Segmentary Lineage Organization and Conflict in Sub-Saharan Africa

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26 May 2020

Abstract: We test the long-standing hypothesis that ethnic groups organized around 'segmentary lineages' are more prone to conflict. Ethnographic accounts suggest that in such societies, which are characterized by strong allegiances to distant relatives, individuals are obligated to come to the aid of fellow lineage members when they become involved in conflicts. As a consequence, small disagreements often escalate into larger-scale conflicts involving many individuals. We test for a link between segmentary lineage organization and conflict across ethnic groups in sub-Saharan Africa. Using a number of estimation strategies, including an RD design at ethnic boundaries, we find that segmentary lineage societies experience more conflicts and particularly ones that are retaliatory, long in duration, and large in scale.

Key words: Conflict, Civil Conflict, Social Structure, Segmentary Lineage, Kinship
JEL classification: D74, O55, Z1.

*For helpful feedback and comments, the authors thank Jean Ensminger, James Fenske, Francisco Gallego, Joseph Henrich, Saumitra Jha, Sara Lowes, Beatriz Magaloni, Stelios Michalopoulos, Jake Shapiro, Dean Yang, Pierre Louis-Vezina, Scott Walker, and Max Winkler, as well as seminar participants at U.C. Berkeley, University of British Columbia, University of Connecticut, Brown, Chicago Harris, University of Minnesota, M.I.T, U.C. Irvine, Princeton, Simon Fraser, Stanford, and various conferences. We thank Mohammad Ahmad, Aditi Chitkara, Ariel Gomez, Sherif Mabrouk, Matthew Summers, Adam Xu, and Juan Camilo Yamin for excellent research assistance.

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1. Introduction

Conflicts are a common feature of the modern world. In 2018 alone, an estimated 53,081 people died fighting in civil conflicts and 13.6 million civilians were newly displaced, resulting in a total stock of 70.8 million people displaced due to conflict and violence.[1]

In this study, we test a long-standing hypothesis from anthropology about the relationship between conflict and the kinship structure of a society, namely whether an ethnic group is organized into segmentary lineages. Although in Western cultures, the central kinship unit is the nuclear family, in most of the world, people live within much more complex social structures and are connected by extended kin networks. One such structure is segmentary lineage organization, which is the focus of our analysis. The first defining characteristic of this form is unilineal descent, where people trace their ancestry either through the male line (patrilineal) or female line (matrilineal), but not both. Ancestry is often traced back to a common, often mythical founder, after whom the tribe or society is named. The second feature is the presence of sub-sets or segments of a full lineage, which function as autonomous groups that are important for organizing a range of political, judicial, and administrative functions (Fortes, 1953, Smith, 1956, pp. 39–40).

Figure 1 displays a hypothetical patrilineal segmentary lineage system. In the figure, triangles represent men, and the straight lines indicate descent; each row of triangles represents a generation. All individuals in the figure descend from a common ancestor indicated by "I." Also shown in the figure are various segments of the full lineage. The segments are of different sizes: The smallest is the "Minimal Segment," the next larger is the "Minor Segment," and the largest is the "Major Segment."[2]

A number of scholars in the anthropological literature have hypothesized that in segmentary lineage societies, conflicts, particularly ones that are long in duration and large in scale, are more likely to arise. This is not because segmentary lineage groups harbor particular grievances, but because their social structure facilitates the mobilization of combatants when a dispute or conflict occurs. To see why this is the case, consider Figure 1. An important aspect of segmentary lineage societies is that lineages and segments, and one's responsibility to them, are of the utmost importance. In the figure, if individual "i" were to have a dispute with individual "ix" within a

[1] These figures are from the UCDP Battle-Related Deaths Dataset and the UNHCR Statistical Yearbook, 2018.

[2] For a non-hypothetical figure drawn to represent the Somali Clan, see Figure B2 in the Webpage Appendix.

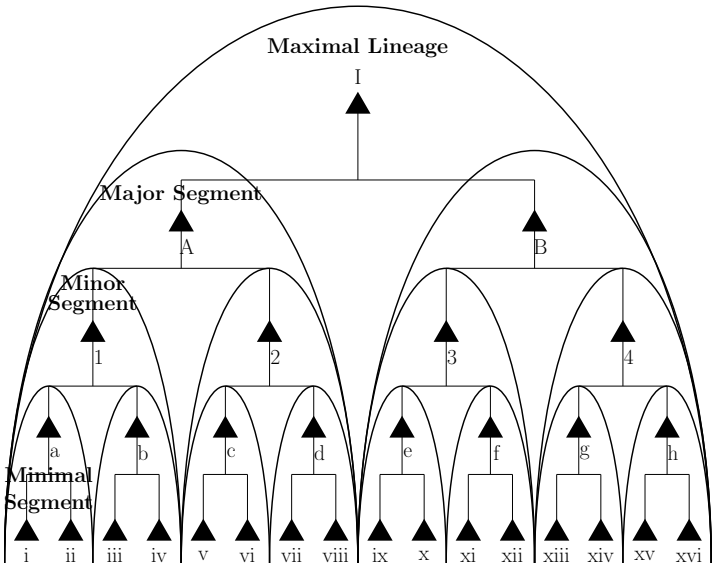


Figure 1: The figure provides a representation of a hypothetical segmentary lineage society.

segmentary lineage system, this would mean that all individuals belonging to "Major Segment A" would be allied with and come to the defense of individual "i." Similarly, all individuals in "Major Segment B" would be allied with and come to the defense of individual "ix." Thus, a dispute between two individuals escalates into a dispute between two large communities. Outside of segmentary lineage systems, where these allegiances are absent, the dispute might comprise, at most, a small number of friends or immediate family members of the two involved in the dispute.

In general, the number of individuals involved in a conflict will depend on the genealogical distance of those involved in the dispute. Because of one's membership in a set of nested segments and the strong obligations within these segments, in segmentary lineage societies small-scale disputes can easily escalate into larger-scale, sustained fighting, or even full-blown warfare. In the modern context, and particularly in Africa, the region of our study, conflict often takes the form of civil conflict, where the enemy is the government. Even in this context, the same characteristics of segmentary lineage societies remain relevant. The structure allows segments to effectively mobilize against the common enemy, which in the setting of civil conflicts is the government.

This characteristic of segmentary lineage systems has been thoroughly studied by anthropologists. Marshall Sahlins (1961, pp. 323, 333) argues that "segmentary lineage organization is a successful predatory organization in conflicts with other tribes. . . [Conflict], even if it has been initiated by a small lineage segment, pits 'all of us' against 'them'." Along similar lines, Evans-Pritchard (1940a, p. 142) describes the organization of the Nuer, a segmentary lineage group:

"Each segment is itself segmented and there is opposition between its parts. The members of any segment unite for war against adjacent segments of the same order and unite with these adjacent segments against larger sections." The logic is also illustrated by a traditional Bedouin proverb that is roughly translated as: "I against my brothers; my brothers and I against my cousins; my cousins, my brothers, and I against the world." (e.g., Barth, 1973, p. 13; Combs-Schilling, 1985, p. 660).

In this study, we take this long-standing hypothesis to the data and test for a relationship between the presence of segmentary lineage organization and contemporary conflict. There are a number of benefits to moving beyond the existing case-study evidence. First, it is unclear whether the cases that have been examined in the anthropological literature are representative. Our empirical strategy has the advantage of being able to estimate an average effect across the ethnicities in our sample. Second, the ethnographic studies are primarily from before the 1970s, and so it is possible that the strength of segmentary lineage organization, and the obligations that go with it, have weakened in recent decades. Although there are examples of segmentary lineages being important for recruitment in modern conflicts (e.g., Stearns, 2013), our findings provide systematic evidence for this. Third, our analysis also makes progress on the mechanisms that underlie the relationship between segmentary lineage organization and conflict. The ethnographic literature has focused on retaliation and escalation as central mechanisms. Our analysis tests for these channels.

Information on the presence of segmentary lineage systems is not available from existing ethnographic databases such as the *Ethnographic Atlas* or the *Standard Cross-Cultural Sample*. Therefore, we collect data using published ethnographies, the primary source being the *Ethnographic Survey of Africa*, which is a series of studies edited by Daryll Forde and published between the 1940s and 1970s. Using the definition from Middleton and Tait (1958), we code an ethnic group as having a segmentary lineage organization if: (1) there is a recognized and known unilineal descent system; (2) segments of the lineage take a 'corporate form', meaning that they are sub-units that affect administrative functions and political positions; and (3) lineages and genealogical relationships influence one's location of residence. If any of the three characteristics are known to not be present, the group is coded as not having a segmentary lineage organization. If information about any of the three characteristics is missing, then the ethnic group is coded as missing and not included in the analysis.

We restrict our analysis to ethnic groups from Africa, both because the ethnographic data are most readily available, systematically documented, and comparable, and because the geo-coded micro-level conflict data that we use are only available for Africa. In the end, we are able to definitively categorize 145 African ethnic groups, 74 of which are segmentary lineage societies and 71 of which are not. This comprises an estimated 212 million people or approximately 38% of the population of sub-Saharan Africa during the sample period.

The conflict data are from the Armed Conflict Location and Event Data Project (ACLED), a geo-coded data set that catalogs information about each conflict event in Africa from 1997–2014. The database includes information on the location, date, and other characteristics of "politically violent events." By linking the geo-coded conflict data with a digitized map of the traditional locations of ethnic groups, we are able to calculate the frequency of conflicts that occur within the territory of each ethnic group.

Our empirical analysis comprises two estimation strategies. The first is to estimate the cross-ethnicity relationship between the traditional presence of a segmentary lineage organization and the intensity of conflict within the territory of the ethnic group from 1997–2014. We find a positive and robust relationship between the two: segmentary lineage groups experience more conflicts. This is true whether we measure conflict intensity using incidence, duration, or number of fatalities. We also find a positive relationship for conflicts of different types; namely, all conflicts, civil conflicts, conflicts that are not civil conflicts, and localized within-group conflicts. The magnitudes of the estimates are sizeable. Segmentary lineage groups experience approximately double the number of conflict incidents compared to groups without segmentary lineages.

The relationships are very similar when we control for an extensive set of covariates, including: country fixed effects, historical covariates (political centralization, historical development as measured by settlement complexity, and patrilineal descent), and a host of geographic covariates (agricultural suitability, altitude, distance from the equator, amount of land inhabited by the ethnic group, distance from the center of an ethnic group to the nearest country border, an indicator for the ethnic group being split by a national border, and historical malaria exposure as measured by the prevalence of the sickle cell trait).

