
Watershed		0.06	−0.02		−0.23	0.06
		[−0.05; 0.22]	[−0.19; 0.15]		[−0.53; 0.13]	[−0.29; 0.62]
Elevation mean		0.84*	−0.00		−0.60	−2.41
		[0.20; 1.36]	[−1.22; 0.96]		[−2.28; 1.35]	[−4.46; 1.00]
Population 1880		0.14*	0.10*		−0.01	−0.06
		[0.11; 0.16]	[0.06; 0.14]		[−0.08; 0.06]	[−0.21; 0.03]
Dist. coast		−0.08*	−0.04		−0.10	−0.06
		[−0.10; −0.04]	[−0.09; 0.02]		[−0.19; 0.00]	[−0.20; 0.06]
∆ Long.			−3.67*			2.83*
			[−3.89; −0.02]			[0.13; 5.12]
∆ Lat.			−2.03			−0.19
			[−2.64; 2.16]			[−1.74; 3.30]
∆ Elevation			2.84			1.73
			[−1.20; 5.12]			[−1.52; 3.12]
Elevation Std. Dev.			−0.62			1.40
			[−1.72; 1.04]			[−1.64; 3.16]
No. of vertices	5042	7433	5042	1010	1825	1010
No. of edges	13880	21135	13880	2584	5125	2584
No. of units	438	590	438	117	132	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

A.8 Precolonial statehood

In order to account for the presence of precolonial states, I draw on data on the territories ruled over by precolonial states collected by Paine (2019) and Wilfahrt (2025). While the first maps approximate state territories based on the Historical Atlas of Africa by Ajayi and Crowder (1985), Wilfahrt (2025) uses 6 hour walking circles around the location of capitals to approximate the reach of precolonial states.[29] I use both datasets to assess whether a vertex is located in a state territory and take the edges' mean value across both datasets and both vertices. Controlling for the resulting index of edge-level stateness in Table A7 shows stable results for the estimate of ethnic boundaries. In addition, the negative effect of the state index supports earlier findings by Müller-Crepon (2020), showing larger administrative units in precolonial states in British colonies (the negative estimate suggests that borders are less likely to be realized in those areas, thus leading to larger units).

Table A7: Effect of ethnic boundaries, accounting for precolonial statehood

	British		French	
	(1)	(2)	(3)	(4)
Constant	-10.03^{*}	-9.27^{*}	-10.01^{*}	-6.33^{*}
	$[-10.72; -9.35]$	$[-10.42; -6.89]$	$[-10.64; -9.08]$	$[-7.87; -2.89]$
State Index	-0.17^{*}	-0.40^{*}	-0.08	-0.17
	$[-0.28; -0.08]$	$[-0.72; -0.08]$	$[-0.16; 0.03]$	$[-0.52; 0.12]$
Ethnic boundary	0.46^{*}	0.36^{*}	0.14^{*}	0.02
	$[0.40; 0.51]$	$[0.23; 0.50]$	$[0.08; 0.20]$	$[-0.21; 0.26]$
Lagged dep. var.		0.82^{*}		1.06^{*}
		$[0.73; 0.99]$		$[0.90; 1.30]$
Controls	yes	yes	yes	yes
No. of vertices	11664	1662	10084	1010
No. of edges	31576	4493	27760	2584
No. of units	1466	247	876	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

A.9 Robustness to network location

To gauge the degree to which results might be due to the precise location of edges and vertices, I here resample the vertices of the main graph 100 times, rerun the data preparation for each set, and reestimate the main models for each resulting network (without uncertainty estimates). Figure A3 shows that the results are not due to the precise locations of nodes sampled for the baseline network, with the main estimates being well contained in the overall distribution.

[29] Due to the lack of spatial precision and coverage of areas organized into smaller polities below the "state," the *boundaries* of the polygons in both datasets are not suitable to explain the relatively low-level subnational administrative borders analyzed here.

