Endogenous Colonial Borders: Precolonial States and Geography in the Partition of Africa

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Abstract

We revise the conventional wisdom that Africa's international borders were drawn arbitrarily. Europeans knew very little about most of Africa in the mid-1880s. Subsequently, their self-interested goals of amassing territory led them to intensely examine on-the-ground conditions as they formed borders. Europeans negotiated with African rulers to secure treaties and to learn about the frontiers of historical states, which enabled Africans to influence the border-formation process. Major water bodies, which shaped precolonial civilizations and trade, also served as focal points. We find support for these new theoretical implications using two original datasets. Quantitatively, we analyze border-location correlates using grid cells and originally compiled spatial data on precolonial states. Qualitatively, we amassed information from treaties and diplomatic histories to code "causal process observations" for every bilateral border. Historical political frontiers directly affected half of all bilateral borders. Water bodies, often major ones, comprised the primary border feature much more frequently than straight lines.

Keywords: Africa, borders, colonialism, geography, precolonial states

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1 INTRODUCTION

The modern political map of Africa reflects the choices of European statesmen, who partitioned Africa in the late nineteenth century. Small coastal settlements suddenly mushroomed into large colonies that, at least on paper, stretched nearly the entire continent. After independence, African state leaders largely retained the colonially drawn international borders. Consequently, "the boundaries were, in many ways, the most consequential part of the colonial state" (Herbst 2000, 94). A large literature examines the consequences of external border formation in Africa for outcomes such as civil conflict (Englebert, Tarango and Carter 2002; Michalopoulos and Papaioannou 2016), international disputes (Touval 1972; Goemans and Schultz 2017), economic development (Alesina, Easterly and Matuszeski 2011; Michalopoulos and Papaioannou 2013), and political identities (Posner 2004; Robinson 2016). Numerous other studies analyze specific bilateral borders and premise their research design on the as-if randomness of border location (McCauley and Posner 2015). Across this literature, the well-established conventional wisdom is that external influence yielded arbitrarily located boundaries in Africa:

Claim 1. Process of forming borders. European actors knew very little about conditions on the ground when they determined Africa's borders. The Berlin Conference of 1884–85 was a pivotal event for border formation; at the Conference and afterwards, Europeans directed this process entirely from their capital cities without African input.

Claim 2. Arbitrarily located borders. This process resulted in arbitrarily located borders, many of which were straight lines, that neglected local features. Ethnic groups and historical states were partitioned via an as-if random process, in the sense that local features do not systematically correlate with the location of borders.[1]

[1]Many prominent publications offer clear statements of both claims, such as Asiwaju (1985), Herbst (1989), Herbst (2000, Ch. 3), Christensen and Laitin (2019, Ch. 8), and Michalopoulos and Papaioannou (2016). Others expound the second claim in more depth, such as Yakemtchouk (1971), Touval (1972), Englebert (2002, 85–88), Englebert, Tarango and Carter (2002), Abraham (2007), and Alesina, Easterly and Matuszeski (2011). Collectively, these leading contributions have amassed over 8,000 citations. Appendix A.1 provides accompanying quotes and related claims from the popular press.

We revise the conventional wisdom in this article. The location of borders in Africa cannot generally be characterized as arbitrary. Despite intense interest in African border formation and its consequences, the literature exhibits a crucial gap: the absence of systematic evidence about how colonial borders were actually formed. This historical process is important to study in its own right; it directly created the modern-day countries in Africa and the resultant political map. Moreover, scholarly interest in studying the *consequences* of African borders showcases the need to understand the *process* by which these borders arose in the first place—which was a deliberate, rather than haphazard, process.

We begin by documenting foundational facts about the timing of African border formation. As late as 1887, Europeans' claims were largely limited to the coasts and very few borders had taken their final form. This reflected the relative insignificance of the Berlin Conference of 1884–85 for border formation. The Conference addressed the Congo region only and the boundaries it laid out for the Congo Free State were later revised. Among all bilateral borders, the median year of initial border formation was in 1891, and the median year in which a border reached its final form occurred after the turn of the century. Even after the rough spheres of influence were largely worked out in the 1890s, the process of forming and finalizing borders was ongoing.

We propose an alternative theory for understanding African border formation. The later-than-realized timing of settling borders matters because, in the interim, Europeans learned about and adjusted to on-the-ground realities. This reflected their self-interested motives to defend and extend territorial claims, which required local knowledge. Our alternative theoretical framework emphasizes the central role of precolonial states and geographical features such as major water bodies (rivers, lakes) and major watersheds. These were important objects of contention in their own right and provided focal points (or "focal zones") for determining specific borders.[2]

To minimize intra-European conflict amid intense deliberations, European powers agreed on the principle of suzerainty: a power that signed a recognized treaty with an African ruler gained *all* the

[2]For IR research on focal points and borders, see Simmons (2005); Goemans (2006); Carter and Goemans (2011).

territory within their domain. This encouraged drawing borders around, rather than partitioning, large precolonial states. This process of information gathering meant that African agency played an important role in determining the location of borders, even though the broader project of creating new states was directed (almost) entirely by Europeans. African rulers had greater knowledge of their claimed domains, which enabled them to influence European deliberations. In some cases, Africans were direct participants in negotiations over the colonial borders. Europeans were also intensely interested in major water bodies and their derivatives to facilitate trade. Multiple powers often competed for influence over specific rivers and lakes, which were focal for settling specific borders. The most frequently emphasized feature of African borders, straight lines, were expedient only in areas that lacked discernible local features, in particular low-population-density areas such as deserts.

Using two original datasets, we empirically support two main hypotheses: borders should align with the boundaries of precolonial states but not partition them, and water bodies should be used to form borders. Quantitatively, we conduct a statistical analysis using square grid cells. We analyze which cell characteristics (e.g., territory governed by a historical state, presence of a river) correlate with the presence of a border segment in the cell. To quantitatively assess hypotheses about precolonial states, we compiled an original spatial dataset based on detailed maps of African regions from Ajayi and Crowder (1985) and numerous additional historical maps for individual states (Appendix B.2 provides details). Grid cells containing the frontiers of a precolonial state are significantly more likely than non-state cells to form part of a colonial state border, whereas the interior cells of precolonial states are significantly less likely to contain a border. Additionally, cells with rivers and lakes are significantly more likely to contain a colonial border. Our new data represent an important improvement over the commonly used map of ethnic groups from Murdock (1959). We agree with the descriptive claim in existing work that many ethnic groups were partitioned across international borders, which Michalopoulos and Papaioannou (2016) have confirmed using the Murdock data. However, we contend that the Murdock data cannot be used to adequately assess the relationship between *precolonial states* and country borders (see Appendix A.4).

Our second original dataset is based on case studies of all 107 bilateral borders in Africa. We code three specific variables: primary/secondary physical features of the border, years of major border revisions, and whether a historical political frontier (usually a precolonial African state, but sometimes other frontiers such as white settlements) directly affected the border. We refer to the latter variable as "causal process observations" (Collier 2011) because it concerns the *process* of border formation. Our coding decisions are based on more than 100 pages of notes, presented in Appendix C.

Historical political frontiers directly affected *more than half* of all bilateral borders, 54 of 107. This finding contrasts with existing discussions, which dismiss any notable role for historical political frontiers in shaping African borders.[3] For precolonial states specifically, coding a direct effect requires us to find evidence that European powers deliberated among themselves or with African rulers about the boundaries of the historical state. In practice, this usually meant that a border treaty specifically mentioned an African polity and that Europeans directly interacted with Africans to learn information about the border. We also demonstrate that water bodies, often major ones, much more frequently comprised the primary element of a bilateral border than straight lines, 57% versus 34%. This finding contrasts with commonly stated claims that overemphasize the prevalence of straight-line borders. Such borders are mostly confined to desert areas of lesser strategic importance, as we demonstrate.

Our findings reject both strong and weak versions of claims that the location of borders in Africa can generally be considered as arbitrary. The strong version of this claim is that local features are systematically uncorrelated with the location of African borders. The weak version is that the only features systematically related to borders are orthogonal to human experiences on the ground. Our findings about precolonial states unambiguously reject both. The results for major water bodies clearly reject the strong version, and we contend that they reject the weak version as well. In contrast to astronomical lines, water bodies were intimately related to lived experiences. Some served as bedrocks for precolonial civilizations and human settlements whereas others delimited

[3] See the references in Appendix A.1.

their reach. In many stateless areas, water bodies shaped long-distance trade networks for centuries and determined the human and social ecology of the area.

The idea that Africa's international borders are unusually arbitrary is foundational. Overturning this conventional wisdom provides new insights into the origins of contemporary African countries and the resultant political map, which has subsequently influenced domestic and international political institutions. In the conclusion, we discuss three broader implications of our findings: (1) using African borders in regression-discontinuity designs, (2) long-term effects of precolonial states, (3) identifying what is exceptional about African states and borders, and understanding other means by which external state formation yielded harmful outcomes.

2 Historical Background: It Didn't Happen at Berlin

The conventional wisdom is that Europeans knew very little about conditions on the ground when they determined Africa's borders. Many characterize the Berlin Congo Conference of 1884–85 as a pivotal event in a process of border formation that was directed entirely from European capitals without African input. Countering this view, we demonstrate that border formation in Africa occurred later than realized. In doing so, we provide novel quantitative evidence that supports a long-standing contention by many historians that the Berlin Conference was largely irrelevant for border formation; simply, "It didn't happen at Berlin" (Katzenellenbogen 1996). By the late 1880s, Europeans had yet to draw any borders, even preliminary, for most of Africa, in particular in the interior. Most borders were not initially created until the 1890s and a majority underwent major revisions in the twentieth century. In the years and decades following the Berlin Conference, Europeans frenetically gathered intelligence about conditions on the ground. Our theoretical framework, presented in the next section, explains how this improved knowledge impacted border formation.

For centuries, Europeans had participated in the African slave trade and some forms of legitimate commerce. As late as the 1870s, European territorial influence in Africa was mostly limited to

small footholds on the coast (Foster 1968, 51). For example, British and French presence in West Africa was largely confined to trading companies, such as the Royal African Company and the *Compagnie du Sénégal*, and annexations of some small coastal territories. Traders, missionaries, and colonial agents on the ground often petitioned the metropole for the resources to expand inward. However, they were usually rebuffed because the metropole did not want to assume the costs of managing larger territorial areas believed to be of minimal economic or strategic value.

This status quo changed suddenly in the early 1880s. For varied reasons across different regions of Africa, the major powers began to fear their exclusion from, as King Leopold II of Belgium phrased it, "a slice of this magnificent African cake" (quoted in Davidson 1985). In the Congo region, exaggerated reports of untapped potential abounded in Europe in the 1870s and 1880s (Wesseling 1996, 73). These accounts prompted competition among France, Portugal, and King Leopold to control the mouth of the Congo River. Given prospects for spiraling territorial claims to lead to conflict, the powers agree to Germany's proposal to hold a conference in Berlin in 1884.