Despite an extensive set of covariates, the conditional correlations might still suffer from the presence of omitted factors, including those that are unobservable to the researcher. Given this, we present a second set of estimates. We restrict attention to pairs of ethnic groups that share a

border and in which one group is a segmentary lineage society and the other is not. In our sample, there are 68 such pairs. We then take 10km-by-10km grid-cells to be the unit of observation and implement a regression discontinuity (RD) design, where we estimate the effect of segmentary lineage organization on conflict across grid-cells that are close to the border, while controlling for a two-dimensional running variable.

We first verify the accuracy of the mapped ethnic boundaries by using data from the third through sixth rounds of the *Afrobarometer* surveys, which report the location (latitude and longitude) and ethnicity of respondents. Confirming the validity of the ethnic boundaries, the RD estimates shows a sharp discontinuity in ethnic identity exactly at the boundaries. We find that the RD estimates of the effect of segmentary lineage organization on conflict are qualitatively identical to the OLS estimates. The relationships between segmentary lineage organization and our measures of conflict are all positive and highly significant. The findings are robust to different bandwidths and to different methods of controlling for the two-dimensional running variables.

The validity of the RD estimates rests on the requirement that omitted factors vary smoothly over space – for example, because physically close units have similar geography, climate, and history. The strategy is deficient if there are omitted factors that also vary discontinuously at the border. We test for the validity of this assumption by checking for differences in observable characteristics between societies with and without segmentary lineages. We find that the two groups are balanced on a wide variety of observable covariates. This finding is consistent with arguments suggesting that the emergence of segmentary lineage systems was an idiosyncratic process and, therefore, tended to be uncorrelated with environmental, social, or structural factors (Evans-Pritchard and Fortes, 1940, Smith, 1956, Salzman, 1978, Kelly, 1983). We also conduct a series of placebo tests where we examine pairs of adjacent ethnic groups that have the same segmentary lineage status but differ in other dimensions. Using the same RD estimator, we find no evidence that any of the other characteristics affect conflict.

The most-commonly cited reason for a link between segmentary lineage organization and conflict is that the segmented structure coupled with strong lineage allegiances causes initially-small disputes to escalate into larger-scale conflicts. We perform three tests for this mechanism. The first separately estimates the effect of segmentary lineage organization on conflicts that are retaliatory (i.e., in response to a previous conflict) and those that are not. We find that while segmentary lineage organization is associated with more conflict of both types, the association is significantly

larger for retaliatory conflicts. The second test that we undertake estimates the relationship between segmentary lineage organization and the frequency of conflicts of different sizes, as measured by the number of fatalities. We find that although segmentary lineage organization is associated with a greater incidence of conflicts of all types, the estimated relationship is systematically stronger, both in terms of magnitude and statistical significance, the larger the conflict. The final test examines the effect of segmentary lineage organization on the duration of existing conflicts and on the onset of new conflicts. We find that the effect of segmentary lineage organization on conflict duration is positive, large in magnitude, highly significant, and robust across specifications. By contrast, we find that the effect of segmentary lineage organization on conflict onset, although also positive, is much smaller in magnitude, often statistically insignificant, and not robust across specifications.

The findings from the three tests provide evidence for the channels discussed in the anthropological literature; namely, retaliation and escalation. We also test for a host of other mechanisms, which are not the focus of the literature but could affect conflict; namely, economic wellbeing, public goods provision, risk sharing, and exclusion from national political power. Looking at each, we find no evidence that they are the reasons for the relationship between segmentary lineage and conflict.

Our findings contribute to a better understanding of the incidence, intensity, and duration of conflict in developing countries (Blattman and Miguel, 2010), particularly those studies examining the historical roots of conflict (e.g., Besley and Reynal-Querol, 2014, Depetris-Chauvin, 2015, Michalopoulos and Papaioannou, 2016) or the importance of ethnic or social factors (Montalvo and Reynal-Querol, 2005, Esteban, Mayoral and Ray, 2012, Rohner, Thoenig and Zilibotti, 2013). Most closely related to the focus of our research is the recent analysis by Konig, Rohner, Thoenig and Zilibotti (2017), which shows the importance of cross-group network structures and alliances. Our findings complement this line of research by also showing the importance of within-group social structure for conflict.

Our findings also contribute to an established anthropological literature which, through case studies, has hypothesized and documented the effects that segmentary lineage structures have on conflict (e.g., Evans-Pritchard, 1940a,b, Bohannon, 1958, Kelly, 1985, Lewis, 1994, 1989, Salzman, 2007, Zeman, 2009, Stearns, 2013, Ahmed, 2013b, Hoehne, 2015). While the studies recognize that segmentary lineage organization can potentially affect all types of conflict, their focus tends

to be on the effects that segmentary lineages have on within-ethnicity conflict. Our estimates test for this directly by examining the effects of segmentary lineage on localized within-group conflicts, as well as extending this line of inquiry and asking whether the same mechanisms are also important for civil conflicts.

Our findings also add to a deeper understanding of the importance of social structure and kinship for economic development. They contribute to previous studies that document the effects of other dimensions of kinship such as whether inheritance is matrilineal or patrilineal (La Ferrara, 2007, Gneezy, Leonard and List, 2009, La Ferrara and Milazzo, 2011, Lowes, 2016); whether a society is matrilocal or patrilocal (Bau, 2016); and whether kinship features cross-cutting alliances, such as "cousinage" (Dunning and Harrison, 2010). Our analysis also furthers a line of research that studies the consequences of extended kinship ties and their importance for long-term economic development (Greif, 1994, Greif and Tabellini, 2010), democracy (Schulz, 2017), corruption (Akbari, Bahrami-Rad and Kimbrough, 2017), or the intersection of morality, psychology, and economic behavior (Enke, 2019). Our findings also contribute to an existing literature that studies the strength of family ties and their importance for a range of economic, social, and political outcomes (e.g., Dal Bo, Dal Bo and Snyder, 2009, Alesina and Giuliano, 2014, Naidu, Robinson and Young, 2015, Cruz, Labonne and Querubin, 2017, Querubín, 2016).

The paper proceeds as follows. In the next section, we review the existing anthropological explanations for why some societies are organized along the basis of segmentary lineages and others are not. We then discuss case study evidence which makes a causal link between segmentary lineage organization and conflict. Section 3 discusses the data and, in particular, the coding of segmentary lineage structure based on ethnographic sources. Section 4 presents our OLS estimates and section 5 presents our RD estimates. Section 6 investigates causal mechanisms, including retaliation and escalation channels that have been the focus of the anthropology literature. Section 7 discusses the relevance of our findings for ethnic groups outside of Africa. Section 8 concludes.

2. Background

A. *The Determinants of Segmentary Lineage Organization*

Why some societies are organized in segmentary lineages and others are not has been a long-standing question in anthropological research. Although several theories have been presented to explain the origin of segmentary organization, there is, as of yet, no agreed-upon explanation. One school of thought hypothesizes that the physical environment is an important determinant. It has been argued that if the environment is such that a group can survive without significant travel outside their tribal sub-group's territory, then associations outside of the group do not form, which tends to maintain a segmentary lineage system (Evans-Pritchard, 1969, Forde, 1953, 1970, Verdon, 1982). Another hypothesis, recently investigated by Enke (2019), is that the severity of the disease environment discourages interactions with outside groups and thereby strengthens kinship ties. While strong kinship ties are not the same as segmentary lineage organization, the two are related.

Motivated by the potential for such determinants, our analysis checks for balance between segmentary lineage and non-segmentary lineage groups across an extensive set of covariates, including those that potentially affect the extent to which groups interact beyond their kinship network. Moreover, if segmentary lineage organization is caused by environmental factors that we are unable to account for directly, the RD design will provide consistent estimates as long as features of geography, ecology, and disease environment vary smoothly at ethnic group boundaries.

As we will see, segmentary lineage and non-segmentary lineage groups appear balanced across a wide range of observable characteristics, including those chosen to explicitly capture the hypothesized environmental determinants of segmentary lineage organization (Table I). This finding is consistent with the more-recent and currently-dominant view in the anthropological literature, which is that segmentary lineage organization arises through a complex evolutionary process that leads to an emergence of the organizational form in a manner that appears idiosyncratic and uncorrelated with environmental factors (Smith, 1956, Salzman, 1978, Kelly, 1983). If this is the case, then the RD estimates, which only require that the effects of the idiosyncratic factors vary smoothly at ethnic boundaries, will again provide consistent estimates.

B. ***The Relationship between Segmentary Lineage and Conflict***

Numerous studies have documented examples of an apparent link between segmentary lineage organization and conflict. Many point out the strong effect that segmentary lineage organization can have on the exacerbation of small conflicts. Once a conflict begins, segmentary lineage structure results in an essentially automatic mobilization of additional combatants, which makes resolving the conflict much less likely.

One of the best-studied segmentary lineage societies is the Somali, whose social structure is dominated by segmentary organization. Anthropologist Ioan Lewis (1961) argues that the segmentary lineage system plays a major role in propagating conflict in Somalia. He writes that "quarrels between individuals which result in loss of life or property or both are often quickly followed by retaliation where there is little thought of negotiation. Within a clan bitter feuds develop and persist, often for many years and sometimes generations, erupting spasmodically as later incidents occur, and being temporarily forgotten only in the context of wider hostilities" (Lewis, 1961, p. 243).

Segmentary lineage organization has also been associated with more-organized forms of conflict, like political violence. In his book *Blood and Bone*, Ioan Lewis (1994) describes the link between segmentary lineage organization and organized violence in the Somali region during the 1980s. After the Ogaadeen war of 1977–1978, there was an upsurge of "tribalism," which was led by the President Siad Barre, whose goal was to consolidate the position of his own clan and family. Rather than develop a national identity, his strategy was to recruit as many tribal segments as possible within the segmentary system. In turn, this caused segments opposed to the government to build allegiances among their own segments (Lewis, 1994, pp. 225–226). That is, the "segmentary structure allowed both the government and opposition to mobilize large swaths of the lineage system" (Lewis, 1994, p. 232). This societal polarization along tribal and genealogical lines lays at the foundation of Somalia's subsequent political conflict.

The relationship between lineage organization and violent conflict continues to be important even today. A 2015 Rift Valley Institute Report reaffirms its importance in a discussion of an upsurge of conflict during 2006. It describes how the military efforts of the Warsangeli and Dubays fighters are "in line with the segmentary logic of the northern Somali society as a whole: as soon as a common threat emerges from outside, members of a descent group unite at the highest necessary level (sub-clan, clan, or clan-family). Conversely, in the absence of such a

threat, a group breaks up into smaller units that fend for themselves" (Hoehne, 2015, p. 217).