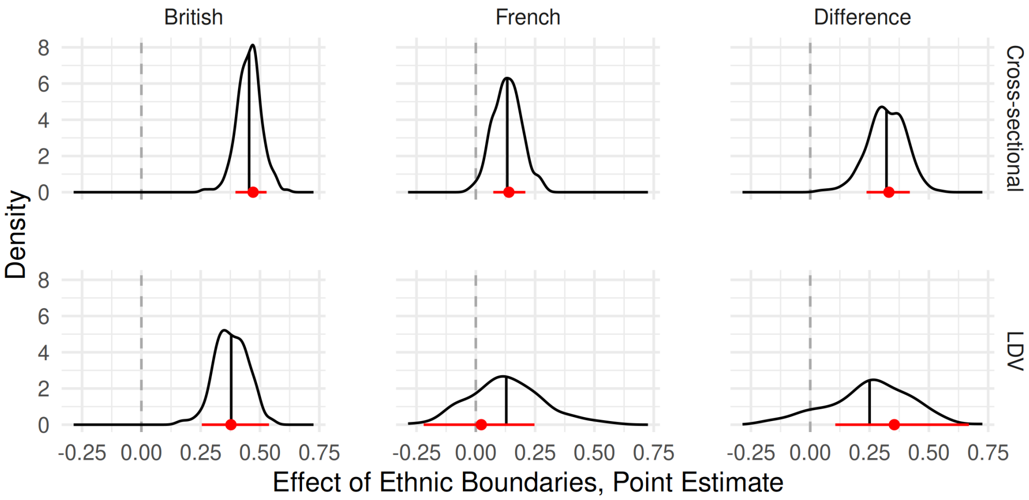


Figure A3: Point estimates of the effect of ethnic boundaries: Shifting the spatial graph

Note: Distributions result from re-estimating the main models 100 times, with data from 100 resampled planar graphs. Red estimates show the results of the main results in Table 2.

A.10 Spatial structure

I conduct a series of checks to investigate the sensitivity of the main results of the effects of ethnic boundaries on administrative borders to changing (1) the spatial resolution of the planar graph and (2) its connectivity structure. As Figure A4 shows, the results are robust to the use of spatially coarser and more disaggregated graphs but effect sizes generally increase with lower resolutions. This is not surprising, given that the encoding of ethnic boundaries on very short edges becomes more noisy and less likely to precisely coincide with the location of district borders (see also below).

The main results are also robust to different connectivity structures, ranging from regular hexagonal, via quadratic graph structures, to graphs based on points sampled using normal population weights and completely random networks (Figure A5). Though note that standard errors increase for the LDV models when sampling points based on untransformed population distributions or randomly. While estimate sizes remain consistent, the effects of ethnic geography in the British colonies remain statistically significant but not their difference to the effects in the French colonial empire. This might be due to numerous very short edges that dominate the network when sampling from untransformed population distributions and noise introduced in the purely random sampling in which unpopulated areas become overrepresented.

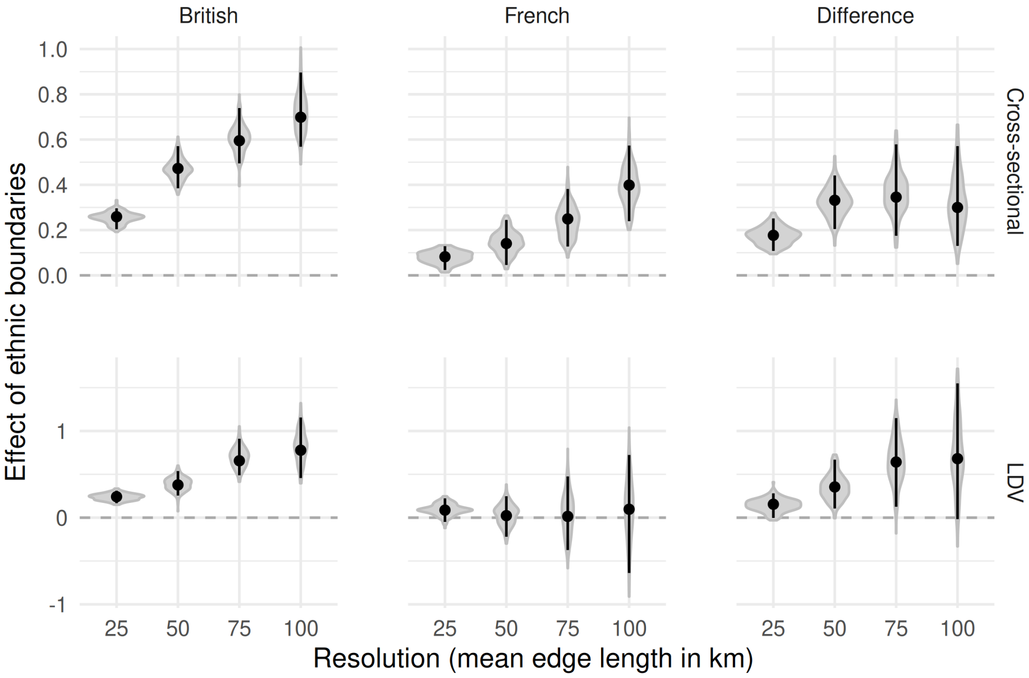


Figure A4: Effect of ethnic boundaries at varying resolutions of the spatial lattice

Note: 95% CIs and estimate distributions result from a parametric bootstrap with 160 iterations.