Although the Berlin Congo Conference exemplified European greed and shamelessness, it minimally impacted borders. Wesseling (1996, 126) contends, "Africa was not only not divided at Berlin, but the subject was not even on the agenda; indeed, the partition of Africa was explicitly rejected by the conference." Many historians support this view, although the proclaimed importance of the Berlin Conference for border formation has proven to be a "stubborn myth" among non-specialists (Nugent 2019, 18).[4]

The scope of the Conference was limited and created frontiers for the Congo Free State only, most of which were later revised. Although the Congo Free State was not formally created until several months after the Conference ended, the Conference was undoubtedly the catalyst for creating this colony. The Conference (a) granted international recognition to the International Association of

[4]See our Appendix A.1 for some documentation of this "stubborn myth." For concurring views by other historians, see Crowe (1942, 152); Crowder (1968, 55, 62–63); Katzenellenbogen (1996, 31); Boilley (2019, 4).

the Congo (IAC), the nominal governing body for the Free State; (b) defined the "Geographical" Congo Basin, which roughly circumscribed the Free State's eventual frontiers;[5] and (c) outside the official Conference proceedings, France, Portugal, and the IAC concluded a series of bilateral agreements that delimited territorial possessions from the mouth of the Congo River to the Stanley Pool/Pool Malebo (Crowe 1942).

But even for the Congo Free State, the borders created during and shortly after the Conference were *preliminary but not final*, as we illustrate in Figure 1. Its original borders were, other than the Congo-river portions, primarily straight meridian lines. Later, in the west and north, the borders were shifted to the Obangui and Mbomou rivers.[6] In the east, the frontier north of Lake Tanganyika was shifted to Lake Kivu and the Ruzizi river, which corresponded with the western limits of the traditional Rwandan state.[7] In the south, border revisions reflected the frontiers of various states: Lunda, Kazembe, and Msiri.[8] Thus, this supposedly paradigmatic case of arbitrary borders previews the types of local factors that we demonstrate were commonplace in border negotiations. Moreover, The Congo Conference largely failed to establish rules for claiming territory, another of its supposed purposes.[9]

Moving beyond this single case, we provide novel evidence that most borders were not initially formed until after the Berlin Conference and that an even longer time lapse occurred before they took their final form. For all 107 bilateral borders in the final colonial map (circa 1960), we code the date of initial border formation and years of major revisions. A major revision constitutes a substantial transfer of territory, forming a previously unformed segment of a border, or changing the primary feature of a border (e.g., replacing a straight line with a river). We use this information in two ways. First, using bilateral borders as the unit of analysis in Figure 2, we track over time the cumulative fraction of the 107 borders that had been initially formed (red line) or that had

[5]The Conference also defined the "Conventional" Congo Basin, or Conventional Free Trade Area, which had no discernible impact on borders.

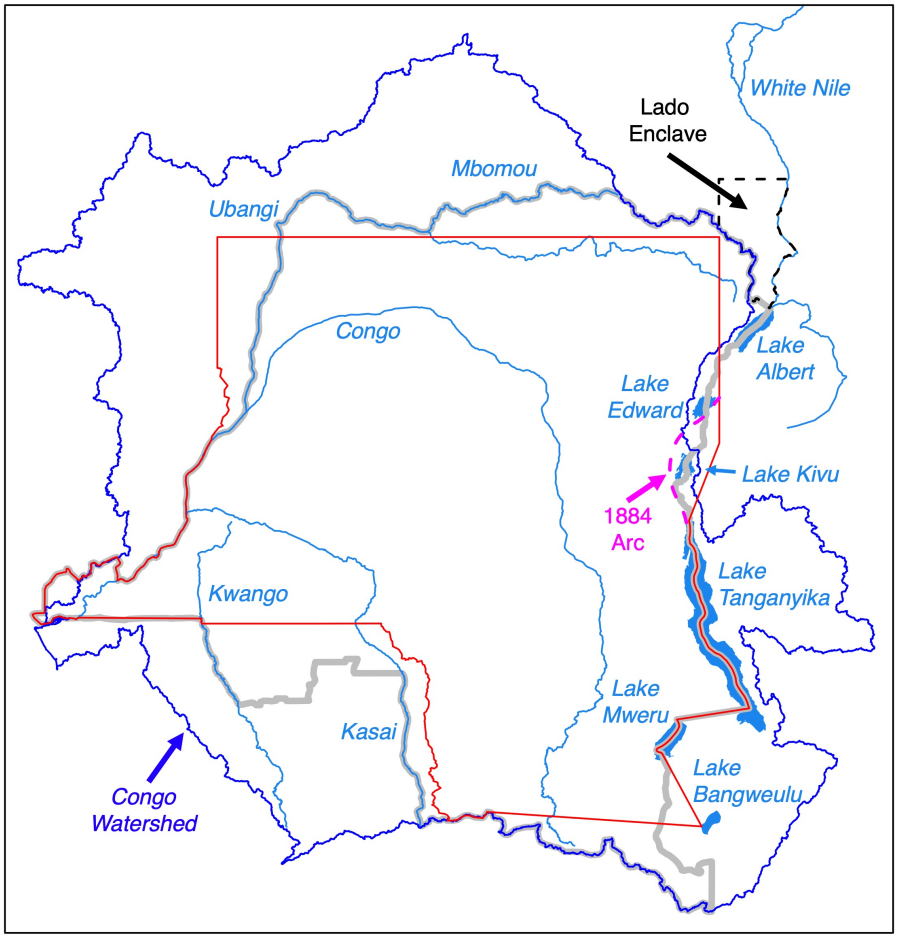
[6]See Appendix C.3.1 and C.3.2.

[7]See Appendix C.4.8.

[8]See Appendix C.3.3 and C.3.5.

[9]Appendix A.2 provides details.

Figure 1: Evolving Borders for the Congo Free State



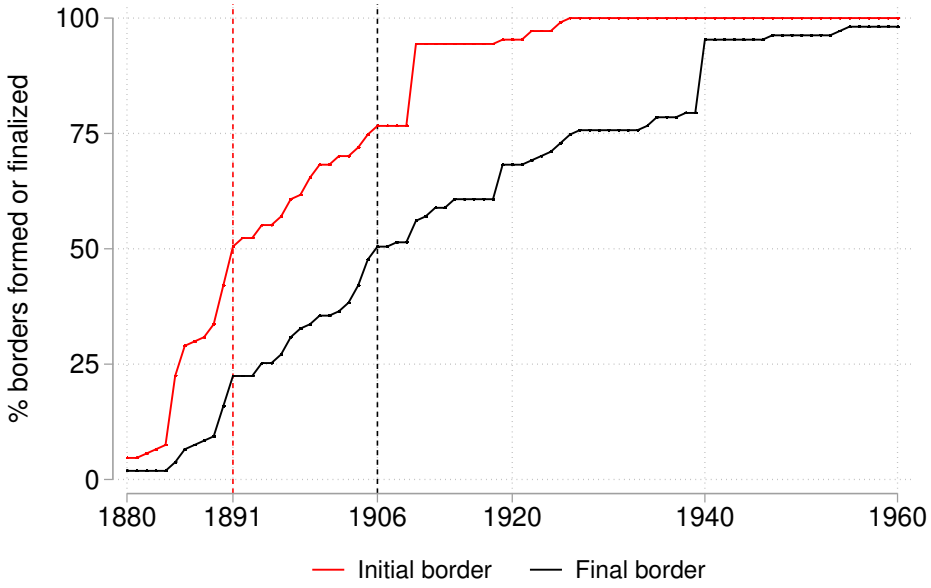
Notes: Original borders of the Congo Free State in red. Final colonial (and contemporary) borders of the Democratic Republic of the Congo in gray. Major rivers and lakes are labeled in light blue, and the Congo watershed in darker blue. For the 1884 arc, see Appendix C.4.8. For the Lado Enclave, see Appendix C.4.10.

undergone their final major revision (black).[10] Second, we digitized maps from Sanderson (1985) of formal European claims in Africa at different dates: 1887, 1895, and 1902. This enables us to compare earlier colonial borders to the final colonial borders circa 1960 as well as to assess the amount of territory Europeans had claimed at different points in time. In Figure 3, claimed territory is in gray. Using the detailed information we coded about each border, we color segments of the boundaries shown in these maps either in black (indicating correspondence with a final colonial

[10] See details in Appendix C.

border) or red (not yet formed or later revised).[11]

Figure 2: Border Formation Over Time in Africa



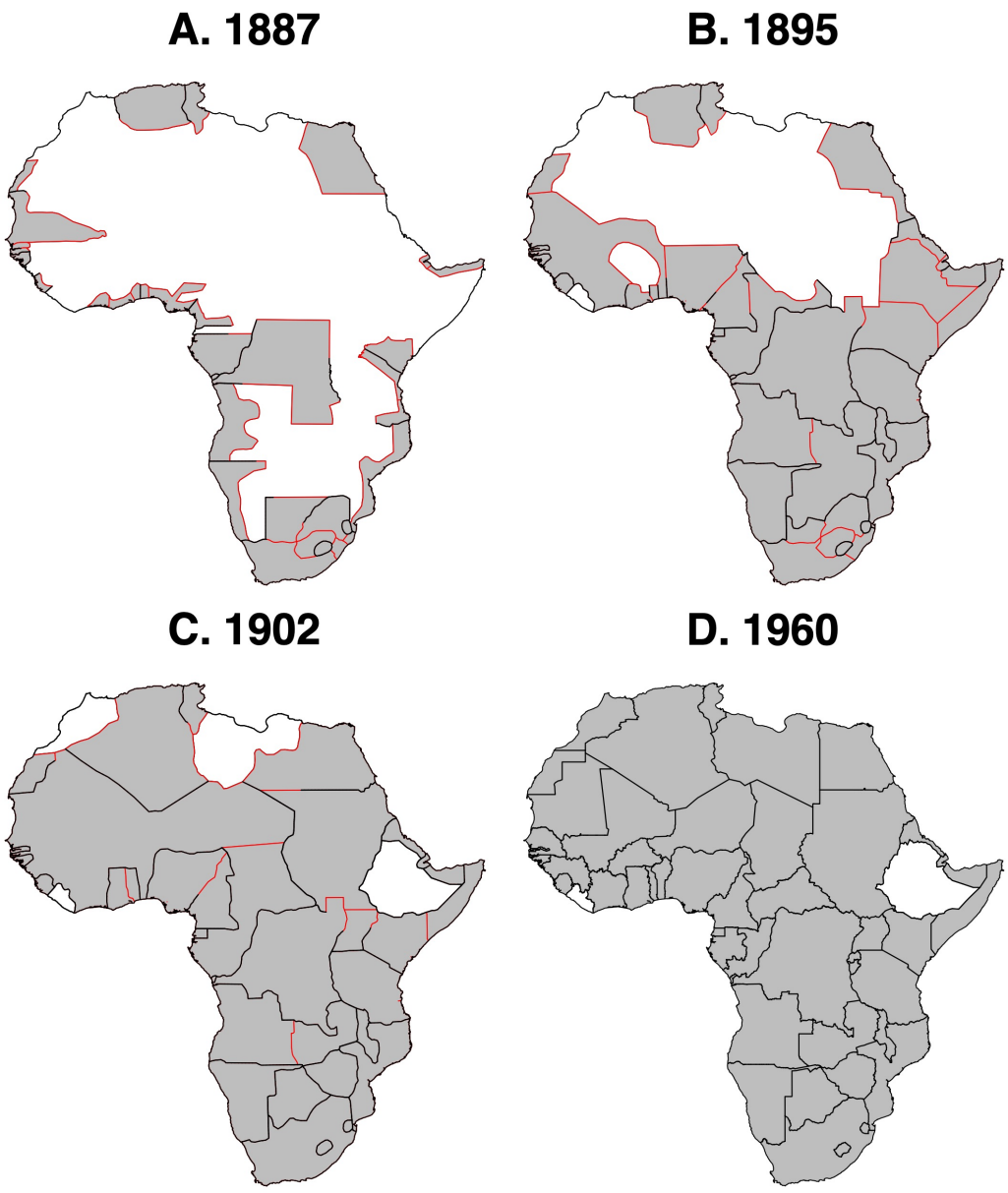
As of 1887, the colonial map was highly preliminary. A majority of territory along the coasts had been claimed (56% of territory within 300km of the coast), but not the interior (22% of territory farther inland, and only 14% when excluding the Congo Free State). "Macro" components of African border formation were clearly taking form, that is, which powers competed for territory in each broad region. However, borders beyond the coast were almost entirely undetermined at the "meso" level, which concerns the main objects of strategic interest within a broader region of contention between multiple powers; let alone the "micro" level, the exact location and features of borders.[12] Overall, 30% of bilateral borders had been initially formed by 1887 but only 8% were in their final form (Figure 2). Taking the total length of African borders in 1960, only 18% was finalized by 1887 (Figure 3, Panel A).