The Somali example clearly illustrates the obligations that arise due to segmentary lineages and how these can cause individuals to align with large portions of society against common threats. This process often obliges individuals to become involved in conflicts even if they are otherwise far removed from the source of the conflict. This has been documented among numerous segmentary lineage groups. The Nuer, an ethnic group from South Sudan that strictly abides by segmentary lineage organization, have been well studied. Evans-Pritchard (1940a) describes this obligation among the Nuer of South Sudan, writing that they "state this structural principle clearly in the expression of their political values. Thus they say that if the Leng tertiary section of the Lou tribe fights the Nyarkwac tertiary section – and, in fact, there has been a long feud between them – the villages which compose each section will combine to fight." (Evans-Pritchard, 1940a, p. 142). Lienhardt (1958) describes the same allegiance structure among the Dinka. Bohannon (1958) describes it amongst the Tiv of Nigeria, another segmentary lineage society and provides the specific example of fighting between the Morov of MbaKetsa and MbaHura of Tondov. In this case also, the segmentary structure facilitated recruitment to conflict, which significantly escalated a feud that began between only two tribal segments (Bohannon, 1958, p. 46).

The link between segmentary lineage organization and contemporary civil conflict is well illustrated by recent events in the Eastern Democratic Republic of the Congo (DRC), which has been a location of persistent conflict since 1994. One of the key rebel groups in the region today are the Raia Mutomboki. As their name, which is "angry citizens" in Swahili, indicates, the groups comprise populations of villagers who have mobilized for self-defense. The population, a segmentary lineage ethnic group called the Rega, first mobilized in a spontaneous and decentralized manner from 2005–2007 and then again in 2011. The success of the group is believed to have been due, in part, to their segmentary lineage structure, which enabled the near-automatic mobilization of fighters against their common enemy, the FDLR (Stearns, 2013). It is likely that the Raia Mutomboki would not have emerged if they were not organized into segmentary lineages.

C. *Other Systems of Kinship*

Our control group comprises societies without segmentary lineages. Within this group, a common organizational form is centered around the village, which is led by a village chief. Radcliffe-Brown

(1950, p. 42) describes this form of organization, referring specifically to the Lozi and Bemba of modern Zambia: "The typical corporate group in that region is a village constituted, by the persons who attach themselves to a headman... This group is an open, not a closed group; that is, individuals or families may join or leave it, moving from one village to another. It is usual that a number of the inhabitants of a village at any time should be related, either by cognatic ties or through marriage with the headman or with one another, but they do not form a unilineal kin group, which is by its constitution a 'closed' group."

Radcliffe-Brown (1950, p. 43) also describes why unilineal descent (lineage traced through the male line only or the female line only) is important for segmentary lineage organization and why cognatic descent (tracing lineage through both the male or female lines) is not compatible with segmentary lineage organization: "It is the corporate kin group... that controls the use of land, whether for hunting, for pastoral life, or for cultivation; that exacts vengeance for the killing of a member, or demands and receives an indemnity... A continuing social structure requires the aggregation of individuals into distinct separated groups, each with its own solidarity, every person belonging to one group of any set... In kinship systems cognatic kinship cannot provide this; it is only made possible by the use of the principle of unilineal descent."Analyses of cognatic kinship groups illustrate that they are very different in structure from segmentary lineage groups. Most important for thinking about the mechanisms linking social structure and conflict is the fact that segmentary lineage societies are closed in a way cognatic societies are not. All of the functions that a corporate group might undertake – social, political, judicial, or administrative – are fused together in a segmentary lineage group. These elements create far greater social solidarity in segmentary lineage societies and much greater ability to engage in collective action. This is not so in societies with cognatic kinship, where there is typically a clear differentiation between kinship relations and political relations (Fortes, 1953, p. 26; Gluckman, 1951, p. 31).

Writing about the Lozi of Zambia, Max Gluckman (1950) makes a similar point: "No corporate unilineal group of kinsmen exists among the Lozi. Every child... has a right to make its home in a village of either of its mother's parents and to inherit there. It also has these rights with the kin of its father... There are no broadly based unilineal groups associating in common rights of residence, ownership, inheritance, production etc." (Gluckman, 1950, pp. 171, 173). Thus, it is clear that the social organization of ethnic groups, like the Bemba or Lozi, who base groups on villages, is very different from segmentary lineage organization, where kinship ties are pre-

determined, clearly defined, and form distinct non-overlapping groups (i.e., segments). While the Bemba and Lozi had centralized states, their form of village/chief organization can also be found among ethnic groups that were stateless, such as the nearby Tonga (Colson, 1951). This system is also common among groups in other parts of Africa, with the most well-studied groups being the Wabena of Tanzania and the Ankole and Toro of Uganda (Gluckman, 1950, p. 178).

In addition to cognatic kinship societies, there are a number of other common forms of organizing society apart from adopting a segmentary lineage organization. For example, there are societies, like the Masai in Kenya and Tanzania, whose politics and administration are organized by age – i.e., around age-sets – and not by lineage or descent. Age-based organizations also create obligations, although to those within one's own age set. One could also imagine that age could also provide a useful axis for mobilization and collective action, and there is some evidence that in certain instances it can, either historically (Gluckman, 1940, Eldredge, 2014) or in the modern period (Kurimoto and Simonse, 1998). However, what is distinct about segmentary lineage societies is the number of individuals who can be mobilized through lineage relative to age sets. While an age grade typically consists of tens of people, lineage segments consist of hundreds or even thousands of people.

A final alternative organization form is very small scale societies that never develop either unilineal or cognatic kinship in any institutionalized form. Examples include groups such as the Hadza or the San people.

3. Data

A. *Conflict Data (ACLED)*

Our conflict data are from the *Armed Conflict Location and Event Data Project* (ACLED) database, which provides details of all known conflict events within Africa from January 1, 1997 to December 31, 2014. For each conflict event, information is provided on the location (latitude and longitude), the type of incident (riots and protests, battles, violence against civilians, etc), the actors involved (government forces, rebel militia, civilians, protestors, etc), the motivation of the actors (e.g., aimed at taking over land, riots, protests, etc), and the number of fatalities.

Given the possibility that the effect of segmentary lineage systems on conflict may differ depending on the nature of the conflict, our analysis examines four different measures of conflict.

The first is the broadest and most aggregate measure, which includes all conflict incidents. The next two measures disaggregate conflict incidents depending on whether or not they are part of a civil conflict, which is defined as fighting between the government military and rebel groups. Thus, the second measure is conflict incidents that are part of a civil conflict, and the third measure is of conflict incidents that are not part of a civil conflict. The last measure that we construct isolates very local conflict incidents where both parties in the conflict are geographically local, meaning they likely belong to the same village or local ethnic group.[3]

For each of the four types of conflict, we construct three measures of the frequency or prevalence of each type: the number of deadly conflict incidents, number of conflict deaths, and number of months from 1997–2014 with a deadly conflict incident. A deadly conflict is one with at least one battle death. In total, we have twelve measures of conflict.[4]

Following the methodology of previous studies (e.g., Michalopoulos and Papaioannou, 2016), we use location to connect conflict incidents to ethnic groups. This is done by combining the location of the conflict event with a digitized version of the map of ethnic boundaries taken from Murdock (1959) to construct measures of the frequency and intensity of conflicts occurring within the territory of each ethnic group.[5] The use of location to infer those who are involved in the conflicts is motivated by the fact that, in general, conflicts tend to occur close to the homelands of participants. This is most clearly true for disputes and conflicts that do not involve the government military, which tend to be very localized. For conflicts that involve the government – i.e., conflicts that we refer to as civil conflicts – conflict incidents also often occur within the ethnic homelands of the combatants. See for example the recent findings of Michalopoulos and Papaioannou (2016).[6]

B. *Identifying Segmentary Lineage Societies*

The most commonly used source for ethnographic information is the *Ethnographic Atlas*, which contains information on the traditional practices and characteristics of 1,265 ethnic groups. Al-

[3]Details of the identification of each conflict type are provided in the Webpage Appendix.

[4]All measures are positively correlated, with correlation coefficients that range from 0.49–0.93. See Table B.I of the Webpage Appendix.

[5]The digitized map is taken from Nunn (2008) and is the same map as used in Michalopoulos and Papaioannou (2013, 2014, 2016).

[6]Although it would also be informative to connect ethnic groups to conflict by using information on the participants involved, unfortunately, this strategy is not feasible. It requires detailed information on the ethnicity of the parties involved in each conflict, which is not available. Often, we only have a very general description of the participants, such as "locals", "protestors", "civilians", etc.

though this source does include some characteristics of kinship practices, it does not contain information on whether a society is organized according to segmentary lineages. Therefore, to identify the presence or absence of a segmentary lineage system, we relied on the *Ethnographic Survey of Africa*, which is a multi-volume work that compiles ethnographic information from a large number of African ethnic groups. The *Survey*, edited by Daryll Forde, was published over the course of several decades, beginning during the late-1940s, by the International African Institute in London. It is divided into individual volumes, first by region and then by ethnic group, and each entry contains detailed information about the political, social, cultural, and economic practices of each ethnic group, as well as a description of the ecological environment inhabited by the group. If a particular group was not included in the *Ethnographic Survey of Africa*, or if the information available was insufficient to determine whether or not it was a segmentary lineage society, we then consulted additional sources, including the references used in the *Ethnographic Atlas* to try to determine if the group had a segmentary lineage structure.

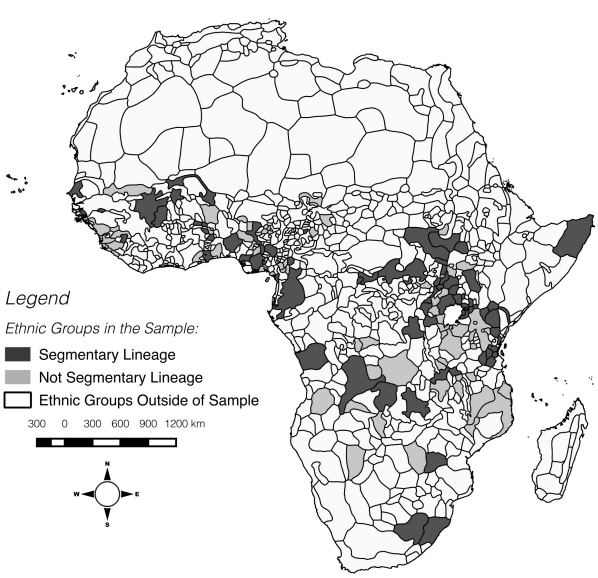
For a group to be coded as a segmentary lineage society, we required that it satisfy the following three criteria, which are taken from Middleton and Tait's (1958) definition of a segmentary lineage society.