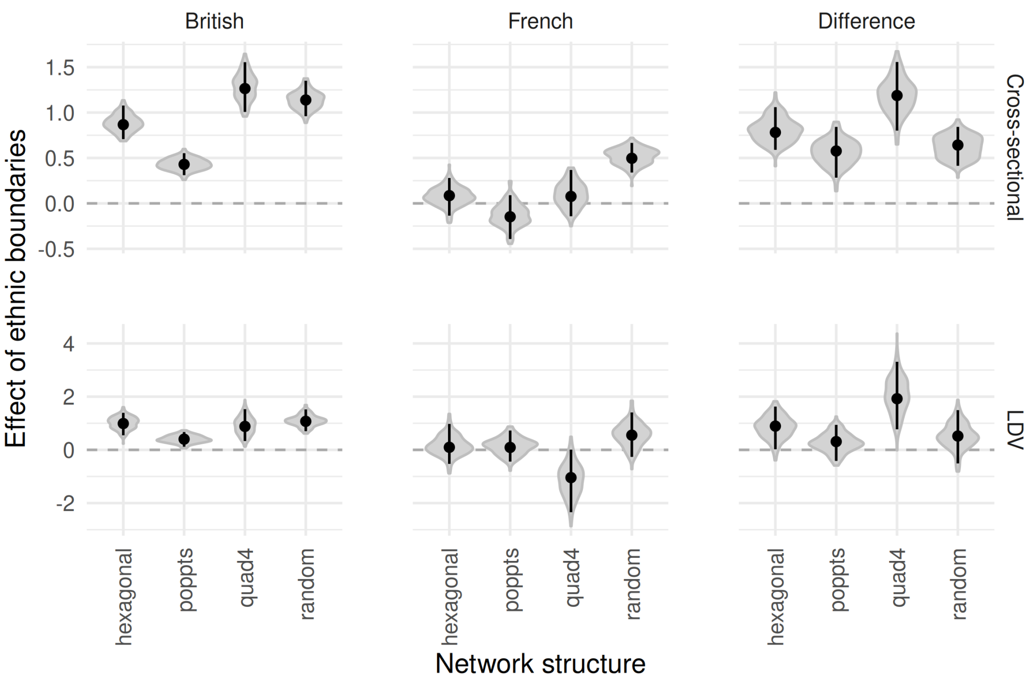


Figure A5: Effect of ethnic boundaries using hexagonal, quadratic, triangular, and random planar graph structures

Note: 95% CIs and estimate distributions result from a parametric bootstrap with 160 iterations.

A.11 Standard regression models (with fixed effects)

I employ a set of much simpler linear and logistic regression models which estimate the *edge-level* effect of ethnic boundaries on administrative borders. These models abstract away from edges interdependence which is only taken into account for the clustering of standard errors.Using the cluster-robust variance estimator for dyadic data by Aronow, Samii and Assenova (2015). Yet, they do allow for a much thorougher accounting of unobserved factors through fixed effects at the vertex level and are interpretable in a straightforward manner.

Shown in Table A8 for the OLS analysis, ethnic boundaries are associated with a positive, substantively large, and statistically significant effect of 22 (16) percentage points on the probability of British district borders in the baseline (LDV) model or 62 (40) percent of the mean outcome. In the French sample, this effect amounts to a statistically significant but much smaller 4 percentage points in the baseline model or 12 percent of the mean outcome. The LDV specification yields a non-significant effects of close to 0 percentage points. Adding vertex fixed effects does not change effects substantively in the linear model which account for significant amounts of local variation – basically any geographic characteristic that is not relational (as in, only measurable on edges) and can be measured at the level of vertices, such as the identity of ethnic groups, local geographic conditions or the presence of natural resources.Including thee fixed effects raises the R^2 from below .18 (.10) to .61 (.55) in the British (French) baseline model. Table A9 shows that effect estimates are consistent when estimating logistic regressions. Here, including vertex fixed effects significantly increases effect estimates. This is due multicollinearity which leads to the exclusion of all edges connected to vertices without any cross-border edges.