Border-formation events accelerated shortly after 1887. Between 1889 and 1894, the major powers completed numerous bilateral treaties, such as the Anglo–French Agreement of 1889 (West

[11] See details in Appendix A.2.

[12] We thank an anonymous referee for suggesting the macro/meso/micro distinction.

Figure 3: The Evolution of the European Political Map of Africa



Africa), the Anglo–German Agreement of 1890 (whole continent), and the Anglo–Portuguese Treaty of 1891 (southern Africa). These and other agreements determined territorial allocation in most of the continental interior (meso level), excepting the Sahara, and formed at least preliminary bilateral borders throughout parts of the interior (micro level). At this point, Europeans claimed 83% of Africa's coastal territory and 58% of the interior. Yet many borders were still in flux; when

we examine border length, only 43% of all borders in 1960 were in place in 1895 (Figure 3, Panel B). Among bilateral borders, 55% were initially formed and 25% were finalized.

By 1902, Europeans had claimed almost the entire continent (90% of interior territory), which finalized most macro- and meso-level components of border formation.[13] Thus, the political map in broad strokes resembled its postcolonial form. However, even at this late date, the micro-level process of forming specific borders was still ongoing. Based on border length, 29% of bilateral borders in 1960 were not formed even initially by 1902 (Figure 3, Panel C)—almost two decades after the Berlin Conference. Among bilateral borders, 70% were initially formed and only 36% were finalized. In the twentieth century, nineteen substantial territorial transfers occurred (see Appendix Table A.1). This included Anglo-French divisions of formerly German territory after World War I, various transfers to reward Italy's participation on the Allied side in the war, and several major transfers between Uganda and neighboring states. Numerous other borders were revised to lengthen the original border or to change its features, often incorporating local features and migration patterns (Appendix Figure A.1).

3 Theory: The Process of African Border Formation

"It happened at Berlin" is not a compelling model of African border formation, nor is the broader idea that Europeans determined African borders entirely from the vantage point of European capitals with minimal knowledge of conditions on the ground. Yet other key pieces of the conventional account are undoubtedly correct. European statesmen had self-interested motives in claiming territory for themselves but studiously sought to avoid intra-European conflict, given the generally low value they placed on African territory (Herbst 2000, ch. 3; Christensen and Laitin 2019, ch. 8). We present a new theory of African border formation that explains how these premises created incentives to draw borders *conscientiously*, rather than haphazardly. The implications from our theory differ from the conventional characterization that Africa's borders are, for the most part, arbitrar-

[13] The exceptions were Morocco and Libya (late colonies) and Ethiopia and Liberia (not colonized).

ily designed (often straight lines), neglect local features, and indiscriminately partition historical states.

The Berlin Conference settled few borders and created only vague rules for "effective occupation" (see Appendix A.2). As the process of border formation unfolded in the years and decades following the Conference, it is crucial to understand the meso-level objects of strategic interest and candidates for micro-level focal points or "focal zones." Existing research on international borders (Simmons 2005; Goemans 2006; Carter and Goemans 2011) emphasizes the costliness of unsettled borders and of conflict over borders, and the need to coordinate on focal points that settle territorial disputes. We apply this mechanism by highlighting two local features that appear countless times in historical accounts: historical political frontiers (in particular precolonial states) and major water bodies. To promote their territorial claims, Europeans gathered substantial intelligence about conditions on the ground.

Precolonial states and historical political frontiers. For centuries, Europeans had engaged in treaty-making with African rulers using documents that explicitly affirmed the sovereignty of the rulers with whom they contracted. This practice continued through the late nineteenth century, with the main difference that these treaties now entailed African rulers renouncing sovereignty over external affairs. Because Europeans agreed that African rulers were legally sovereign, as opposed to treating their territory as unoccupied *territorium nullius*, Europeans considered bilateral treaties as necessary to provide legal justification for acquiring African territory (Alexandrowicz 1973). Consequently, treaties with local rulers were the agreed-upon currency to fill in the ambiguous rules of "effective occupation" laid out in Berlin, which induced a rush to gain treaties with Africans in areas of strategic interest. "[T]he importance of these treaties lay, for European governments, not in the exchanges between Africans and Europeans but in the documents' value for European diplomatic relations. These treaties provided the legal cover for European powers to show other European powers that they maintained effective control over certain inland territories, even if the document did not accurately describe the situation on the ground" (Carpenter 2012, 116; see also

Wesseling 1996, 127–28).

Data from the British empire illustrates the frenetic pace of treaty signings during the Scramble. Britain engaged in some treaty-making with African rulers between 1808 and 1883, averaging 0.9 treaties per year. This activity spiked in the next decade, with an average of 59 treaties per year between 1884 and 1893.[14]

When Europeans secured treaties with rulers of sizable historical states, they gained claims over large swaths of territory via the principle of suzerainty. A British official explicated this principle in a dispute with France in 1896: "We could not abandon the principle of suzerainty. This principle was recognized in all international negotiations and we held that, in treating with a suzerain, the rights conferred [...] extended to the whole of the territory under his dominion" (quoted in Anene 1970, 220). Nugent (2019, 20) suggests broadly that "where existing states controlled territory, European actors would appeal to treaties or conquest—in either case seeking to inherit the entire territory attached to the kingdoms in question."[15] By contrast, where one ruler was found to be subordinate to another, a treaty with the subordinate ruler could be challenged on the grounds that they lacked territorial rights in the first place (Alexandrowicz 1973, 141).

Capitalizing on the principle of suzerainty required self-interested European powers to gather intelligence about the frontiers of historical states and vassalage relations. Europeans were largely ignorant about on-the-ground realities in Africa when they convened the Berlin Conference. However, afterwards, learning about local conditions enabled European powers to maximize their territorial claims—which were based, in part, on treaties with African rulers.

Gathering intelligence, in turn, necessitated continual interactions with local rulers. This facilitated African agency, a claim for which we provide extensive evidence later in the article and throughout

[14]Figures computed by authors by tallying treaties listed in Hertslet (1909). Although this source provides some information on French treaties (see pp. 634–41), comprehensive information for other empires has yet to be compiled (Alexandrowicz 1973, 139 lists sporadic sources for other empires). However, it is well established that all powers used treaties to make territorial claims and that this activity accelerated in the 1880s (see Alexandrowicz 1973 and numerous examples in our Appendix C).

[15]See also Hiribarren (2017). Historical political frontiers were also paramount in shaping borders within Europe (Goemans 2006, 28; Abramson and Carter 2016).

the case studies in Appendix C. Many rulers were strategic and sought to preserve areas they controlled. The territorial boundaries of precolonial African states were often contested and changed over time because of external wars and secession. Local rulers influenced colonial negotiations by supplying information about their boundaries. They often exaggerated their territorial claims, for example, by claiming to control areas that had slipped away by the late nineteenth century. On occasion, they used military force. Eager to maximize their own territory, European statesmen favored claims by rulers with whom they signed treaties and contested those by others. The most famous example was the "race for Nikki" between Britain and France in 1894 to determine the northern part of the Benin–Nigeria border. Later we demonstrate that disputes over the limits of precolonial states were commonplace. This competitive process provided Europeans with detailed information about the domains of African rulers. Whereas competing European powers contested territorial claims based on fanciful descriptions of reality, they usually accepted territorial claims with unambiguous empirical backing—all of which depended upon continual interaction with African rulers.

We expect this process to yield two consequences. First, borders should rarely cut through areas governed by precolonial states because this would violate the principle of suzerainty (assuming one power had an unambiguous claim over the historical state and its historical frontiers were agreed upon). And for intra-imperial borders, more effective administration could be achieved by preserving a historical polity within a single colony. Second, borders should often lie at the frontiers of historical states because one power's claim ended there. Although historical borders were rarely precise enough to create specific focal points, these historical frontiers nonetheless created a type of "focal zone" for forming borders. Thus, we expect that Europeans took precolonial states into account not out of benevolence, but instead because this local feature provided a convenient bargaining chip to extend territorial claims while minimizing the risk of intra-European conflict.

By contrast, we anticipate that colonial borders will often divide peoples in areas without ma-

jor states. There, a European power would be hard-pressed to argue that treaties among loosely affiliated rulers constituted a basis for gaining control over an extended area. "European strategists' preoccupation with the major African powers in drawing up spheres of influence meant that less powerful tributary or independent peoples were mostly ignored: their political uses of the landscape mattered only insofar as they could be used to claim greater territorial limits for major African powers" (McGregor 2009, 57; see also Miles 2014, 22–29). Broadly defined cultural areas obscured clear divisions of territory given the "intermingling and flexibility of these human groupings," as Mills (1970, 19) contends for Yorubaland. Yoruba speakers were fractured into numerous states and stateless areas, which meant that gaining a treaty with any one ruler did not establish suzerainty over all of Yorubaland. Asiwaju (1976, 9) expounds this point by arguing that political decentralization made the culturally unified area of Western Yorubaland prey for competing, powerful African neighbors, and that the resultant warfare "provided one of the excuses for the French and British intervention in local politics, leading to the partition of the area in 1889." Consequently, although many ethnic groups in Africa were partitioned amid the Scramble, we anticipate that this process was not arbitrary or as-if random. Historical states were systematically different than areas lacking political unity.

Not all historical frontiers were precolonial African states. Other frontiers included white settlements and states in southern Africa, Ottoman territories in the north, and the resettlement colony of Liberia. We also expect these historical political frontiers to shape borders, albeit under better-founded pretenses of effective occupation.

Major water bodies. Access to major water bodies was another common goal of European statesmen. Unlike natural harbors, which also attracted early European penetration (Ricart-Huguet 2022), rivers could facilitate transportation and trade between the coast and interior. Later, as Europeans "discovered" inland lakes, they similarly sought access to facilitate trade. We anticipate that major water bodies would serve as focal points for determining borders, given these strategic interests and the precedent of using such features in European borders (Goemans 2006). Unlike

precolonial states, multiple powers could access the same water body if their common border shared this feature. And each power knew that others needed access to transportation hubs to make their colonies economically viable. Therefore, given the general desire to avoid intra-European conflict, we would usually expect them to yield to demands for access to the water bodies. Achieving this outcome was even simpler for intra-colonial borders, as the same power controlled both sides. Although our strongest expectations are for longer rivers and larger lakes, minor rivers, lakes, and watersheds could serve similar purposes, especially (but not exclusively) when they formed the frontiers of historical states or provided an outlet to the sea or other major rivers.