1. The society must be based on unilineal descent, and there must have been direct and explicit evidence that people identify with their lineages and are aware of their genealogical connections to members of other sub-groups.

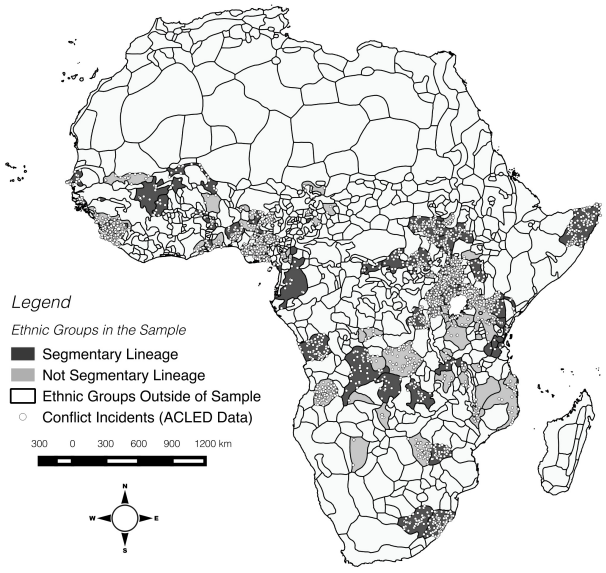
2. The segments of the lineages must take on a 'corporate form', which means that branching lineage segments must determine administrative functions and political allegiances, and that a centralized political authority entirely divorced from the lineage structure does not exist.

3. Lineage and genealogical relationships affect where people live, with those who are more closely related living geographically closer to one another. Thus, we require evidence that there is a geographic organization of residence that is based on the lineage system.

For an ethnic group to be coded as being a segmentary lineage society, we require direct evidence that each of the three criteria is satisfied. For an ethnic group to be coded as a non-segmentary lineage society, we required direct evidence that any of the three criteria is not satisfied. Therefore, lack of evidence for a criterion does not cause a group to be coded



(a) Segmentary lineage classification



(b) Segmentary lineage classification and conflict incidents

Figure 2: Maps showing the boundaries of ethnic groups, the presence and absence of segmentary lineage organization, and, in Figure 2b, the location of conflict incidents that occur within the boundaries of the ethnic groups in our sample.

as not having segmentary lineages.[7] In the end, we are able to code our segmentary lineage society indicator variable for 145 ethnic groups within Africa using the ethnicity classification of Murdock (1959). For the other ethnic groups, the existing evidence was not sufficient to determine with confidence whether an ethnic group is based on segmentary lineage organization or not. Although we do not have data for all ethnic groups in sub-Saharan Africa, the 145 ethnic groups account for 38% of the population of sub-Saharan Africa.[8]

As a check on the validity of our coding, after the variable was constructed, we consulted the existing secondary literature for cases where scholars had previously characterized or described specific ethnic groups as having a segmentary lineage organization or not. Reassuringly, in all cases (42 in total), our classification matched the majority consensus.[9] These cases are summarized in the Webpage Appendix.

The 145 ethnic groups are shown in Figures 2a and 2b. Segmentary lineage societies are

[7]See Section 1B and Figure B1 of the Webpage Appendix for an illustration of the coding for the Idoma ethnic group.

[8]The figures are calculated using NASA *EarthData* estimates of population density in 2000 and Murdock's ethnic boundary shapefile.

[9]This is not to say that there is always unanimity within the literature about the classification of every society. For example, Sahlins (1961) argues that the Dinka are not a segmentary lineage society, while Butt (1952) and Middleton and Tait (1958) argue that they are. The difference arises because Sahlins appears to have been using a narrower definition of segmentary lineage than is standard.

depicted in dark grey and non-segmentary lineage societies in light grey. The map shows that our sample includes ethnic groups from many parts of Africa. In Figure 2b, we add the locations of conflict incidents in the ACLED dataset that occur within the boundaries of the ethnic groups in our sample.

To better understand the extent to which our sample of 145 ethnic groups is representative of the full population of societies within sub-Saharan Africa, we compare the characteristics of the ethnic groups within our sample to the ethnic groups that are outside of our sample but in the *Ethnographic Atlas*. Within the *Ethnographic Atlas*, there are 420 ethnic groups from sub-Saharan Africa, 145 of which are in our sample and 275 of which are not. In Appendix Table A.I, we report the averages for and differences between the two groups for nineteen historical, ethnographic, and geographic characteristics. For 16 of the 19 variables examined, we find no statistically significant difference between the two groups (at the 5% level or stronger). The three measures for which the samples appear different are: levels of jurisdictional hierarchy, the natural log of total population, and longitude. Thus, larger groups that have a more centralized political system are more likely to be in our sample. This is not surprising given that larger ethnic groups were more likely to be studied and documented by anthropologists and therefore are more likely to appear in our sample. This difference should be kept in mind when interpreting our results.[10]

C. *Descriptive Statistics*

Within our sample of 145 ethnic groups, 74 have a segmentary lineage organization, while 71 do not. Average differences between the two groups are summarized in Table I, which reports the sample mean of and the estimated difference between segmentary lineage and non-segmentary lineage ethnic groups for different covariates. Panel A of the table reports statistics for the twelve conflict measures, constructed from the ACLED database.[11] We observe that for all twelve conflict measures, conflict is significantly higher within segmentary lineage societies. The differences are large. Segmentary lineage groups tend to have 100–200% more conflicts than non-segmentary lineage groups.

[10]Our sample is slightly more likely to include ethnic groups from the eastern portion of Africa. It is possible that ethnic groups in the region were studied in greater detail than groups from other regions. It is also possible that it is simply due to chance. With almost 20 variables being examined, it is expected that even with actual balance, one of the twenty would be different from zero at a 5% significance level.

[11]Four types of conflicts are examined (all, civil, non-civil and local), with their intensities measured using either number of incidents, months of fighting, or deaths.

Table I: Balance statistics, reporting average differences between segmentary lineage and non-segmentary lineage societies.

(1) Variable Name	(2) Sample Mean	(3) SL vs. Not SL	(4) Variable Name	(5) Sample Mean	(6) SL vs. Not SL	(7) Variable Name	(8) Sample Mean	(9) SL vs. Not SL
Panel A: Conflict Variables								
ln (1+Deadly Conflict Incidents):			*ln (1+Conflict Deaths):*			*ln (1+Months of Deadly Conflict):*		
All Conflicts	2.556	1.554	All Conflicts	4.006	2.085	All Conflicts	2.158	1.246
		(0.269)			(0.426)			(0.217)
Civil Conflicts	2.070	0.972	Civil Conflicts	3.109	1.8	Civil Conflicts	1.631	1.043
		(0.297)			(0.443)			(0.215)
Non-Civil Conflicts	2.024	1.034	Non-Civil Conflicts	3.046	1.91	Non-Civil Conflicts	1.674	1.108
		(0.248)			(0.361)			(0.197)
Within Group Conflicts	1.266	1.058	Within Group Conflicts	2.196	1.737	Within Group Conflicts	1.128	0.916
		(0.196)			(0.343)			(0.169)
Panel B: Geographic Variables								
Land area (km squared)	32,517	8,955	Potato maximum yield (kg/ha)	58.41	11.51	Mean temperature (degrees C)	24.17	-0.202
		(7,132)			(16.81)			(0.471)
Distance to nearest border (km)	127.8	-35.23	Yam maximum yield (kg/ha)	217.7	-7.89	Malaria index, 0-39	14.05	1.213
		(17.49)			(12.66)			(1.554)
Split ethnic group (10%), 0/1	0.317	0.0697	Mean altitude (km)	0.365	0.0286	Tsetse fly suitability index	0.122	-0.226
		(0.0775)			(0.0569)			(0.154)
Agricultural suitability index, 0-1	0.569	-0.00379	Ecological diversity (Fenske, 2014)	0.344	-0.0025	Sicke cell allele frequency	0.0590	-0.0125
		(0.0282)			(0.0362)			(0.0056)
Maize maximum yield (kg/ha)	277.6	-5.581	SD of agricultural suitability index	1.461	-0.0884	Latitude (degrees)	1.355	0.728
		(11.78)			(0.0776)			(1.517)
Cassava maximum yield (kg/ha)	288.6	-7.921	Coastline Indicator	0.145	0.00780	Absolute latitude (degrees)	7.70	-1.692
		(20.14)			(0.0588)			(0.880)
Millet maximum yield (kg/ha)	49.27	-3.941	River Indicator	0.669	0.0689	Longitude (degrees)	19.50	3.978
		(4.159)			(0.0786)			(2.655)
Sorghum maximum yield (kg/ha)	157.9	-2.13	Terrain Ruggedness (mean)	26.981	-2.998			
		(10.07)			(2.997)			
Panel C: Ethnicity-Level and Historical Variables								
Jurisd. hierarchy (beyond local), 1-5	2.270	-0.417	Patrilineal, 0/1	0.697	0.0954	Pastoralism dep. (Becker, 2019), 0-1	0.207	0.00514
		(0.165)			(0.0766)			(0.0241)
Jurisd. hierarchy (local), 1-3	1.879	-0.0624	Matrilineal, 0/1	0.138	-0.0098	Female particip. in agriculture, 1-6	4.051	-0.352
		(0.111)			(0.0585)			(0.221)
Headmen elected, 0/1	0.0621	-0.0164	Patrilocal, 0/1	0.783	0.0511	Dependence on agriculture, 0-9	5.834	-0.269
		(0.0444)			(0.0694)			(0.242)
Property rights in land, 0/1	0.939	-0.0121	Matrilocal, 0/1	0.0420	0.0262	Dependence on husbandry, 0-9	2.021	0.0405
		(0.0448)			(0.0335)			(0.233)
Settlement pattern complexity, 1-8	5.821	0.228	Polygyny, 0/1	0.855	-0.0906	Agricultural intensity, 1-6	3.462	0.108
		(0.288)			(0.0581)			(0.165)
City in 1800, 0/1	0.0417	-0.0012	Cousin marriage, 0/1	0.673	0.0705	ln slave exports (norm. land area)	0.348	0.113
		(0.0335)			(0.0890)			(0.124)
ln population density in 1960	2.656	0.339	Bride price, 0/1	0.786	0.0778	Christian mission station, 0/1	0.690	0.0266
		(0.208)			(0.0685)			(0.0774)
Single inheritor for land, 0/1	0.577	-0.0730	Moral high God, 0/1	0.172	-0.0485	Colonial railroad, 0/1	0.166	0.0483
		(0.0944)			(0.0632)			(0.0619)
Panel D: Contemporary Variables								
Mean lights in 2010	0.814	0.820	SD of lights in 2010 (norm. by mean)	13.04	-2.102	Growth 2000-2010, mean lights	0.157	0.036
		(0.512)			(2.105)			(0.169)
ln (1+mean lights in 2010)	0.311	0.138	ln (1+SD lights in 2010)	2.323	-0.119	SD of lights growth, 2000-2010	0.509	-0.007
		(0.088)			(0.142)			(0.104)
Muslim majority religion, 0/1	0.200	-0.0221						
		(0.0669)						

Notes: The unit of observation is an ethnic group. Columns 1, 5, and 7 report the ethnicity-level characteristics. In Panel A, the characteristics are the 12 baseline measures of conflict. In Panel B, they are geographic variables. In Panel C, they are historical characteristics. In Panel D, they are contemporary characteristics. Columns 2, 5, and 8 report the sample mean of each measure and columns 3, 6, and 8 report the difference in the characteristic between segentary lineage and non-segmentary lineage groups. The standard error is reported in parentheses.