Table A8: Linear Probability Model (OLS, edge-level)

Dependent Variable:	District border							
Colonizer	British				French			
Specification	Baseline		LDV		Baseline		LDV	
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Constant	-1.76**		-1.44**		-1.90**		-0.67**	
	(0.07)		(0.13)		(0.08)		(0.15)	
Ethnic boundary	0.22**	0.22**	0.16**	0.16**	0.04**	0.04**	0.00	0.01
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Lagged dep. var.			0.40**	0.38**			0.67**	0.65**
			(0.02)	(0.02)			(0.02)	(0.02)
Fixed-effects								
Vertex 1 x Period		Yes		Yes		Yes		Yes
Vertex 2 x Period		Yes		Yes		Yes		Yes
Fit statistics								
Outcome mean	0.35	0.35	0.41	0.41	0.32	0.32	0.33	0.33
Observations	15,788	15,788	4,493	4,493	13,880	13,880	2,584	2,584
R^2	0.18	0.61	0.34	0.65	0.10	0.55	0.52	0.73
Within R^2		0.15		0.29		0.09		0.48

Custom standard-errors in parentheses
*Signif. Codes: **: 0.01, *: 0.05, +: 0.1*

Table A9: Logistic Regression Model (edge-level)

Dependent Variable:	District border							
Colonizer	British				French			
Specification	Baseline		LDV		Baseline		LDV	
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Constant	-13.14**		-12.88**		-13.48**		-10.97**	
	(0.48)		(0.98)		(0.52)		(1.70)	
Ethnic boundary	1.03**	1.98**	0.87**	1.46**	0.18**	0.32**	0.01	0.09
	(0.04)	(0.11)	(0.08)	(0.20)	(0.04)	(0.10)	(0.13)	(0.36)
Lagged dep. var.			1.95**	2.86**			3.47**	4.73**
			(0.08)	(0.20)			(0.12)	(0.34)
Fixed-effects								
Vertex 1 x Period		Yes		Yes		Yes		Yes
Vertex 2 x Period		Yes		Yes		Yes		Yes
Fit statistics								
Outcome mean	0.35	0.49	0.41	0.49	0.32	0.46	0.33	0.45
Observations	15,788	7,727	4,493	2,503	13,880	7,000	2,584	1,317
Squared Correlation	0.18	0.38	0.34	0.51	0.10	0.29	0.52	0.66
Pseudo R^2	0.15	0.31	0.28	0.42	0.09	0.23	0.44	0.55

Custom standard-errors in parentheses
*Signif. Codes: **: 0.01, *: 0.05, +: 0.1*

B Robustness checks: Dismemberment and Suffocation

B.1 Burnin period length

I first test in how far the length of the burning period affects uncertainty estimates from the parametric bootstrap for the supra-edge level estimators of dismemberment and suffocation. Importantly, Figures A6 and A7 show that the sequential, vertex-wise sampling introduced by Müller-Crepon, Schvitz and Cederman (2025) works much less well for these higher-level than for edge-level predictors. While Appendix A.1 shows stable results with only 1 burnin period for the latter, confidence intervals only stabilize after around 25 periods for Dismemberment and Suffocation. I therefore choose a burnin period of 50 for the respective analyses.