As with precolonial states, claims to water bodies were more effective when accompanied by knowledge of conditions on the ground. Earlier in the Scramble, British Prime Minister Lord Salisbury remarked, "We have been engaged in drawing lines upon maps where no white man's foot ever trod; we have been giving away mountains and rivers and lakes to each other, only hindered by the small impediment that we never knew exactly where the mountains and rivers were." Europeans' ignorance changed over time as they invested in local knowledge to bolster territorial claims. For example, the original border that separated the Congo Free State and German East Africa was a longitude meridian. In the mid-1890s, Germany realized that parts of Rwanda were located west of this meridian. It sought to revise the border to Lake Kivu ("discovered" by Europeans in 1894) and the Ruzizi river, which it had learned were the historical limits of the kingdom. "In the long run the German case proved the most forceful—natural and ethnic frontiers, so far as possible, should not be violated . . . The imperial powers began with arbitrary boundaries, but they finished with natural frontiers and minute on-the-spot delimitation. . . . The Germans and British claimed to uphold natural frontiers, but if they appear as champions on the side of Africans, it is at least in part because it was to their advantage to press the Congo State for natural boundaries. . . . There was agreement between Britain and Germany that Ruanda-Urundi should not be divided; but none of the three powers hesitated to divide the smaller ethnic groups" (Louis 1963, 93–94).

Conversely, Germany's lack of local knowledge undermined the value of territory it gained in its 1890 agreement with Britain. The Caprivi Strip, which created access to the Zambezi for South West Africa (Namibia), was economically worthless because the Zambezi becomes unnavigable at Victoria Falls, located just east of the German territory.

Straight-line desert borders. Some parts of Africa lacked clear focal points, in particular deserts and other areas of low population density. Europeans should be more likely to draw (and retain) artificial borders, often based on parallels and meridians, that disregard conditions on the ground in areas that lacked focal points. However, the stakes of border placement were lower because the territory was rarely valuable. Therefore, although the exact placement of a straight-line border is typically arbitrary, the decision to draw a straight-line border should be conscious and strategic—and, consequently, relegated to areas with low population density.

4 Quantitative Analysis of Border Location

We test our main theoretical implications with multiple forms of evidence. The quantitative evidence in this section comes from analyzing African borders using square grid cells and assessing correlations with (a) original data on precolonial states and (b) geographic features. We also summarize results from the statistical analysis of ethnic partition.

4.1 Variables

Precolonial states. We compiled new spatial data on precolonial states. Ajayi and Crowder's (1985) atlas provides the most extensive and detailed maps of which we are aware containing the territorial location of precolonial polities on the eve of European colonization. The atlas contains eight detailed regional maps for the nineteenth century, each of which is produced by a leading scholar on a particular region of Africa.

We do not classify every polygon from the Ajayi and Crowder (1985) maps as a precolonial state. Instead, we consulted additional sources to assess which candidate cases meet Fortes and Evans-

Pritchard's (1940, 5) criteria for "Group A" societies, meaning they have "centralized authority, administrative machinery, and judicial institutions—in short, a government." This distinguishes cases in which a polity had a discernible ruler with whom Europeans could sign a treaty and whose political authority extended over a broader area corresponding with the territory in Ajayi and Crowder's (1985) maps, as opposed to petty chieftaincies or areas where rulers exerted autonomous rule in individual villages. We consulted three sources that provide a continent-wide list of states in the nineteenth century: Stewart (2006), Paine (2019), and Butcher and Griffiths (2020).[16] Some cases are unambiguous because all three sources identify the polity as a state. For cases with disagreement among the three, we consulted additional sources to make our coding decision. Finally, we restrict the sample to states that originated before 1850. Appendix B.1 provides details on all these points.

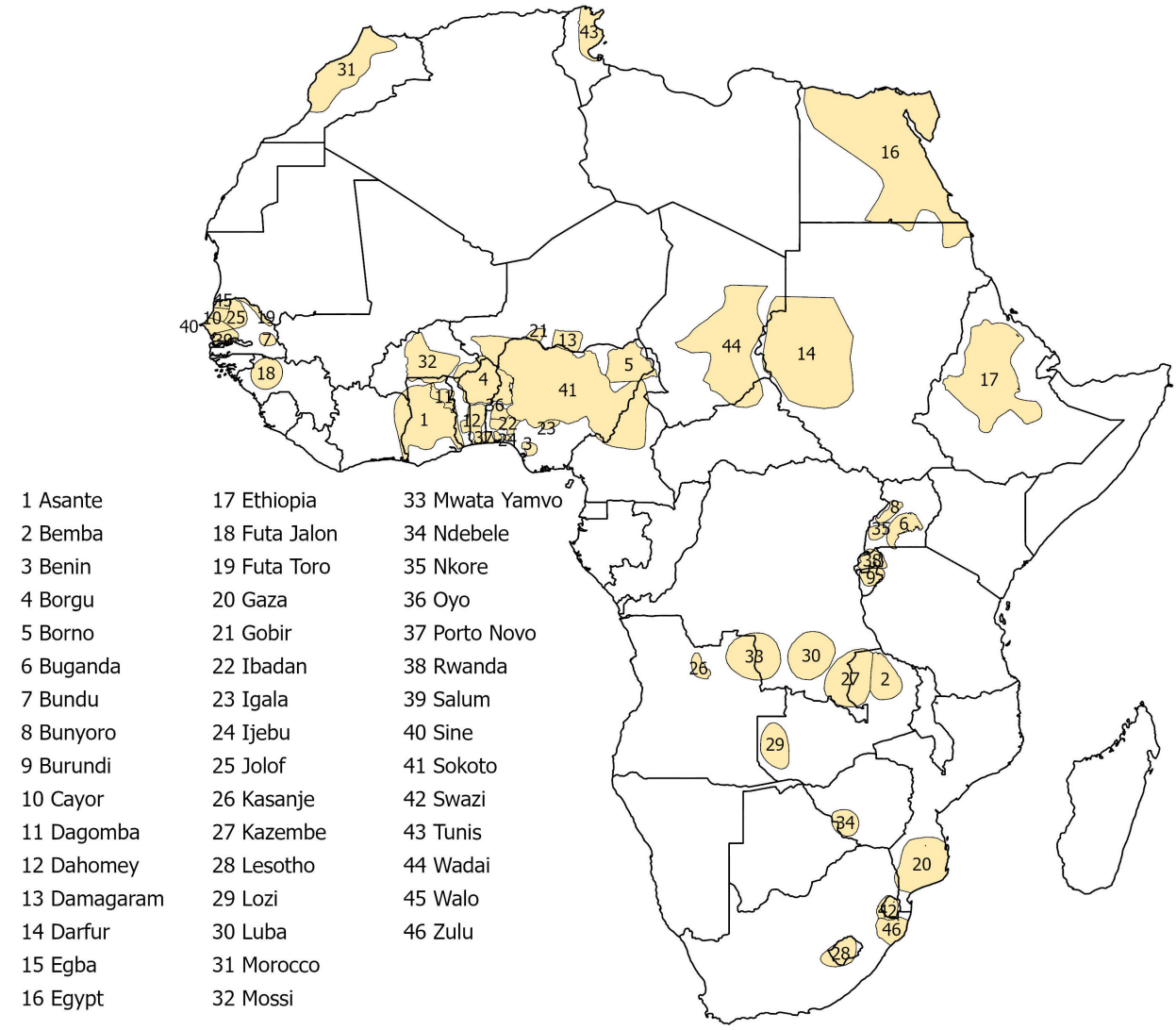
For each of the forty-six polities that we classified as a state, we consulted Ajayi and Crowder's (1985) atlas and at least one historical monograph with a map and qualitative description of historical boundaries. In most cases, we digitized a polygon from Ajayi and Crowder (1985), although in a handful of cases we digitized an alternative map. We use maps that capture African states on the eve of colonization. In most cases, we use a polygon from around 1885. However, in cases of earlier colonial penetration (e.g., Senegal, South Africa), we use polygons from the mid-nineteenth century. African states generally had meaningful territorial limits, at least in the sense of discernible frontier zones, although measurement error is inevitable because of often-shifting territorial control throughout the nineteenth century and the general imprecision of frontier areas.

Figure 4 depicts every precolonial state in our dataset and Appendix B.2 provides extensive supporting evidence for each polygon. Although our polygons of precolonial states have high face validity, due to inevitable measurement error, we perform a robustness check in which we create a 0.25º buffer on each side of the border (thus 0.5º in total) that "thickens" the border and thus

[16]These sources also confirm the comprehensiveness of Ajayi and Crowder's (1985) maps. See Müller-Crepon (2020) for another use of Stewart (2006) to indicate precolonial states across the continent.

accounts for imprecision in frontier areas.

Figure 4: Map of Precolonial States and Boundaries



Notes: This map depicts all forty-six PCS polygons in our dataset.

Water bodies, watersheds, and deserts. We assess three measures of rivers: all rivers, the ten longest rivers on the continent, and navigable rivers. These different measures allow us to capture rivers of varied importance and to conduct a more comprehensive assessment of their role in border formation. Navigable rivers are closely related to economic activities and colonial interests, while international borders often involve segments of smaller rivers that are locally salient. For similar

reasons, we assess all lakes as well as the ten largest lakes. We also assess major watersheds as derivatives of water bodies. Finally, we examine desert areas. We provide the sources for each variable in Appendix A.3.

International borders. We use international borders around the time of independence (1960) and exclude post-independence border changes.[17] As discussed throughout Appendix C, colonizers constantly adjusted the borders during their rule. We capture the end result of this protracted process. Furthermore, for many research questions, the final colonial map is most relevant for studying the postcolonial legacies.