Panels B, C, and D of Table I report balance for geographic, historical, and contemporary covariates.[12] The variables examined are motivated by the existing literatures on the historical determinants of social structure, institutions, or conflict. In contrast to the difference in conflict

[12] A discussion of the motivation behind each variable is provided in Section 1F of the Webpage Appendix.

prevalence, we find little difference between the two groups for these other characteristics. For twenty-one of the twenty-three geographic variables and for twenty-three of the twenty-four historical variables, we find no statistically significant difference. We find that for all seven of the contemporary measures, there is no statistically significant difference between the two groups. Importantly, we find that the traditional reliance on pastoralism, as measured in Becker (2019), is similar between the two groups. This alleviates the concern that segmentary lineage organization might be correlated with a 'culture of honor', which can lead to an escalation of violence and conflict (Nisbett and Cohen, 1996, Grosjean, 2014). The only historical characteristic that is statistically different between the two groups is the number of levels of jurisdictional hierarchy beyond the local community. This is important given the existing evidence that historical state centralization is associated with better development outcomes today (Gennaioli and Rainer, 2007, Michalopoulos and Papaioannou, 2013). Given this, we include the measure of historical state centralization in our baseline set of covariates.

4. OLS Estimates

A. *Baseline Estimates*

We now turn to OLS estimates of the relationship between segmentary lineage organization and conflict today. For this, we use the following estimating equation:

$$y_i = \alpha_{c(i)} + \beta I_i^{SL} + \mathbf{X}_i'\mathbf{\Gamma} + \varepsilon_i, \tag{1}$$

where i denotes ethnic groups and c countries. y_i denotes one of our twelve measures of conflict experienced by ethnic group i. I_i^{SL} is an indicator variable that equals one if ethnic group i is traditionally organized into segmentary lineages and zero if it is not. $\alpha_{c(i)}$ denotes country fixed effects. $\mathbf{X}_i'$ is a vector of ethnicity-level historical and geographic covariates. The geographic controls are: the natural log of the land area occupied by the ethnic group, the natural log of the minimum distance between the ethnic group centroid and a national border, an indicator variable that equals one if the ethnic group is cut by a national border, average altitude, the absolute value of latitude, longitude, average agricultural suitability, and the historical prevalence of malaria measured using the frequency of the sickle cell gene. The historical controls are: pre-industrial political centralization (levels of jurisdictional hierarchy beyond the local community), pre-industrial economic development measured by the complexity of settlement patterns, which

is measured on a 1–8 integer scale, and an indicator variable that equals one if the group is patrilineal.[13] The coefficient of interest is β. A positive coefficient indicates that segmentary lineage societies experience more conflict.

Estimates of equation (1) are reported in Table II. Each panel reports estimates for one of the four conflict types: all conflicts, civil conflicts, non-civil conflicts, and within-group conflicts. Each triplet of columns reports estimates for one of our three measures of conflict intensity: the natural log of the total number of deathly conflict incidents (columns 1–3), the natural log of the number of conflict deaths (column 4–6), or the natural log of the number of months of deadly conflict (columns 7–9). For each outcome variable, we report three specifications, each with a different set of covariates. The first specification (in columns 1, 4, and 7) is the most parsimonious and only includes country fixed effects. The second specification (in columns 2, 5, and 8) also controls for the geographic covariates. The final specification (in columns 3, 6, and 9) also controls for historical covariates.

Across all 36 specifications, we estimate a positive and significant relationship between the presence of segmentary lineage organization and conflict. In addition to being statistically significant, the estimates are also quantitatively meaningful. For example, according to the estimates for the number of deadly conflict incidents (columns 1–3 of panel A), a segmentary lineage society experiences 104–116% more incidents than a society that does not have a segmentary lineage organization. The estimated effects also remain very similar as we add additional covariates. This is important since it informs the likelihood that unobservables are driving our estimates.[14]

In Figure 3, we report partial correlation plots for each type of conflict, measured by number of incidents, and from the specification that includes country fixed effects, the geographic controls, and the historical controls (column 3). For each conflict type, the relationship appears general and does not appear to be driven by a small number of influential observations.

An important assumption in our baseline estimates is that the segmentary lineage status of ethnic group i only affects conflict within group i's own territory. However, it is possible that segmentary lineage groups could induce conflict not only in their territory but also in that of adjacent groups (e.g., if they launch attacks into neighboring territories). We test for such spillover effects by augmenting equation (1) with the addition of two spillover variables. The first is

[13]The details of the construction and measurement of each covariate is provided in the Webpage Appendix.

[14]Formal tests of this are reported in Appendix Table B.V of the Webpage Appendix. They indicate that it is unlikely that the estimated effects are due to unobservable characteristics.

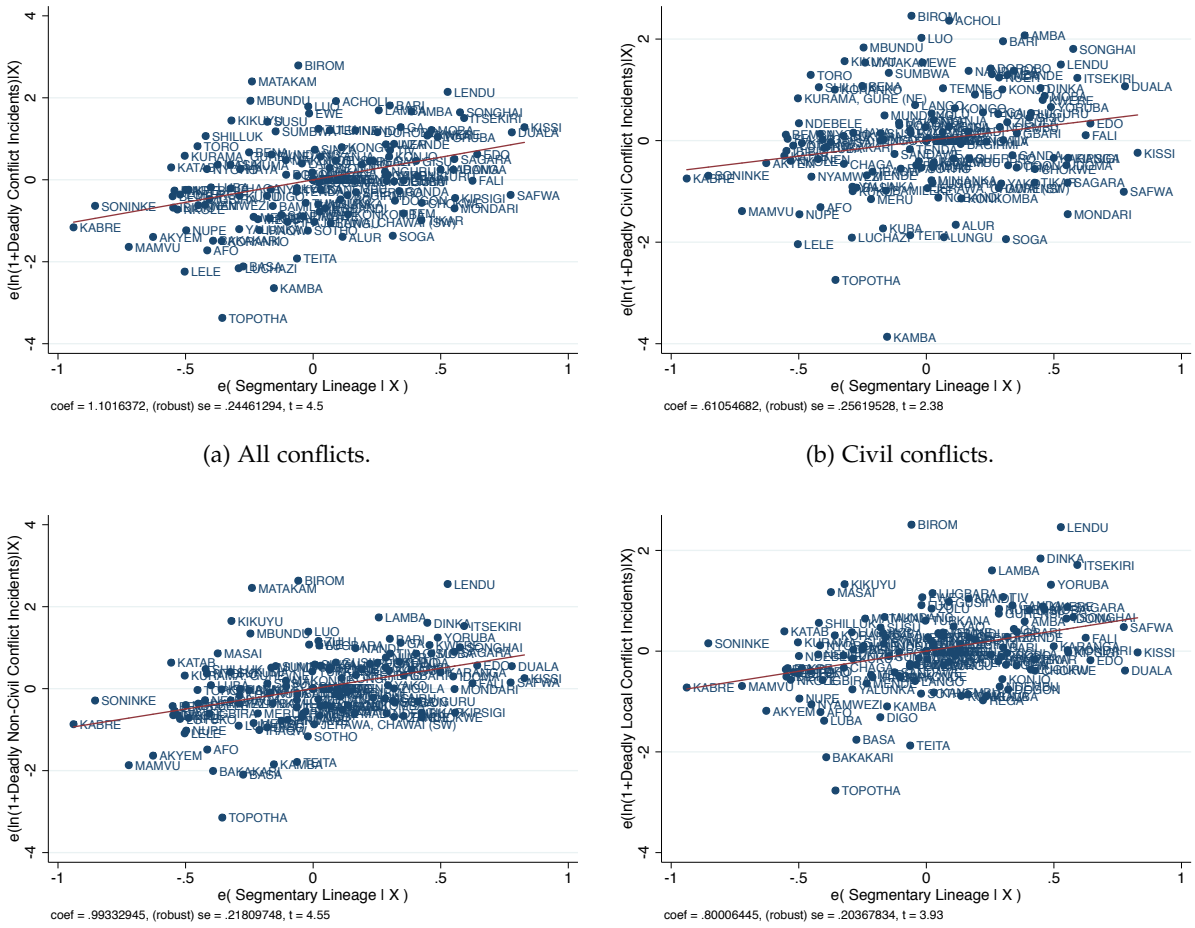
Table II: Segmentary lineage and conflict: OLS estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable:	ln (1+Deadly Conflict Incidents)			ln (1+Conflict Deaths)			ln (1+Months of Deadly Conflict)		
					Panel A: All Conflicts				
Segmentary Lineage	1.147	1.146	1.102	1.627	1.685	1.439	0.905	0.89	0.869
	(0.294)	(0.217)	(0.245)	(0.467)	(0.375)	(0.420)	(0.240)	(0.176)	(0.195)
Jurisdictional Hierarchy			-0.0641			-0.303			-0.0133
			(0.122)			(0.186)			(0.0964)
Mean of Dep. Var.	2.56	2.56	2.56	4.01	4.01	4.01	2.16	2.16	2.16
R-squared	0.530	0.705	0.717	0.555	0.694	0.716	0.525	0.713	0.726
					Panel B: Civil Conflicts				
Segmentary Lineage	0.819	0.79	0.611	1.306	1.383	1.051	0.704	0.704	0.577
	(0.297)	(0.245)	(0.256)	(0.497)	(0.433)	(0.460)	(0.251)	(0.205)	(0.216)
Jurisdictional Hierarchy			-0.178			-0.347			-0.112
			(0.122)			(0.184)			(0.0925)
Mean of Dep. Var.	2.07	2.07	2.07	3.11	3.11	3.11	1.63	1.63	1.63
R-squared	0.556	0.693	0.716	0.514	0.633	0.670	0.470	0.634	0.657
					Panel C: Non-Civil Conflicts				
Segmentary Lineage	0.905	0.893	0.993	1.513	1.58	1.637	0.773	0.765	0.848
	(0.244)	(0.189)	(0.218)	(0.407)	(0.317)	(0.371)	(0.214)	(0.164)	(0.185)
Jurisdictional Hierarchy			0.101			0.0552			0.0971
			(0.114)			(0.183)			(0.0996)
Mean of Dep. Var.	2.02	2.02	2.02	3.05	3.05	3.05	1.67	1.67	1.67
R-squared	0.584	0.730	0.742	0.518	0.681	0.693	0.524	0.705	0.721
					Panel D: Within Group Conflicts				
Segmentary Lineage	0.773	0.779	0.8	1.393	1.363	1.32	0.664	0.661	0.684
	(0.190)	(0.184)	(0.204)	(0.349)	(0.337)	(0.385)	(0.162)	(0.157)	(0.174)
Jurisdictional Hierarchy			-0.0399			-0.129			-0.0374
			(0.112)			(0.211)			(0.0956)
Mean of Dep. Var.	1.27	1.27	1.27	2.20	2.20	2.20	1.13	1.13	1.13
R-squared	0.586	0.679	0.697	0.576	0.650	0.673	0.583	0.689	0.703
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Historical controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	145	145	141	145	145	141	145	145	141