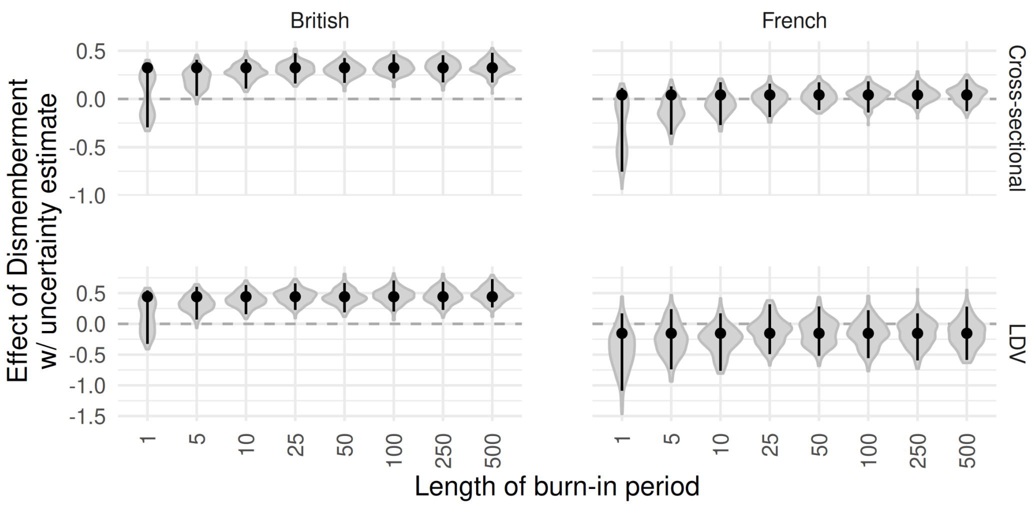


Figure A6: Dismemberment: Standard errors with varying burnin rate

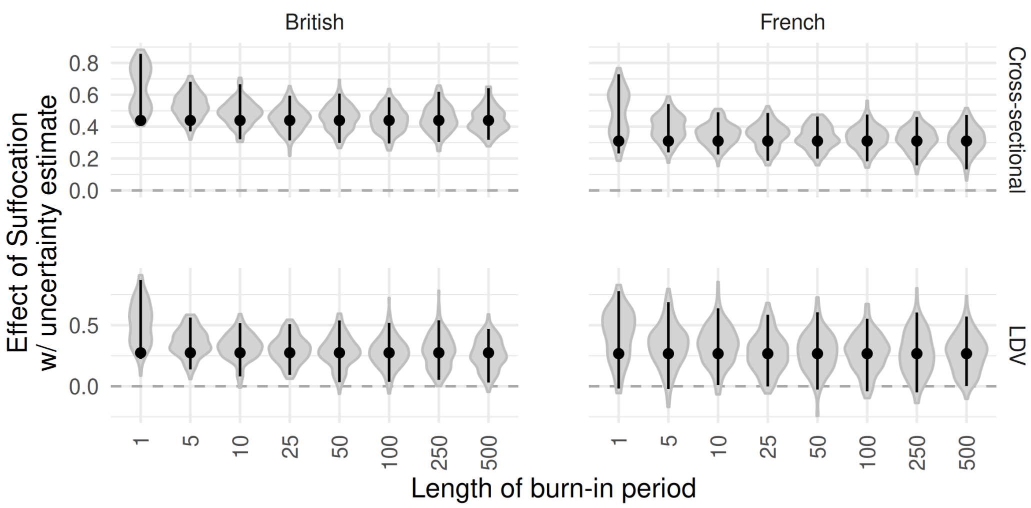


Figure A7: Suffocation: Standard errors with varying burnin rate

Table A10: British colonies: Details on dismemberment or suffocation?

	(1)	(2)	(3)	(4)
Constant	-9.72^{*}	-9.02^{*}	-10.13^{*}	-9.27^{*}
	$[-10.50; -8.55]$	$[-10.07; -6.45]$	$[-10.96; -9.10]$	$[-10.56; -6.51]$
Dismemberment	0.60^{*}	0.63^{*}		
	$[0.48; 0.71]$	$[0.43; 0.85]$		
Suffocation			0.61^{*}	0.50^{*}
			$[0.49; 0.71]$	$[0.33; 0.71]$
Lagged dep. var.		0.81^{*}		0.82^{*}
		$[0.69; 0.97]$		$[0.70; 0.96]$
Controls	yes	yes	yes	yes
No. of vertices	5209	1662	5209	1662
No. of edges	14042	4493	14042	4493
No. of units	681	247	681	247

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

B.2 Separate modeling of dismemberment and suffocation

Tables **??** and **??** model the effects of dismembmerment and suffocation separately for the British and French samples, respectively. While the results for the French sample remains largely unaffected, British effect estimates for dismemberment and suffocation both increase when modeled without taking the other into account. This suggests a strong negative correlation between the two (since dropping an estimator is equivalent to forcing its parameter to 0). See also Appendix B.6.

Table A11: French colonies: Details on dismemberment or suffocation?

	(1)	(2)	(3)	(4)
Constant	-10.63^{*}	-6.54^{*}	-10.58^{*}	-6.44^{*}
	$[-11.51; -8.83]$	$[-8.32; -3.16]$	$[-11.33; -8.91]$	$[-8.10; -3.05]$
Dismemberment	0.22^{*}	-0.03		
	$[0.01; 0.34]$	$[-0.43; 0.40]$		
Suffocation			0.32^{*}	0.23
			$[0.23; 0.47]$	$[-0.04; 0.56]$
Lagged dep. var.		1.07^{*}		1.06^{*}
		$[0.91; 1.27]$		$[0.93; 1.29]$
Controls	yes	yes	yes	yes
No. of vertices	4030	1010	4030	1010
No. of edges	10566	2584	10566	2584
No. of units	428	117	428	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

B.3 Splitting the network into colonies

As for the main analysis (A.6), I find stable results for the estimates of dismemberment and suffocation when splitting the planar graph into colonies rather than colonial empires.