4.2 Unit of Analysis: Grid Cells

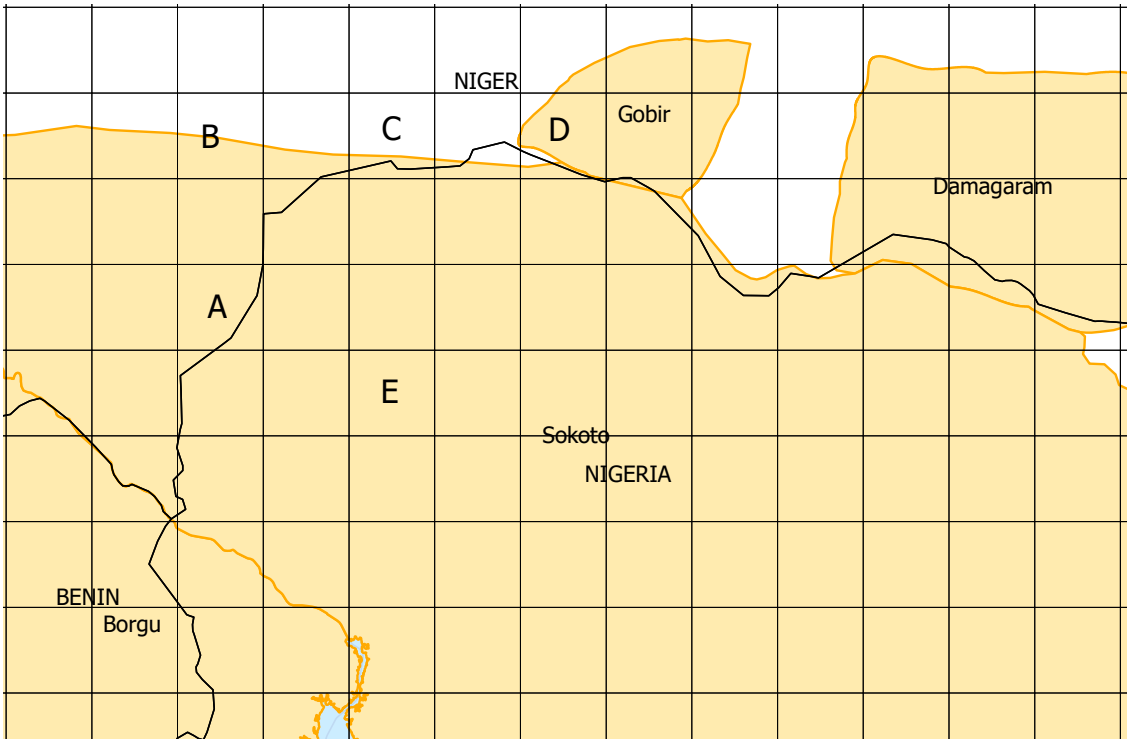
The unit of analysis is square grid cells. Each cell is 0.5×0.5 decimal degrees (approximately 55 km. at the equator), following standard practice (Michalopoulos 2012; Kitamura and Lagerlöf 2020). This procedure yields more than 10,000 grid cells across the continent (excluding islands). To score the variables for each grid cell, we combined the spatial data described above with the grid cells. Most are indicator variables, for example, whether a cell includes any part of a river.

We use our PCS dataset to distinguish each grid cell based on whether it includes a PCS border, PCS BORDER IN CELL; lies entirely within a PCS polygon, CELL INSIDE PCS; or contains no PCS.[18] Figure 5 uses the Nigeria–Niger border to visually illustrate how we code grid cells. This map illustrates grid cells overlaid onto precolonial states (orange coloring and borders) and countries (black borders). Our outcome equals 1 whenever a country border exists in the cell (e.g., cell A in the map). PCS BORDER IN CELL $= 1$ when a PCS border exists in the cell (B). In some cells, both variables equal 1 (C and D). Finally, CELL INSIDE PCS $= 1$ when a cell is fully within a PCS (A and E).

[17] We include Eritrea and Somaliland (British) as separate from Ethiopia and Somalia, respectively, given their distinct colonial status and territorial uncertainty as of 1960.

[18] Appendix Figure A.5 shows that our results are not sensitive to including two PCS variables in the same model while leaving the third as the reference category.

Figure 5: Niger–Nigeria Border with Overlaid 0.5°x0.5° Grid Cells



4.3 Regression Results

For the grid-cell analysis, we specify our hypotheses as follows:

1. Grid cells with PCS borders (PCS BORDER IN CELL=1) should be more likely to have country borders.

2. Grid cells contained within a PCS (CELL INSIDE PCS=1) should be less likely to have country borders.

3. Grid cells with rivers and lakes should be more likely to have country borders.

To assess these hypotheses, we estimate the following models with OLS:

$$\text{Border}_i = \beta_0 + \beta_1 \text{Geog}_i + \epsilon_i \tag{1}$$

$$\text{Border}_i = \beta_0 + \beta_1 \text{PCS}_i + \text{Geog}_i^T \beta_2 + \text{X}_i^T \beta_3 + \eta_j + \epsilon_i. \tag{2}$$

In every regression, the dependent variable indicates whether the cell contains part of a country border. The index for grid cells is i. We use Conley standard errors (Conley 1999; Hsiang 2010) to account for spatial autocorrelation.[19] We use a distance cutoff of 300 km. (approximately 6 grid cells at the equator) in our main results, although the findings are robust to altering the cutoff.[20]

We use bivariate models to assess each geographic feature. We purposely do not control for "post-treatment" variables such as the existence of a precolonial state. However, we show in the appendix that the results in Figure 6 are robust to their inclusion and to including multiple geographic variables in the same model.

We estimate multivariate models for each PCS indicator, PCS BORDER IN CELL and CELL INSIDE PCS. We include a vector of "pre-treatment" geographic variables as controls. We also add a vector of variables (X_i) to control for European interest in the area, including latitude, longitude, size of the ethnic group in cell, distance to the coast, historical natural resources, slave exports, suitability for European settlement, agricultural intensity, population density in 1850, ecological diversity of the ethnic group in cell, and TseTse fly suitability. We add region fixed effects (indexed by j in the estimating equations) to compare similar areas within Africa.[21]

The multivariate models reflect our attempt to recover the claim that, *ceteris paribus*, colonizers were less likely to draw borders that cut through historical states. Yet areas with precolonial states were generally more desirable and attracted more European competition. This made drawing *any* border in those areas more likely, hence biasing away from finding an effect for cells inside

[19] Spatially proximate units might be highly correlated in their unobservables but as the distance increases, the correlation gradually dissipates. In our analysis, cells close to a border cell are more likely to also contain country borders. Conley standard errors account for such spatial dependence in the data by adjusting the variance-covariance matrix taking into consideration spatial distances between observations. In computing the variance-covariance matrix, the method commonly uses a uniform kernel function to weight pairs of observations that equals 1 if two observations are within a cut-off distance and 0 otherwise. The kernel function measures which observations are near and which are far. And the choice of the cut-off distance affects the standard errors obtained.

[20] See Appendix A.3.3 for results with different cutoffs.

[21] Because our dependent variable is country borders, we construct five regions across Africa based on latitude and longitude—rather than using conventional regions based on existing country borders.

PCS.[22]

We summarize the regression estimates with a coefficient plot in Figure 6. The top part validates our third hypothesis. Across different measures of rivers and lakes, areas with major water bodies are more likely to have a nearby country border. The coefficient estimates are particularly large in magnitude for the longest rivers and largest lakes. The presence of a top 10 river in a cell increases the predicted probability that a border will exist in that cell from 13.8% to 32.7%, a 135% increase. For top 10 lakes, the probability increases from 14.3% to 38.2%, a 167% increase. Desert areas are less likely to have a country border, which reflects the typically large size of colonies in thinly populated areas (see also Green 2012).

The bottom part of Figure 6 supports our first and second hypotheses. First, cells containing PCS borders are more likely to contain country borders. Second, cells in a PCS are less likely to contain country borders. With other variables held at their means, the presence of a PCS border in the cell raises the predicted probability that a country border will exist in that cell from 14.2% to 22.7%, a 60% increase. For cells inside PCS, the predicted probability decreases from 15.8% to 8.5%, a 46% decline.

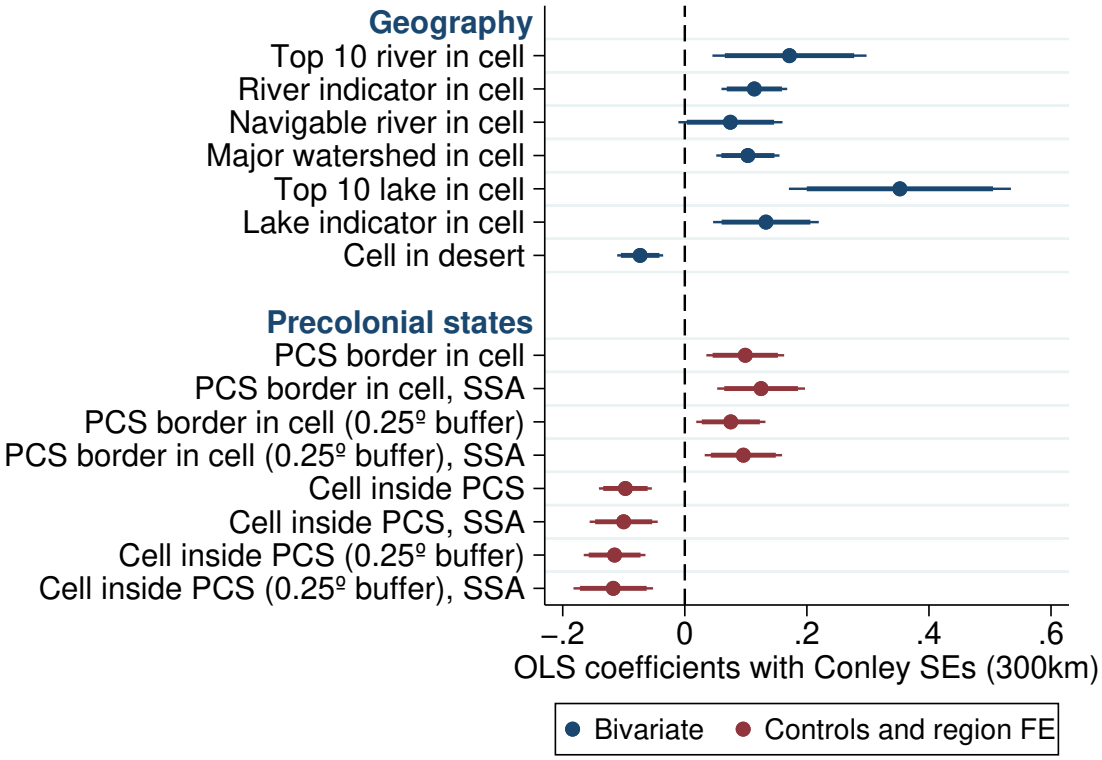
Figure 6 also presents various robustness checks for the PCS variables. We restrict the sample to Sub-Saharan Africa (SSA, cells south of 18°N) and/or create a 0.25° buffer on each side of PCS borders. The findings are qualitatively unchanged and the coefficients increase in magnitude for the SSA sub-sample, which excludes large Saharan areas of minimal European interest. In Appendix A.3, we report additional robustness checks using probit models and with standard errors clustered by country or by ethnic group.

4.4 Ethnic Groups as the Unit of Analysis

Using square grid cells to assess correlates of border location differs from the state of the art in the literature, in particular the pioneering approach of Michalopoulos and Papaioannou (2016) to

[22]Despite this confounding concern, the results are qualitatively similar in regressions that include the PCS indicator but not the battery of covariates (Appendix Figure A.2).

Figure 6: Correlates of African Borders



Notes: The figure summarizes coefficient estimates and confidence intervals for the main explanatory variables. See Tables A.2 and A.3 for the full regression results. We estimate each model using OLS and present confidence intervals at the 95% and 90% levels based on Conley standard errors (Conley 1999; Hsiang 2010), which account for spatial correlation. All models use 0.5ºx0.5º grid cells as the unit of analysis ($n = 10,341$ for the full sample and $n = 7,135$ for the SSA sub-sample). The outcome is 1 in the presence of a border in that grid cell and 0 otherwise.

Every geography model in the top part is bivariate. Every model in the lower part controls for geography (every variable in the top part), latitude, longitude, logged area of the ethnic group in cell, distance to the coast, historical natural resources in cell, logged area-adjusted slave exports of the ethnic group in cell, suitability for European settlement, agricultural intensity of the ethnic group in cell, population density in 1850, ecological diversity, TseTse fly suitability, and region fixed effects (FE).

use the map from Murdock (1959, 1967) to assess correlates of ethnic partition. Our approach is more general by remaining agnostic about the correct unit of analysis. In Appendix A.4, we run additional results to assess ethnic partition specifically, and also discuss the limitations of this approach.