Notes: The unit of observation is an ethnic group. Along with the segmentary lineage variable, in columns 1, 4 and 7, we include country fixed effects. In columns 2, 5 and 8, we add a set of 'geographic controls,' which include the log of the land area occupied by the ethnic group, the log of the minimum distance between the ethnic group centroid and a national border, an indicator variable that equals one if the ethnic group is split by a national border, mean altitude, absolute latitude, longitude, an agricultural suitability index, and the average sickle cell allele frequency in the ethnic group homeland. In columns 3, 6 and 9, we add a set of 'historical controls,' which include historical political centralization (jurisdictional hierarchy beyond the local community), historical settlement pattern complexity, and an indicator for patrilineal societies. The coefficient on the political centralization variable is displayed since it is of independent interest. In Panel A, the dependent variables are constructed using all conflicts in the ACLED data; in Panel B they are constructed using civil conflicts; in Panel C, they are constructed using non-civil conflicts; and in Panel D, they are constructed using within group conflicts. All dependent variables are parameterized as ln(1+x). Robust standard errors are reported in parentheses.

$SL_i^{Neighbor} = \sum_{k \in K_i} I_k^{SL}$, where k indexes neighbors, K_i is the set of neighbors of ethnic group i, and I_k^{SL} is an indicator that equals one if neighbor k is segmentary lineage. The second is $Non\,SL_i^{Neighbor} = \sum_{k \in K_i} I_k^{Non\,SL}$, where $I_k^{Non\,SL}$ is an indicator variable that equals one if neighbor k is not a segmentary lineage group. We are able to include both measures in equation (1) due to ethnic groups that are uncoded and therefore not defined as segmentary lineage or non-segmentary lineage. Thus, the sum of $SL_i^{Neighbor}$ and $Non\,SL_i^{Neighbor}$ does not equal one.

The two variables capture the relationship between the average segmentary lineage status of an ethnic group's neighbors and conflict in the ethnic group's territory. The estimates, which are reported in Appendix Table A.II, show no evidence that being next to a segmentary lineage



(a) All conflicts.

(b) Civil conflicts.

(c) Non-civil conflicts.

(d) Intra-group conflict.

Figure 3: The figure reports partial correlation plots where the dependent variable is the natural log of the number of conflict incidences of the reported conflict type. All specifications include country fixed effects, geographic covariates, and historical covariates.

group increases conflict.[15] For none of the 48 specifications, is either spillover measure statistically different from zero. In addition, the direct effect of segmentary lineage on conflict remains very similar in magnitude and significance with the inclusion of the spillover variables.

Our segmentary lineage indicator measure is comprised of three parts, each of which must each be satisfied for a group to be coded as having segmentary lineages. Thus, the variable can be thought of as a triple interaction between three indicator variables, one for each part of the definition. We check the sensitivity of the estimates to controlling for the components of the definition – i.e., the individual indicators and their double interactions. The estimates, which are reported in Appendix Table A.III, show that the importance of segmentary lineage organization

[15]The table has one fewer observation than for our baseline estimates. This is because one of the groups in our sample is an island and so has no immediately adjacent ethnic groups.

is robust to controlling separately for the components of the definition. This highlights the importance of segmentary lineage organization itself and suggests that its relationship with violent conflict is not driven by the fact that it is correlated with, for example, unilineal descent.

Our construction of the segmentary lineage indicator variable relied on direct coding using existing ethnographic sources. In the end, we are able to identify whether or not segmentary lineages were present for 145 ethnic groups. While the information needed for a direct coding is not available from the *Ethnographic Atlas*, an alternative strategy is to use the information that is available to create an imputed proxy measure of segmentary lineage organization that is available for a wider range of ethnic groups. To do this, we first identify the variables in the *Ethnographic Atlas* that most closely correspond to each component of the definition of segmentary lineage organization: (*i*) variables $v17$ and $v19$, which report the largest matrilineal and patrilineal kin group; (*ii*) variable $v15$, which contains information about whether communities are segmented and whether clans exist or not; and (*iii*) variable $v12$, which contains information about the local of post-marital residence. We then create indicator variables, one for each category of each chosen variable,[16] and then estimate the relationship between the ethnography-coded segmentary lineage variable and the indicators and their interactions using the study's sample of 145 ethnic groups. We then predict segmentary lineage organization for all African ethnic groups that are in the *Ethnographic Atlas* using a restricted set of predictors identified using LASSO with the extended Bayesian information criterion (EBIC).[17]

The correlation between our baseline measure and the imputed measure is 0.65, suggesting that the variables in the *Ethnographic Atlas* have predictive power. The distribution of the imputed measure is shown in Appendix Figure A.1. As shown, the distribution is continuous. While many ethnic groups have predicted values that lie close to zero or close to one, many also have values that are close to 0.5. Given that the characteristic of interest is discrete, such intermediate values are difficult to interpret. This is an important shortcoming of the imputed measure. With this caveat in mind, we estimate the relationship between conflict and the imputed segmentary lineage measure, using an extended sample that includes a larger sample of approximately 500 ethnic groups. The estimates, which are reported in Appendix Table A.IV, show that using this alternative measure yields estimates that are very similar to our baseline estimates.

[16]We also include a category for the variable being coded as missing. A number of observations (68 of 473) have missing values for at least one variable.

[17]The LASSO coefficients are reported in Webpage Appendix Table B.IV.

B. ***Robustness and Sensitivity Checks***

We now turn to an examination of the sensitivity and robustness of our findings. Our baseline strategy determines whether or not an ethnic group participates in a conflict by comparing the location of the conflict to the are inhabited by the ethnic group. An alternative strategy is to use whether or not an ethnic group is mentioned among the participants of the conflict in the conflict summary that is provided in the ACLED data. Since the summary typically does not mention the ethnicity of those participating in the conflict, this strategy results in the vast majority of conflicts not being linked to an ethnic group. Specifically, only 9.1% of the conflicts in our sample are successfully matched using this method. With this important caveat in mind, we report estimates using this matching strategy in columns 1–3 of Appendix Table A.V. As an additional check, we also report estimates using data from an alternative widely-used source of conflict data, the *Uppsala Conflict Data Program - Georeferenced Event Dataset* (columns 4–6 of Appendix Table A.V).[18] With both alternative strategies, we continue to find a positive, sizeable, and significant relationship between segmentary lineage and conflict.

We next check the sensitivity of our estimates to controlling for the frequency of conflict prior the 19th Century, using data from either Besley and Reynal-Querol (2014) or Jaques (2007). The estimates, which are reported in Appendix Table A.VI, show that our findings remain robust to accounting for historical conflict.

Another potential concern is the presence of outliers, which could cause our estimates to be driven by a small number of influential conflicts with intensive fighting. While the partial correlation plots reported in Figures 3a–3d show visually that our relationships are not due to a small number of influential observations, we test this further by re-estimating our baseline specification after dropping observations identified as influential using Cook's distance or observations with values of conflict in the top five percent. The estimates, which are reported in panels A and B of Appendix Table A.VII, show that both strategies yield estimates that are similar to the baseline estimates. Given our use of location to link conflicts to ethnic groups, in panel C, we check the robustness of our estimates to omitting conflicts for which the location is only known with certainty at the province level and not at a smaller administrative unit, which is the case for 4.75% of all conflicts. As shown, the estimates remain robust.

[18]The UCDP data begin in 1991, six years earlier than the ACLED data. In addition, unlike the ACLED data, the it has a minimum requirement of 25 fatalities in a calendar year before a conflict appears in the dataset.

An alternative estimation strategy to OLS is to use propensity-score matching, which compares each segmentary lineage group to the non-segmentary lineage group that is most similar, based on observable characteristics. Estimates, matching using either location, the baseline set of geographic and historical controls, or the baseline set of controls with the added condition that the matched pair must have the same level of jurisdictional hierarchy, are reported in Appendix Table A.VIII.[19] The matching estimates are very similar to our baseline OLS estimates. The last check that we perform is to use negative binomial and Poisson models in our estimation. The estimates, which are reported in Appendix Table A.IX, are, again, very similar to our baseline estimate.

C. *Heterogeneous effects*

We now turn to the question of whether the effects of segmentary lineage organization differ depending on the characteristics of the country that the ethnic group is predominantly within. We examine heterogeneity depending on whether the country has a British legal origin, was a former British colony, or had a rural independence movement. We also check for heterogeneity by a country's per capita income, polity score, rule of law, and ethnic heterogeneity. We fail to find evidence of heterogeneity along any of these dimensions (Appendix Table A.X).