Table A12: Dismemberment and suffocation, administrative borders within colonies only

	British		French	
	(1)	(2)	(3)	(4)
Constant	-9.66^{*}	-8.92^{*}	-10.64^{*}	-6.13^{*}
	$[-10.34; -8.88]$	$[-9.92; -6.22]$	$[-11.37; -9.48]$	$[-7.52; -2.38]$
Dismemberment	0.33^{*}	0.44^{*}	-0.02	0.10
	$[0.23; 0.41]$	$[0.17; 0.65]$	$[-0.14; 0.06]$	$[-0.35; 0.54]$
Suffocation	0.40^{*}	0.25^{*}	0.29^{*}	0.07
	$[0.33; 0.50]$	$[0.09; 0.47]$	$[0.20; 0.42]$	$[-0.30; 0.43]$
Lagged dep. var.		0.77^{*}		1.10^{*}
		$[0.65; 0.96]$		$[0.95; 1.39]$
Controls	yes	yes	yes	yes
No. of vertices	10412	1661	8042	1007
No. of edges	27288	4398	19798	2448
No. of units	1370	248	916	115

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

B.4 Precolonial statehood

As in Appendix A.8, accounting for the precolonial statehood index based on the data in Paine, Qiu and Ricart-Huguet (2024) and Wilfahrt (2025) discussed above does not change the results.

Table A13: Dismemberment and suffocation, accounting for precolonial statehood

	British		French	
	(1)	(2)	(3)	(4)
Constant	-9.91^*	-9.10^*	-10.60^*	-6.39^*
	$[-10.65; -9.17]$	$[-10.74; -6.75]$	$[-11.57; -9.61]$	$[-7.57; -3.41]$
State centralization	-0.23^*	-0.47^*	-0.15^*	-0.15
	$[-0.32; -0.10]$	$[-0.72; -0.19]$	$[-0.25; -0.04]$	$[-0.50; 0.17]$
Dismemberment	0.33^*	0.47^*	0.05	-0.15
	$[0.16; 0.32]$	$[0.17; 0.63]$	$[-0.21; 0.03]$	$[-0.66; 0.19]$
Suffocation	0.42^*	0.24^*	0.30^*	0.26^*
	$[0.42; 0.58]$	$[0.09; 0.51]$	$[0.30; 0.45]$	$[0.03; 0.62]$
Lagged dep. var.		0.82^*		1.06^*
		$[0.69; 0.96]$		$[0.91; 1.25]$
Controls	yes	yes	yes	yes
No. of vertices	10418	1662	8060	1010
No. of edges	28084	4493	21132	2584
No. of units	1362	247	856	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

B.5 Control variables

In line with the robustness checks for the main analysis, the estimates of dismemberment and suffocation are robust to dropping all control variables – which increases estimated effects – or adding additional ones (see Appendix A.7 above for details) in Tables A14 and A15 for the British and French sample, respectively.

Table A14: British colonies: Dismemberment and suffocation with varying controls

	Baseline		LDV	
	(1)	(2)	(3)	(4)
Constant	-0.91^*	-11.29^*	-1.20^*	-8.98^*
	$[-0.98; -0.84]$	$[-12.10; -8.37]$	$[-1.37; -1.07]$	$[-9.68; -4.52]$
Dismemberment	0.53^*	0.33^*	0.53^*	0.44^*
	$[0.37; 0.61]$	$[0.16; 0.42]$	$[0.28; 0.75]$	$[0.13; 0.67]$
Suffocation	0.59^*	0.43^*	0.42^*	0.26^*
	$[0.48; 0.76]$	$[0.35; 0.56]$	$[0.19; 0.66]$	$[0.08; 0.51]$
Lagged dep. var.			0.92^*	0.81^*
			$[0.81; 1.07]$	$[0.70; 0.99]$
Baseline controls	no	yes	no	yes
Extended controls	no	yes	no	yes
No. of vertices	5209	5209	1662	1662
No. of edges	14042	14042	4493	4493
No. of units	681	681	247	247