The findings for water bodies are largely the same as in our main analysis, although the results for precolonial states are null. We contend that these null findings arise mainly because of mea-

surement error in Murdock's polygons and his assignment of jurisdictional hierarchy scores, as well as the conceptual mismatch between precolonial states and ethnic groups (Appendix A.4 provides details).[23] These concerns further substantiate the value-added of our new data collection and approach to statistical analysis.

5 Qualitative Evidence for Bilateral Borders

The regression evidence demonstrates that precolonial states and water bodies systematically correlate with border location. In this section, we analyze qualitative evidence for all 107 bilateral borders in Africa to achieve two goals. First, our theory contains several implications about mechanisms that cannot be tested with correlational evidence alone. For the *process* of border formation, we expect (a) precolonial states and water bodies were of intense strategic interest, (b) Europeans actively collected information about conditions on the ground, and (c) African agency affected the process. Second, our theoretical expectations are incompatible with existing assertions that the overwhelming majority of Africa's borders consist of straight lines. Consequently, we present new evidence about the *physical features* of African borders. Combined with the data on major border revisions, described earlier, these originally coded data for each bilateral border substantially revise our understanding of Africa's borders. Appendix C provides over 100 pages of coding notes to justify our decisions.

5.1 Precolonial States and Historical Political Frontiers

The present consensus is that existing political realities played little to no role in the partition of Africa. By contrast, we find that a historical political frontier directly affected *half of all bilateral borders*, fifty-four of 107. Of the fifty-four, thirty-nine involved at least one PCS in our quantitative dataset. These findings are based on "causal process observations" that assess, for each

[23] To further this point, and as a placebo test of sorts, Appendix Table A.3 shows that "ethnic homeland boundaries" do not correlate with colonial borders. We do not rule out that a better map of "ethnic boundaries" than Murdock's might correlate with country borders because Europeans sometimes referenced ethnic groups in diplomatic correspondence and treaties. However, it is hard to argue given the historical evidence that "ethnic boundaries" constituted regular focal points or zones.

bilateral border, whether a historical political frontier directly affected the location of the border. For African precolonial states specifically, coding a direct effect requires us to find evidence that European powers deliberated among themselves or with African rulers about the boundaries of the historical state. In practice, this usually meant that a border treaty specifically mentioned an African polity and that Europeans directly interacted with Africans to learn information about the border. This is a stringent standard. It was not sufficient to find that Europeans had gained a treaty with a ruler and that the border is located close to that polity; instead, we required direct evidence that Europeans explicitly considered the frontiers of the polity when setting the border. For cases with more suggestive evidence that a precolonial state influenced the border (or did so for a preliminary border), we coded a separate distinction of indirect effect. We apply the same standard to other types of historical political frontiers, which include diverse entities such as white settlements in southern Africa, Ottoman Empire territories in North Africa, and Liberia.

In Appendix Table A.5, we list and provide a brief summary of all twenty-two precolonial states that we coded as directly affecting at least one bilateral border. In eight cases, Europeans used the frontiers of precolonial states to draw borders and did not dispute those frontiers. These were usually predicated upon a treaty between European agents and a local ruler. For example, the treaty that established the Guinea–Guinea-Bissau border stated, "Art. II.—His Majesty the King of Portugal and Algarves recognizes the French Protectorate over the territories of Fouta-Djallon ..." Thus, "[t]he Bayol treaty, even though it did not accurately describe the relationship between Futa Jallon and France, nevertheless became a foundation for French claims vis-à-vis the Portuguese when the two European powers negotiated their African claims in the Portuguese-French convention of May 12, 1886" (Carpenter 2012, 117).

In an additional fourteen cases, Europeans engaged in lengthy disputes about the limits of historical states; when one European power used African-signed treaties or other means of effective occupation to make territorial claims, another power challenged their claims. For example, Britain and France contested the limits of the Sokoto Caliphate when determining what became the border

between Nigeria and Niger, leading to several major revisions shown in Panel A of Figure 7. Amid their northward expansion from the Niger Delta, British agents from the National African Company (later, Royal Niger Company), gained a treaty with the Caliph of Sokoto in 1885 (Hertslet 1909, 122–23). France accepted British suzerainty over Sokoto in an 1889 treaty, which stated that Britain would gain all the territory "that fairly belongs to the Kingdom of Sokoto" (quoted in Hertslet 1909, 739). At the time, neither power had an effective presence in the area;[24] consequently, they drew the border as a straight line that connected points on the Niger river and Lake Chad. But as the powers collected more intelligence about conditions on the ground, France sought to revise a line which they claimed granted Britain control over territories that lay north of Sokoto's historical frontiers. This contention had historical basis. Throughout the nineteenth century, flag bearers from the Caliphate conquered traditional Hausa states and converted them into Fulani-ruled emirates. Some Hausa dynasties fled, as with the traditional ruling family of Katsina who moved north to Maradi (shown in our figure), and fought wars to preserve their independence.[25] Other states, such as Damagaram centered at Zinder, formed later in the nineteenth century and were independent of Sokoto.

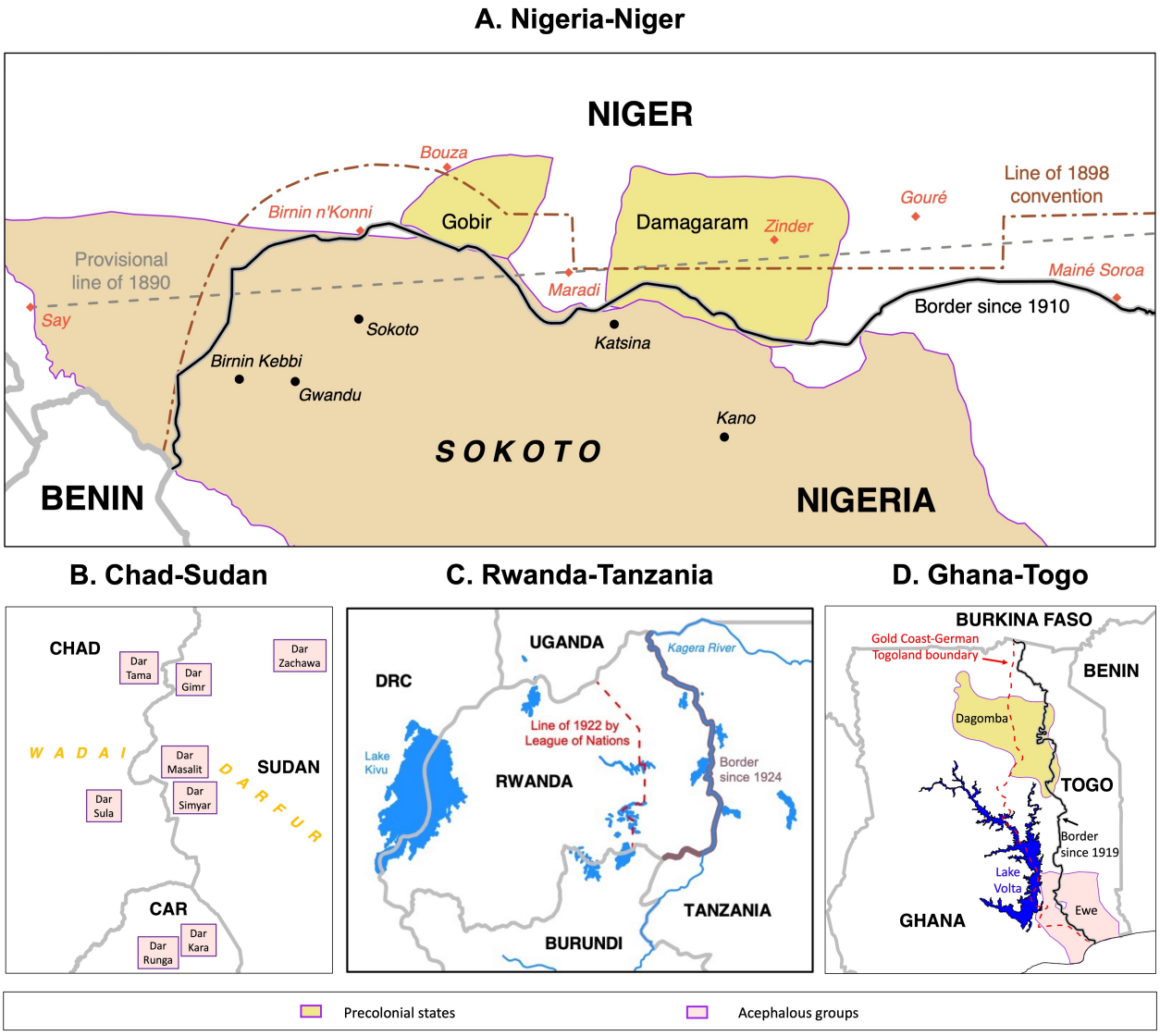
Britain and France established the broad contours of the present-day Nigeria–Niger border in 1904, following another ill-informed border drawn in 1898. The new border replaced arbitrary lines with a delimitation based precisely on the location of different towns and existing roads used to connect them. The 1904 treaty explicitly stated, "In order to avoid the inconvenience to either party which might result from the adoption of a line deviating from recognized and well-established frontiers, it is agreed that in those portions of the projected line where the frontier is not determined by the trade routes, regard shall be had to the present political divisions of the territories so that the tribes belonging to the territories of Tessaoua-Maradi and Zinder shall, as far as possible, be left to France" (quoted in Hertslet 1909, 819); and one component of the border description was "a direct

[24] Britain did not conquer Sokoto until 1903.