We also test for differential effects depending on the following ethnicity characteristics: a group's historical intensity of slave exports, its traditional level of jurisdictional hierarchy beyond the local community, the presence of traditional village elections, an indicator for the ethnic group being split by a national border, the presence of colonial missions, the presence of a colonial railway, an indicator for Islam being the majority religion, the presence of a capital city, the presence of diamond deposits, and the presence of petroleum. The estimates, which are reported in Appendix Table A.XI, indicate heterogeneity for one of the eleven characteristics. If there is a capital city within the ethnic group's territory, then the effect of segmentary lineage organization is not statistically different from zero. This is consistent with Michalopoulos and Papaioannou (2014)'s finding that traditional ethnic characteristics are less important close to capital cities, where national institutions matter more.

The final form of heterogeneity that we examine is motivated by prior evidence of a relationship between rainfall and conflict within sub-Saharan Africa (e.g., Miguel, Satyanath and Saiegh,

[19] We use nearest neighbor matching based on Mahalanobis distance.

2004, Rogall, 2014, Konig et al., 2017). The effect of adverse rainfall shocks may be greater in segmentary lineage societies, where altercations more frequently escalate into large scale conflict. To investigate this, we test whether the effects of adverse rainfall shocks are different for groups with and without segmentary lineage organization.

Using rainfall data from the Tropical Rainfall Measuring Mission (TRMM) satellite, which beginning in 1998 are available at a 0.25-by-0.25-degree spatial resolution and at three-hour intervals, we calculate the average daily precipitation (in thousands of millimeters per day) experienced by each ethnic group in each month of our sample period. We then use this to calculate a measure of adverse rainfall shocks experienced by an ethnic group in a month, which is the average monthly rainfall of an ethnic group over the sample period (January 1998 to December 2014) minus the rainfall experienced by the ethnic group in that month; thus, a higher value indicates less rainfall. We denote this variable $\textit{Neg Shock}_{i,t}$ where i denotes ethnic groups and t denotes months. With this measure, we then estimate the following equation:

$$y_{i,t} = \sum_{j=1}^{6} \gamma^j y_{i,t-j} + \beta_1 \textit{Neg Shock}_{i,t} + \beta_2 I_i^{SL} + \beta_3 \textit{Neg Shock}_{i,t} \times I_i^{SL} + \mathbf{X}_e' \mathbf{\Omega} + \alpha_t + \varepsilon_{i,t}, \qquad (2)$$

where $y_{i,t}$ denotes one of our measures of conflict intensity in the territory of ethnic group i during month t. I_i^{SL} is our segmentary lineage indicator variable. The equation also includes time-period fixed effects α_t and six lags of the dependent variable, $\sum_{j=1}^{6} \gamma^j y_{i,t-j}$. Given the high frequency of the panel, it is important to account for lagged conflict; we include all lags of the dependent variable that are statistically significant, which is six. The coefficient of interest is β_3, which tells us whether the effects of adverse rainfall shocks are different for segmentary lineage societies.

Estimates of equation (2) are reported in Appendix Table A.XII. Consistent with previous studies, we find that adverse rainfall shocks tend to be associated with greater conflict (Miguel et al., 2004), but that the relationship is not always precisely estimated (Ciccone, 2013, Buhaug, Nordkvelle, Bernauer, Bohmelt, Brzoska, Busby, Ciccone, Fjelde, Gartzke, Gleditsch, Goldstone, Hegre, Holtermann, Koubi, Link, Link, Lujala, O'Loughlin, Raleigh, Scheffran, Schilling, Smith, Theisen, Tol, Urdal and van Uexkull, 2014). Importantly, we find that the relationship between adverse rainfall and conflict masks systematic heterogeneity. The estimated effect of adverse rainfall is much stronger for segmentary lineage groups than for non-segmentary lineage groups, who are found to have an estimated relationship that is not statistically different from zero.

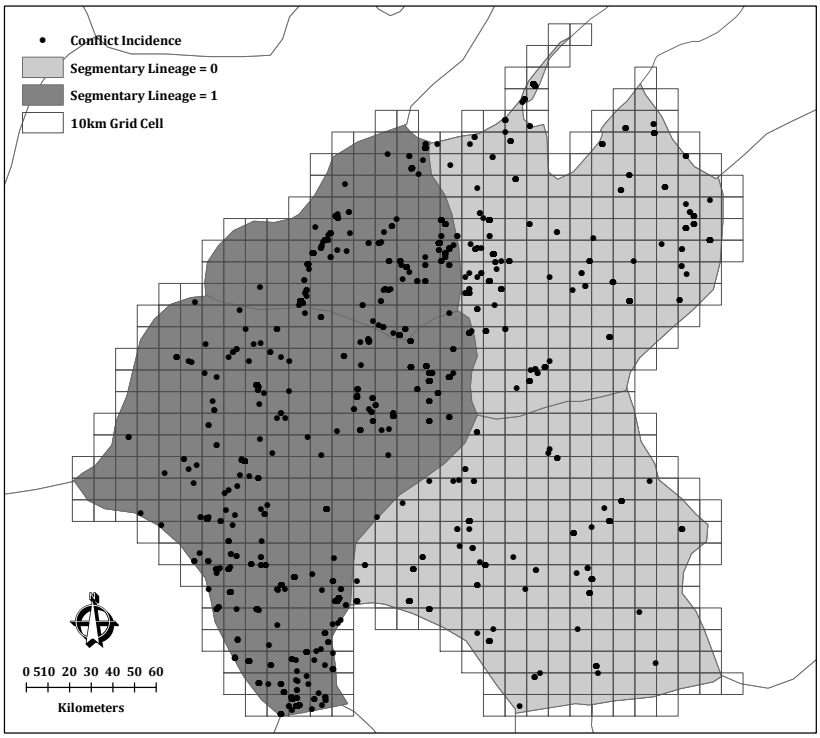


Figure 4: An illustration of the RD setting: ethnicity pairs, deadly conflict incidents, and 10km grid-cells. The two segmentary lineage ethnic groups shown are Ambo (top) and Konjo (bottom), and the two non-segmentary lineage groups shown are Toro (top) and Nkole (bottom) (all in Western Uganda).

5. Spatial Regression-Discontinuity Estimates

A. *Baseline Estimates*

Despite the robustness of our OLS estimates and the fact that our findings are similar when we account for a range of observable characteristics, there remains the concern that there are unobservables that may be biasing our estimates. For example, if ethnic groups have a persistent unobservable propensity to engage in conflict and if this affected whether ethnic groups adopted a segmentary lineage organization in the past, then this unobservable trait could bias our estimates of interest. In this case, we would observe a relationship between segmentary lineage systems and conflict even if no causal relationship exists. Such unobservable traits could originate from a range of different sources, including the physical environment or historical experiences. Similarly, there may be unobservable contemporary factors, like the extent to which the rule of law is able to reach more remote locations from the capital city or the quality of transportation and communication infrastructure. These, and similar factors, might have direct effects on conflict.

Given this possibility, we also implement an alternative estimation strategy. Since unobservable

factors are, by definition, unobservable, the strategy we undertake is to compare locations that are geographically close, but where one location is inhabited by a segmentary lineage society and the other by a society without segmentary lineages. For this analysis, a 10km-by-10km grid-cell is the unit of observation, and the sample consists of grid-cells within pairs of contiguous ethnic groups where one ethnicity has segmentary lineages and the other does not. Figure 4 illustrates the setup, showing grid-cells and pairs of contiguous ethnic groups, one of which has segmentary lineages and the other does not. The figure also shows the locations of deadly conflict incidents.

Our strategy is to use a regression discontinuity (RD) estimation method that restricts the sample to grid-cells that are sufficiently close to the ethnic boundaries and estimates the causal effect of segmentary lineage organization on the incidence of conflict using the estimated difference in conflict at the ethnic boundary. The benefit of this strategy is that it accounts for unobservable factors that vary smoothly across space. Therefore, as long as the determinants of unobservable traits – like geography, history (including the effects of historical conflict), idiosyncratic shocks, state presence etc. – vary smoothly, the unobservable traits will be accounted for by the RD strategy.

Our RD estimating equation is as follows:

$$y_{ip} = \omega_p + \gamma I^{SL}_{e(i)} + f(location_{ip}) + \mathbf{Z}_i'\mathbf{\Gamma} + \varepsilon_{ip} \tag{3}$$

where i indexes a 10-kilometer grid-cell, e ethnicities (80 in total), and p ethnicity pairs where one ethnic group has segmentary lineages and the other does not (68 in total). y_{ip} is a measure of the extent of conflict in grid-cell i which is within ethnicity pair p. $I^{SL}_{e(i)}$ is an indicator variable that equals one if cell i belongs to the ancestral homeland of an ethnic group e that traditionally had a segmentary lineage organization. $f(location_{ip})$ denotes a polynomial that controls for a smooth function of the geographic location of grid cells. In our baseline specification, we use a location's Euclidian distance from the border as the running variable, and, following Gelman and Imbens (2014), use a local linear specification, estimated separately on both sides of the border. We also report estimates using several other functional forms. ω_p denotes fixed effects for each ethnicity-pair. The vector $\mathbf{Z}_i'$ denotes a vector of covariates that includes country fixed effects, as well as the following set of grid-cell level geographical controls: elevation, agricultural suitability, and an indicator if the grid-cell is intersected by a national border.[20] The sample includes all grid

[20]Details, including sources of these measures, are provided in the Webpage Appendix.

cells associated with all pairs of ethnic groups that share a border where one has segmentary lineages and the other does not.[21] The sample is further restricted to grid-cells that are within a certain distance of the border of the two ethnic groups, either 60, 80, or 100 kilometers.

As with the OLS, the RD strategy estimates the effects of a group's social organization on conflict in its territory. Therefore, the estimation will not capture, and might even be biased by, effects on conflicts that occur outside of the ethnic group's territory. Given this, as before, we will examine the effects on the same range of conflict types, including localized conflicts for which we expect all fighting to occur within the territory of the participants. At first glance, it might seem unclear as to whether an RD estimator is appropriate for civil conflicts since the fighting might not occur in the territory of the ethnic group participating in the conflict. While our view is that we should let the data speak on this issue, ex ante, there is reason to expect civil conflicts to occur in the territory of the insurgents. Anecdotal accounts suggest that segmentary lineage groups are able to better mobilize against the government and more effectively attack government forces (e.g., Stearns, 2013). The government forces then retaliate, which tends to be within the territory of the segmentary lineage groups. Thus, even with civil conflicts, one may observe a discontinuity at the boundaries of segmentary lineage groups.