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

Table A15: French colonies: Dismemberment and suffocation with varying controls

	Baseline		LDV	
	(1)	(2)	(3)	(4)
Constant	-1.03^*	-12.47^*	-1.47^*	-5.54^*
	$[-1.12; -0.97]$	$[-12.33; -8.47]$	$[-1.71; -1.29]$	$[-6.90; -2.20]$
Dismemberment	0.22	0.02	-0.00	-0.17
	$[-0.02; 0.31]$	$[-0.17; 0.17]$	$[-0.44; 0.47]$	$[-0.59; 0.23]$
Suffocation	0.47^*	0.32^*	0.31^*	0.27
	$[0.38; 0.65]$	$[0.21; 0.49]$	$[0.00; 0.63]$	$[-0.03; 0.62]$
Lagged dep. var.			1.18^*	1.07^*
			$[1.05; 1.43]$	$[0.96; 1.30]$
Baseline controls	no	yes	no	yes
Extended controls	no	yes	no	yes
No. of vertices	4030	4030	1010	1010
No. of edges	10566	10566	2584	2584
No. of units	428	428	117	117

Notes: 95% confidence intervals from parametric bootstrap in parenthesis. * Statistically significant at the 95% level.

B.6 Robustness to the network location

As with the main results, I resample the vertices of the underlying planar network 100 times to regenerate slightly different versions of the analysis data set. I then rerun the estimation of dismemberment and suffocation for each resampled graph. Figure A8 plot the resulting estimate distributions for the baseline and LDV models in the French and British empires. For the British empire on the left side of the plot, the main estimates of dismemberment and suffocation are well centered in the overall distribution, thus showing robustness to the precise location of vertices and edges.

However, for the French empire, it appears that the estimates of dismemberment are smaller than the average across 100 regenerated graphs (baseline: 0.04 vs. 0.19; LDV -0.15 vs 0.15) but remain smaller than those in the British sample. In turn, the main estimates for suffocation in the French sample are larger than the average across resampled graphs (baseline: 0.31 vs 0.17 ; LDV 0.27 vs 0.12), an average that is in turn smaller than in the British sample. Further inquiry into the correlation between the dismemberment and suffocation estimates shows that they are consistently negative correlated in both empires (Figure A9).

As a result, it emerges that while the main result of lower levels of ethnic dismemberment in British compared to the French empire is robust (even though the main French estimate might be an underestimate), the main null-result on the French-British difference in suffocation should not be taken as strong evidence against the existence of such a difference but is indeed sensitive to the precise location of the graph.

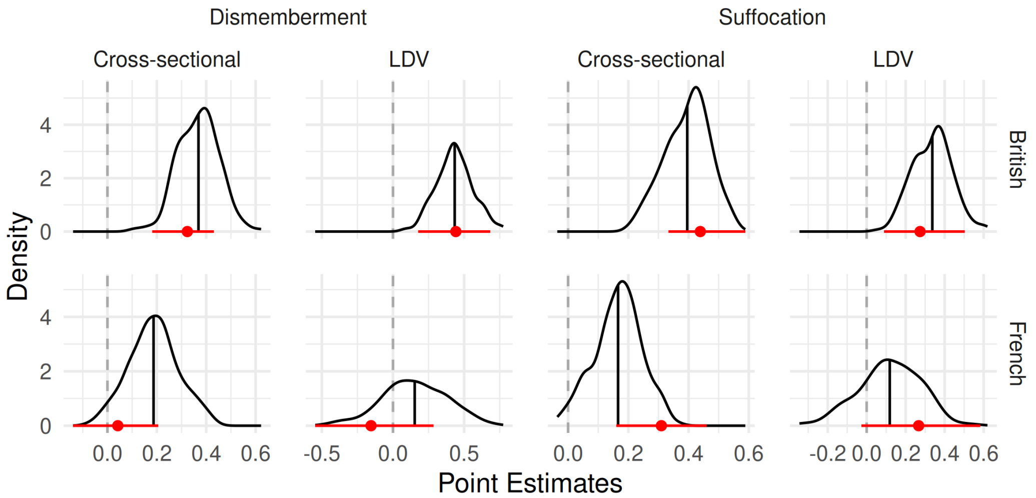


Figure A8: Point estimates of the effect of ethnic dismemberment and suffocation: Shifting the spatial graph

Note: Distributions result from re-estimating the main models 100 times, with data from 100 resampled planar graphs. Red estimates show the respective results from Table 3.