[25] Sokoto flag bearers conquered the original capital of Katsina, located farther south, which it repurposed as the capital of the Katsina emirate.

line to a point 15 kilometres south of Maradi . . . ” (p. 818).[26]

Figure 7: Borders Shaped by Precolonial States



African influence was even more direct in other cases. Farther east, Britain and France disputed the limits of the historical states of Darfur and Wadai, which were mentioned in an 1889 treaty to distinguish their respective spheres of influence. In this case, the Sultan of Darfur retained his army and fought the French for expansive limits to his frontier. The powers finally settled the Chad–Sudan border in the post-war settlement in 1919 by dividing several petty sultanates in

[26]See Appendix C.2.6 for more details.

dispute (Figure 7, Panel B).[27]

After World War I, Germany lost its colonies. In three colonies, reallocating this territory created an opportunity for African rulers to pressure European powers to revise a border that partitioned their territory. German East Africa was divided into two Mandate territories: Belgian Ruanda-Urundi and British Tanganyika. The original division between the new Belgian and British spheres proposed to separate a region (Gisaka) that had historically belonged to Rwanda to create a British Cape-to-Cairo railroad. In response, in 1922, "an alliance between Musinga [the Rwandan ruler], the Belgians and the Catholic Church (especially Cardinal Classe) defended the re-annexation of Gisaka to Rwanda" (Mathys 2014, 155). They "emphasize[d] the social, political, and economic harm caused by the imposition of this arbitrary division and they urge[d] the eastward extension of the boundary to the 'natural frontier' of the Kagera River" (McEwen 1971, 154–55). When the League of Nations' Permanent Mandates Commission reviewed the claims, they highlighted that the agreement separated "one of the richest and most civilised tracts of the Kingdom of Ruanda" and decried the "'deplorable moral effect' that the present arrangement had on the local population and their strong protests." In response to this pressure, British and Belgian officials agreed to alter the boundary to follow the Kagera River (Figure 7, Panel C).[28] In Dagomba, a petition by the Ya Na stimulated Britain to include its historical frontiers within the newly acquired British Togoland, which joined Ghana at independence (Figure 7, Panel D).[29] Similarly, in Borno, wartime assistance from the Shehu encouraged Britain to include its historical frontiers within the newly acquired Northern Cameroons, which joined Nigeria at independence.[30]

The most dramatic example of African agency affecting borders and revising an earlier partition was Ethiopia. This was the sole case of an African precolonial state that retained its independence for (almost) the entire colonial period. Originally allocated to the Italian sphere of influence, the Ethiopian army defeated Italy on the battlefield in 1896 and secured guarantees of its indepen-

[27] See Appendix C.3.13.
[28] See Appendix C.4.16.
[29] See Appendix C.2.7.
[30] See Appendix C.3.6.

dence from other European powers. Earlier, in 1891, the Ethiopian emperor Menelik II made expansive claims about his territory, which Europeans ignored. However, after 1896, they took these claims seriously and Menelik ended up gaining substantial amounts of disputed territory in bilateral treaties with Italy, Britain, and France.[31] However, as we have shown, certain aspects of this seemingly exceptional case were in fact common: Europeans collected intelligence amid debates about the frontiers of a traditional state and Africans participated in the process. Nor was Ethiopia the only case in which Europeans directly negotiated with an African ruler over colonial borders. This also occurred with rulers in Buganda (Appendixes C.4.6 and C.4.13), Lesotho (Appendix C.6.1), and Swaziland (Appendix C.6.2).

5.2 Physical Features of Borders: Water Bodies and Straight Lines

Summary of all borders. We coded the physical features of every bilateral border. The categories are rivers, lakes, watersheds, mountains (and other topographical features), infrastructure (usually roads), villages/towns/cities, and straight lines (either latitude/longitude or non-astronomical). Historical political frontiers are a distinct category from physical features per se. For example, a river could comprise the frontier of a historical state and also be used as a colonial border. In this case, and the river is the physical element of the border even if the precolonial state directly affected the border (as determined using the standards described above). Our main general sources are Hertslet (1909) and Brownlie (1979). The first, published by the British War Office, contains text (usually translated into English) for every inter-European treaty through 1906 as well as every intra-British arrangement. Brownlie (1979) supplements this source by updating the temporal coverage. We also consulted over 100 additional sources, cited in Appendix C, that provide more detailed histories of specific regions, countries, and historical states.

For each bilateral border, we identify one or two features that are the primary feature in the sense of constituting the plurality (and usually the majority) of the length of the border. In some cases,

[31] See Appendix C.5.4 and the other Ethiopian border entries.

this is obvious. For example, the Zambia–Zimbabwe border consists entirely of the Zambezi River. In Botswana–Namibia, there are two primary features, but they are also unambiguous: meridian lines comprise their entire east-west border, the Zambezi River determines the entire north-south border, and both segments of the border are roughly equal in length. In other cases, there is no obvious primary feature(s), and we code this variable based on the length of the different features, the frequency with which treaty documents mention them, and historical context (putting more weight on features that were discussed by European statesmen as more important). Secondary features comprise smaller segments of a border. Appendix Table A.7 summarizes the frequency of each feature.

In 57% of Africa's bilateral borders, water bodies (rivers and lakes) or their watersheds comprise the primary feature. Very few borders include no river, lake, or watershed as any part of the border: only 15% overall, and only 4% outside of desert areas. Major water bodies are an important component of these figures. Major water bodies are the primary feature of 24% of all borders and a secondary feature of an additional 19%. As shown in Appendix Table A.6, all but three of the ten longest rivers or ten largest lakes are the primary feature of at least one border, and all but one are, at minimum, a secondary feature. Nor are borders comprised primarily of water bodies equivalent to borders in which a historical political frontier directly affected a border. Among primarily water-body borders, historical political frontiers directly affected only half (48%).

Straight lines are the primary element of 34% of bilateral borders, with a total of 14% for latitude/longitude lines and 20% for non-astronomical straight lines. Although these figures may appear high, for each type of straight line, our estimates are appreciably smaller than commonly cited statistics that patently overstate the degree to which straight lines were used in African borders. Barbour (1961, 305) asserts that 44% of African borders are astronomical (i.e., meridian) lines, 30% are mathematical (i.e., non-meridian) lines, and 26% are relief features.[32] Barbour bases

[32]For references to Barbour's estimates, see Herbst (2000, 75); Englebert (2002, 88); Abraham (2007). See also Alesina, Easterly and Matuszeski's (2011, 246) assertion, "[e]ighty percent of African borders follow latitudinal and longitudinal lines."

his calculations on information from Hertslet (1909), and therefore ignores the many major border revisions that happened subsequently (see Figure 2 and Appendix Table A.1). He also includes only tropical Africa and explicitly qualifies his calculations as "very approximate." We therefore contend that our summary statistics, based on rigorous definitions and extensive supporting information, offer a more accurate accounting of the features of Africa's bilateral borders.[33]

Straight lines not only comprise the primary feature of a much lower fraction of bilateral borders than commonly claimed, but the location of such borders is highly correlated with desert areas. Desert territories have low population density, fewer local features to use in the borders, and were of lesser strategic interest to Europeans. For each bilateral border, we assessed whether it is primarily located in a desert or semidesert (see Appendix C for details). Among the twenty-seven desert borders, straight lines are the primary feature of 74%, compared to only 20% for the eighty borders not primarily located in deserts.[34] The discrepancies are also stark when restricting attention to borders composed primarily of latitude/longitude straight lines: 44% in desert areas versus 8% not. Figure 8 illustrates these patterns.[35]

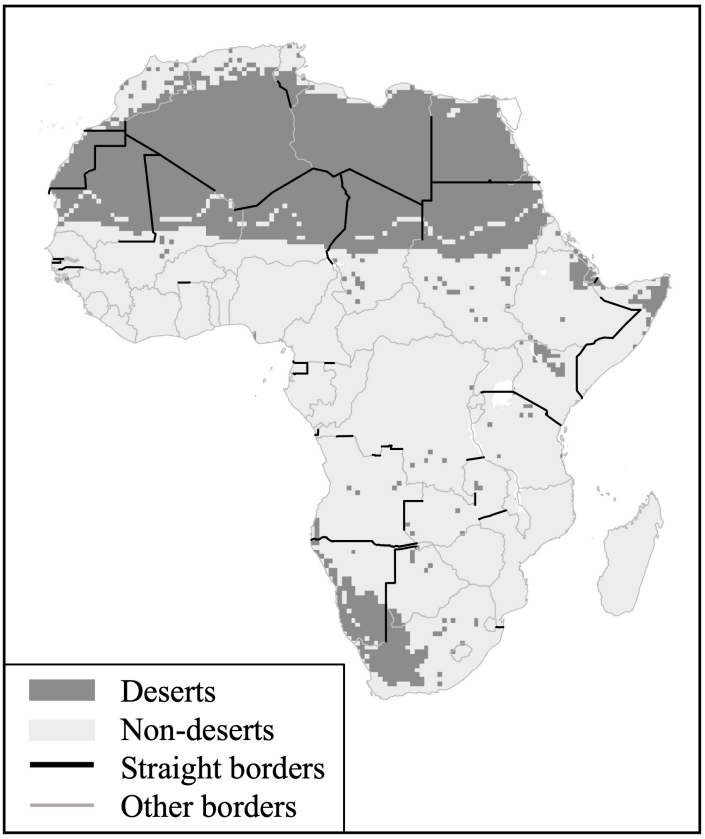
An important difference between latitude/longitude and non-astronomical straight-line borders is that the latter are usually specified in relation to local features. Outside of desert areas, every bilateral border for which the primary feature is non-astronomical straight lines incorporated at least one local feature. These include minor rivers, towns, and roads as secondary elements. Thus, even many straight-line segments of borders cannot be treated as entirely arbitrary in their precise location.

[33] A minor difference is the unit of analysis: bilateral borders for us as opposed to the total length of border lines in Barbour (1961). We would expect his calculations to be higher because of the straight lines used to distinguish large states in the Sahara. However, even when accounting for this difference, his figures appear to be a substantial overestimate.

[34] The figures are similar when expanding the definition of low population density borders to encompass steppe areas: 69% of the thirty-seven desert/steppe borders are primarily straight lines, compared to 15% of the seventy borders located in other vegetation areas.

[35] In Appendix A.4, we demonstrate similar results when using ethnic groups as the unit of analysis.

Figure 8: Deserts and Straight-Line Borders



Interpreting water-body borders. Our findings for water bodies clearly defy a strong version of the arbitrary borders thesis. If Europeans systematically incorporated local features, then the borders are not as-if random. However, our expectation also defies a weaker version of the arbitrary borders thesis. We argue that major water bodies were important objects of strategic interest in their own right, as opposed to purely technical markers for borders, and that borders following rivers or lakes are not orthogonal to human experiences on the ground.[36]

First, regarding strategic interests, competition over the Congo river spurred the Berlin Conference, as discussed earlier. When the British South Africa Company colonized Southern and Northern Rhodesia (Zimbabwe and Zambia), their instructions mentioned the Zambezi River to circumscribe

[36]Existing evidence also shows that water-body borders matter for outcomes. Goemans and Schultz (2017) demonstrate that such borders have been, since independence, significantly less likely to be associated with a territorial disputes.

their jurisdiction.[37] "None questioned the border status of this section of the river . . . it was a 'natural border' simply because it was a feature of the landscape . . . It was thus legitimized through its grounding in the supposed territorial limits of precolonial African states. Finally it was seen as the 'natural' limit' of white settlement, partly for its reputation for unhealthiness, and partly because of the pragmatic need to limit imperial ambitions somewhere" (McGregor 2009, 58–59). Farther west, Germany's push for access to the Zambezi resulted in the geographically absurd Caprivi Strip.[38]