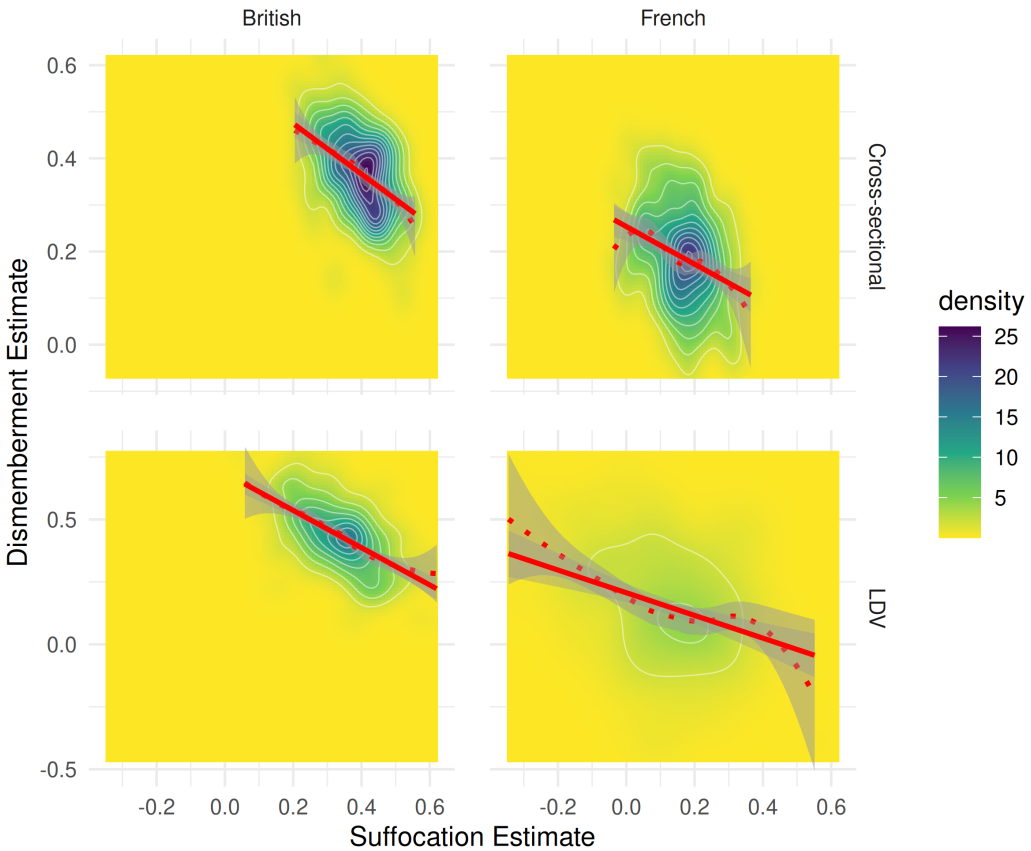


Figure A9: Joint distribution of ethnic dismemberment and suffocation estimates across 100 shifts of the spatial graph

Note: Red straight (dotted) lines result from a linear (LOESS) model.

C References (Appendix)

Ajayi, JF and Michael Crowder. 1985. *Historical atlas of Africa*. Cambridge University Press.

Aronow, Peter M, Cyrus Samii and Valentina A Assenova. 2015. "Cluster–robust variance estimation for dyadic data." *Political analysis* 23(4):564–577.

Lewis, M. Paul, ed. 2009. *Ethnologue: Languages of the world*. Vol. 16 SIL International Dallas, TX.

MacArthur, Julie. 2013. "When did the Luyia (or any other group) become a tribe?" *Canadian Journal of African Studies/La Revue canadienne des études africaines* 47(3):351–363.

Müller-Crepon, Carl. 2020. "Continuity or Change: (In)direct Rule in British and French Colonial Africa." *International Organization* 74(4):707–741.

Müller-Crepon, Carl, Guy Schvitz and Lars-Erik Cederman. 2025. "Shaping states into nations: The effects of ethnic geography on state borders." *American Journal of Political Science* 69(1):132–147.

Müller-Crepon, Carl, Yannick I Pengl and Nils-Christian Bormann. 2021. "Linking Ethnic Data from Africa (LEDA)." *Journal of Peace Research, OnlineFirst* .

Paine, Jack. 2019. "Ethnic Violence in Africa: Destructive Legacies of Pre-Colonial States." *International Organization* 73(3):645–683.

Paine, Jack, Xiaoyan Qiu and Joan Ricart-Huguet. 2024. "Endogenous Colonial Borders: Precolonial States and Geography in the Partition of Africa." *American Political Science Review, FirstView* .

Wilfahrt, Martha. 2025. "A Precolonial Paradox? Rethinking Political Centralization and Its Legacies." *American Political Science Review* pp. 1–20.