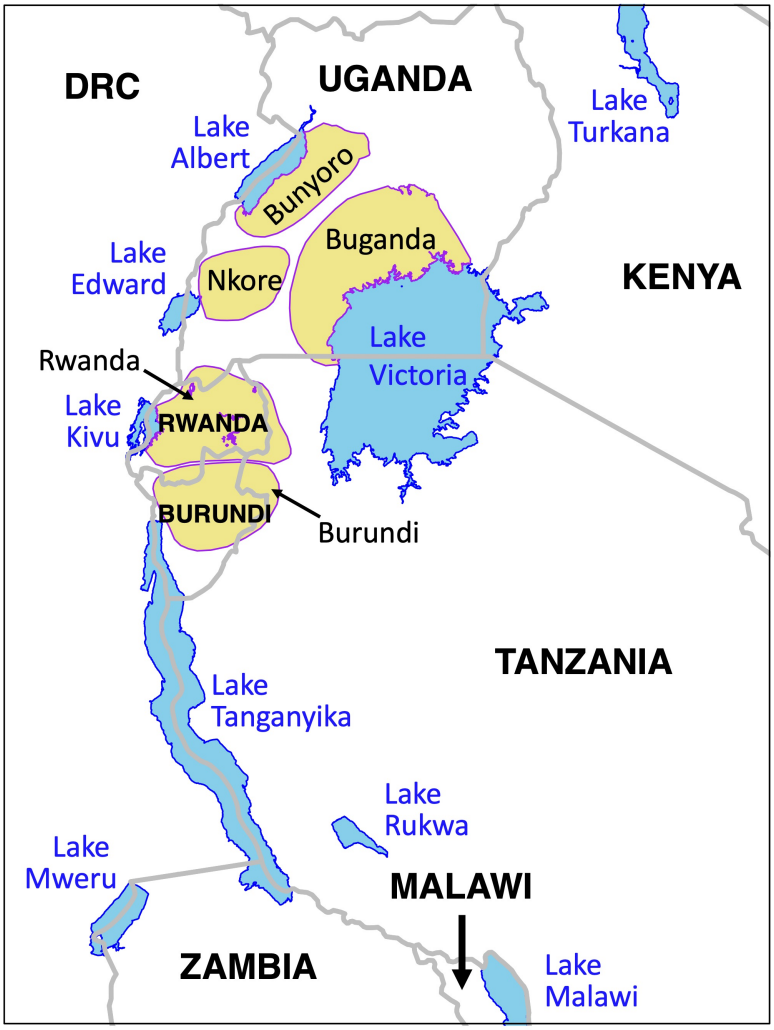
Among the major rivers, the two least important for borders are the Nile (only its watershed is a primary feature of any border) and the Niger (used only for the short intra-imperial Benin–Niger border). Yet these "null" cases in fact reflected a systematic process—British interests in controlling both rivers was strong enough that they were willing to risk war with France to uphold their exclusive claims. In the 1890s, Britain granted leases along the Nile river to the Congo Free State and supported Italy's early claims to Ethiopia mainly to create buffers against French encroachment on the Nile.[39] This competition famously ended with British and French military units meeting at Fashoda in 1898.[40] Earlier, in the 1880s and 1890s, France challenged Britain's supremacy on the Niger, which almost resulted in war amid the "Race for Nikki" in 1894.[41]

Later, as Europeans "discovered" inland lakes, they similarly sought access to facilitate trade. For example, Cecil Rhodes, moving northward from southern Africa, strove "to gain access to Lake Tanganyika, the great waterway to the north" (Roberts 1976, 157).[42] Britain also sought access to Lake Tanganyika from the north by extending their domains south of Uganda.[43] In 1894, they secured a treaty with King Leopold that granted to Britain a thin strip of territory between the Congo Free State and German East Africa that connected to the lake. However, Germany strongly

[37] See Appendix C.6.6.
[38] See Appendix C.6.16.
[39] See Appendices C.4.10 and C.5.6.
[40] See Appendix C.3.13.
[41] See Appendix C.2.1.
[42] See Appendix C.4.1.
[43] See Appendix C.4.10.

opposed this concession that would facilitate an "all-red route" from Cape to (eventually) Cairo, which resulted in Britain withdrawing this article of the treaty. Later in the 1890s, Germany began pressuring the Congo Free State to shift their mutual border eastward to incorporate Lake Kivu, the traditional limits of the Rwandan state.[44]

Figure 9: Borders in the Great Lakes Region



Second, choosing borders that follow rivers or lakes is not orthogonal to Africans' experiences on the ground, as we illustrate with the Great Lakes region (see Figure 9).[45] Economic transformation

[44] See Appendix C.4.8.

[45] Reid (2012, 2–3) makes a similar statement about major rivers: "several riparian systems have shaped Africa's history in the most fundamental of ways: The Niger, Benue, Senegal, Congo, Nile and Zambezi rivers are central to the histories of the regions through which they slice."

through farming and agriculture in the region's fertile forests began centuries ago because of favorable altitudes, adequate rainfall, and water bodies (Curtin et al. 1995, 107, 132). "Lake Victoria was criss-crossed by a network of trade ties" (370), and the most important nod in the network was arguably the Kingdom of Buganda. Reid (2002, 227) discusses "the enormous significance of Buganda's lakeside location," including the invention of sophisticated canoes in the nineteenth century to foster trade and, with it, economic and political development. As Figure 9 shows, every major historical state in the region clustered around a Great Lake. The consequent colonial borders (albeit after numerous revisions) reflected the geography and the political economy of the region. In some cases, water-body borders also incorporated the frontiers of precolonial states, whereas elsewhere (Lakes Tanganyika, Malawi, and Mweru) they were used independently of precolonial states. Rivers and lakes also shaped the precolonial development of peoples with decentralized institutions, including where they settled and the trade patterns among them. Population settlements in western Equatorial Africa, for example, corresponded neatly with rivers and vegetation zones in the precolonial period (Curtin et al. 1995, 217).

The ways in which water bodies affected human and political development in the long-run are complex and variegated. In the Great Lakes region, water-body borders typically united historical states, whereas in other regions they divided groups with cultural similarities. But in either case, important water bodies are not orthogonal to social realities on the ground. In East Africa, creating new, large colonial states was undoubtedly artificial relative to precolonial precedents. However, given this set of states, the borders themselves are anything but as-if random.

6 Conclusion

According to conventional wisdom, European statesmen drew African borders in ignorance of local conditions, exemplified by the Berlin Conference of 1884–85. This resulted in arbitrarily located borders. We overturn this convention. Most African borders were not in fact settled for decades after the Berlin Conference, during which time Europeans gathered extensive information about conditions on the ground. We provide an alternative theory to explain why European

statesmen used the boundaries of precolonial states and major water bodies as focal points to determine borders. Statistically, we use grid cells to show that these local features correlate with the location of borders, including results based on an original spatial dataset of precolonial states. Qualitatively, we demonstrate that historical political frontiers directly affected half of all bilateral borders. In many cases, Europeans learned about and intensively debated the limits of precolonial states, among themselves and also with African rulers, and frequently revised initial borders to reflect local realities. Water bodies, often major ones, comprised the primary border feature much more frequently than straight lines, which are mostly confined to desert areas.

The idea that Africa's international borders are unusually arbitrary is foundational. As Boilley (2019, 5) puts it, "The cliché of Berlin has endured, in spite of efforts of historians to destroy it." Our article provides a coherent alternative theory of border formation in Africa with strong empirical backing. We therefore contribute a new understanding of how modern-day countries were created in Africa and of the resultant political map. This map and borders have subsequently influenced domestic and international political institutions. Here we discuss three broader implications of our findings.

First, we raise important questions about the growing research agenda that exploits as-if randomness in African borders for regression discontinuities and related research designs (McCauley and Posner 2015 provide a recent review of this literature). We heed Kocher and Monteiro's (2016, 952) call that "qualitative historical knowledge is essential for validating natural experiments." Dunning (2012) discusses the relevance of what policymakers knew when choosing a certain policy. The more they knew, the less credible are claims of as-if randomness. We do not question the findings of any particular study here. Some authors carefully motivate a natural experimental or regression discontinuity research design by demonstrating that relevant covariates are continuously distributed across the border. However, we suggest caution for the general characterization that African borders are as-if random. Future quantitative research on borders should treat detailed qualitative historical knowledge as central to their inquiry, rather than as appendix material

for the validation (or rejection) of a purported natural experiment. For example, our border-by-border historical analysis shows why using the post-independence borders as natural experiments is problematic: over half of all African bilateral borders experienced a major revision in the twentieth century, when European knowledge of the continent was far greater than during the 1884–85 Berlin Conference. By describing the history and features of every bilateral border in Appendix C, we aim to facilitate and improve this important research agenda.

Second, many scholars examine how precolonial states affected the directness of colonial rule (Gerring et al. 2011; Letsa and Wilfahrt 2020; Müller-Crepon 2020). Colonialism is a key intervening period in related studies of the long-term consequences of precolonial states for outcomes such as economic development (Michalopoulos and Papaioannou 2013; Dasgupta and Johnson-Kanu 2021), civil war (Wig 2016; Paine 2019), and democracy (Baldwin 2016; Neupert-Wentz, Kromrey and Bayer 2022). By showing that colonial borders largely preserved, rather than dismembered, precolonial states, we can better account for their persistence as important elements of colonial governance (indirect rule) and for affecting post-colonial outcomes. Furthermore, our new georeferenced dataset of African precolonial states should be a useful resource for scholars.

Third, our findings force us to rethink exactly what is exceptional about African states and borders. The specific features of African borders are not distinct in a cross-regional perspective. Historical political frontiers were a key determinant of borders in Europe (Lefèbvre 2015; Goemans 2006; Abramson and Carter 2016, 158) and elsewhere (Carter and Goemans 2011). Rivers routinely determined borders between European states (Kitamura and Lagerlöf 2020) and between states in the United States. Low population densities are the common denominator between straight-line borders in the Sahara and in many states/provinces in the western parts of the United States and Canada.

Instead, the exceptional aspect of African states and borders is the paramount role of external influence in the broader process of forming states. We suggest that the overwhelming focus in the literature on borders, specifically, misunderstands why the broader process of externally imposed

state formation was harmful. We revisit the distinction between "dismemberment," or partitioning groups across international boundaries, and "suffocation," or forcing disparate groups that lack a shared history into the same country (Englebert, Tarango and Carter 2002; see also Christensen and Laitin 2019, Ch. 9).

Colonial borders frequently dismembered ethnic and cultural groups across international boundaries (Asiwaju 1985; Miles 2014). Borders clearly created deleterious human consequences in these cases, even if they incorporated natural features. Our contribution with regard to dismemberment is to demonstrate that which groups were partitioned followed a systematic process, contrary to existing assertions. Areas with precolonial states were rarely dismembered because incorporating their territorial limits created an agreed-upon method for self-interested Europeans to allocate territory. Furthermore, frequent migration and intermingling among peoples of different ethnicities, cultures, and languages ensured that *any* regional system that enshrined fixed territorial borders would divide groups with fractured polities or decentralized institutions.

Suffocation was another inevitable consequence of colonial state formation, yet receives too little attention relative to dismemberment. Precolonial states were too small in number and in size to form the basis of most colonial states across the continent. European administrators focused on creating economies of scale and sometimes used wealthier parts of their territories to subsidize poorer and sparsely populated areas (Gardner 2012; Green 2012). These goals induced Europeans to merge disparate peoples who lacked a shared political history into states that were artificially large relative to historical precedents. This created difficulties for post-independence rulers to broadcast power throughout their national territory (Herbst 2000). Furthermore, combining precolonial states into larger countries with stateless groups against whom they had previously fought wars and raided for slaves created conditions for post-colonial conflict (Paine 2019).

The conventional wisdom on Africa's bad borders suggests the following counterfactual: Taking as given the general contours of the European colonial occupation and externally created states, certain negative outcomes would have been less likely if Europeans had been more conscientious

when determining the location of borders. Our evidence suggests strongly that this counterfactual is wrong. Imposing *any* set of fixed borders would have suffocated precolonial states within larger colonial states (at least without creating hundreds of states) and dismembered fractured groups across borders. Therefore, although colonial *states* in Africa were largely artificial with respect to historical antecedents and geographic considerations, the *borders* between these states were not. Africa's borders reflect a negotiated and systematic process that scholars and popular accounts have largely overlooked and misunderstood.

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