As a first step, we verify the validity of the Murdock (1959) ethnic boundaries that we use in the RD analysis. An important assumption when using the ethnic boundaries is that they coincide with actual discontinuities in ethnic affiliation today. We verify this by examining how ethnic affiliation changes at ethnicity boundaries using data from rounds 3–6 of the *Afrobarometer Surveys*, which record the ethnicity of respondents, as well as their location of residence. Combining this with the ethnicity map from Murdock (1959), we examine whether there is a discontinuity ethnic affiliation at the boundaries of the ethnicity pairs in our sample. Estimates of this are reported in Figure 5. The y-axis displays the fraction of the population in a bin that are a member of the segmentary lineage society whose border we are examining, and the x-axis is distance in kilometers from the border, with positive numbers indicating distances inside of the segmentary lineage territory and negative numbers indicating distances outside of it. We find that there is a discontinuous change in the fraction of the population that report that they are members of the

[21] If an ethnic group is adjacent to more than one ethnic group of different treatment status, then the ethnic group may be a part of multiple pairs.

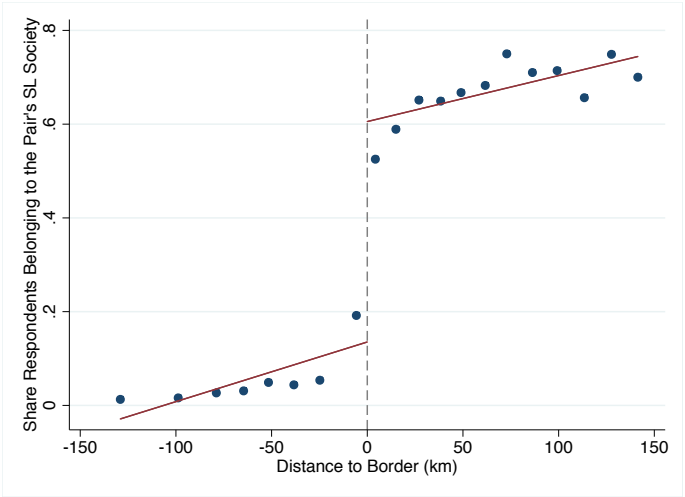


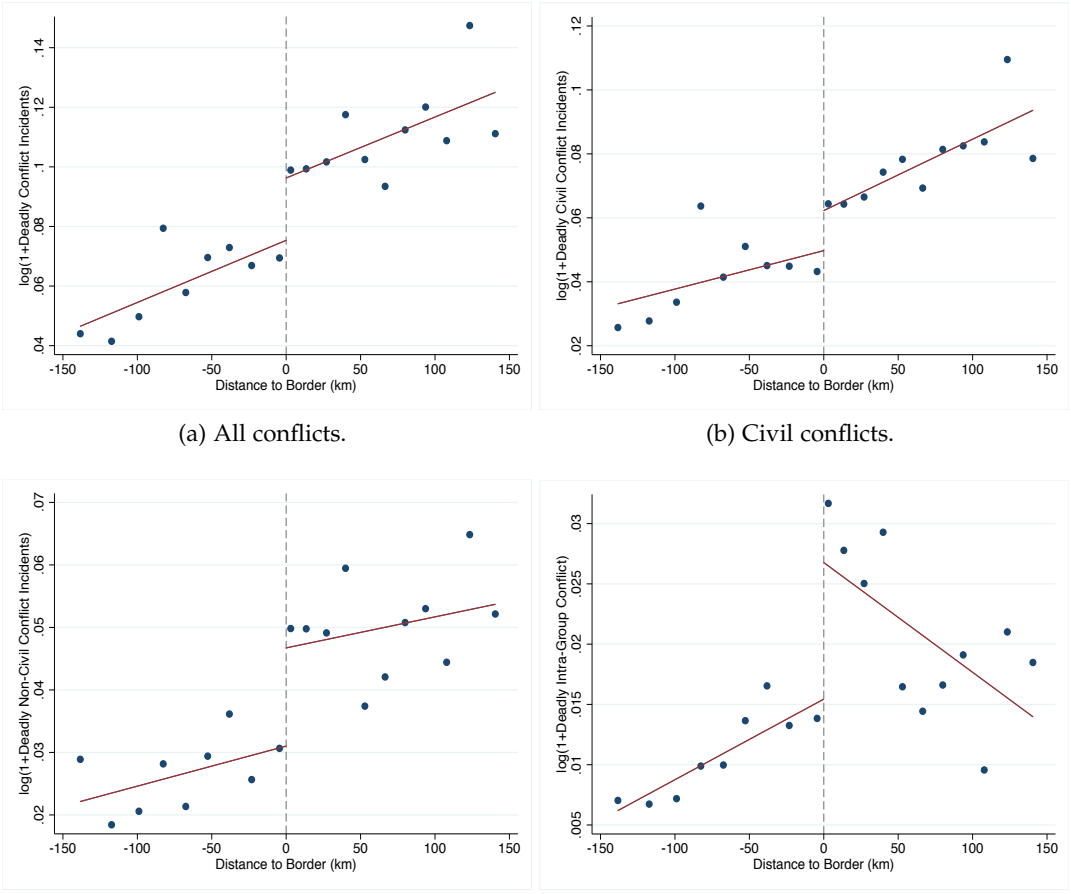
Figure 5: This graph presents the relationship between self-reported ethnicity and geographic location based on survey data from Rounds 3–6 of the *Afrobarometer* Survey. Data are aggregated for all borders between segmentary lineage and non-segmentary lineage societies in our sample. The x-axis reports geographic distance. Positive values imply kilometers into the territory of the segmentary lineage society and negative values are kilometers into the non-segmentary lineage society. The y-axis measures the fraction of the population at each distance that identifies as being a member of the segmentary lineage group.

segmentary lineage group precisely at the border.[22]

The next step of the analysis is to examine the raw data for the RD sample. Figures 6a–6d show bin scatterplots (with 20 bins) of the unconditional relationship between each of the four types of conflict and the distance from the ethnicity boundary. Even in the raw data, a discontinuity at the border is apparent. We observe a discontinuous increase in conflict on the segmentary lineage side of the border.

We next turn to the full RD estimates. Estimates of equation (3), for each of our three conflict measures (incidents, deaths, and months), are reported in Table III. For each outcome, we report three specifications, each in a different column. In the first, we only include ethnicity pair fixed effects; in the second, we add country fixed effects; and in the third, we add the set of geographic controls. Each panel of the table reports estimates for a different type of conflict, either all conflicts, civil conflict, non-civil conflicts, and within-group conflicts. All estimates use a restricted sample of grid cells within 60km of the ethnicity-pair border. We find that in every specification, and irrespective of the measure of conflict, the estimated effect of segmentary lineage systems on conflict is positive and statistically significant. We also find that for each

[22]In Appendix Figure A.2, we report the relationship for each round of the Afrobarometer separately. In all rounds, we see a sharp discontinuity at the ethnic boundaries.



(a) All conflicts.

(b) Civil conflicts.

(c) Non-civil conflicts.

(d) Within-group conflict.

Figure 6: This figure presents a binscatter plot (with 20 bins) of the unconditional relationship between conflict incidence and distance from the border. The y-axis reports the natural log of one plus the number of deadly conflict incidents for each of the four different types of conflict. The x-axis reports distance (in kilometers) from the borders between segmentary lineage and non-segmentary lineage societies. The border is at kilometer 0, and positive values indicate kilometers in the territories of segmentary lineage societies.

outcome, the magnitude of the estimated effect is similar in the different specifications.[23]

According to the estimated RD coefficients, segmentary lineage organization is associated with an increase in conflict of 0.08 to 0.10 standard deviations.[24] These estimates are smaller than those from the cross-ethnicity OLS regressions (reported in Table II), which imply that segmentary lineage organization is associated with an increase in conflict of 0.33 to 0.62 standard deviations. One explanation for this difference is that the local estimate of segmentary lineage organization close to the border may be smaller due to spillover effects. In other words, being close to a segmentary lineage group could also increase conflict. Consistent with this interpretation, Figure

[23]The partial correlation plots for the RD estimates are reported in Appendix Figure A.3.

[24]See Webpage Appendix Tables B.II and B.III for summary statistics.

Table III: Segmentary lineage and conflict: RD estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Sample: Observations Less Than 60 km from Ethnic Boundary Linear Running Variable in Euclidean Distance to the Border								
Dependent Variable:	ln (1+Deadly Conflict Incidents)			ln (1+Conflict Deaths)			ln (1+Months of Deadly Conflict)		
					Panel A: All Conflicts				
Segmentary Lineage	0.042	0.0373	0.0378	0.0862	0.0791	0.0805	0.0323	0.0283	0.0287
	(0.0158)	(0.0153)	(0.0152)	(0.0283)	(0.0283)	(0.0278)	(0.0128)	(0.0126)	(0.0124)
R-squared	0.095	0.122	0.122	0.084	0.088	0.088	0.094	0.116	0.116
					Panel B: Civil Conflicts				
Segmentary Lineage	0.0301	0.0263	0.0263	0.0563	0.0503	0.0505	0.0237	0.0201	0.02
	(0.0134)	(0.0125)	(0.0124)	(0.0238)	(0.0238)	(0.0235)	(0.0102)	(0.00981)	(0.00979)
R-squared	0.103	0.139	0.139	0.088	0.092	0.092	0.101	0.132	0.132
					Panel C: Non-Civil Conflicts				
Segmentary Lineage	0.0253	0.0237	0.0241	0.06	0.057	0.0579	0.0223	0.0211	0.0214
	(0.0088)	(0.0087)	(0.0086)	(0.0175)	(0.0168)	(0.0166)	(0.0082)	(0.0081)	(0.0080)
R-squared	0.047	0.050	0.050	0.044	0.047	0.048	0.050	0.052	0.052
					Panel D: Within Group Conflicts				
Segmentary Lineage	0.0133	0.013	0.013	0.0302	0.0286	0.0288	0.0103	0.01	0.01
	(0.0058)	(0.0059)	(0.0058)	(0.0129)	(0.0126)	(0.0124)	(0.0052)	(0.0053)	(0.0052)
R-squared	0.035	0.036	0.036	0.034	0.035	0.036	0.036	0.037	0.038
Ethnicity Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Geographic Controls	No	No	Yes	No	No	Yes	No	No	Yes
Ethnic Groups	80	80	80	80	80	80	80	80	80
Observations	10,739	10,739	10,739	10,739	10,739	10,739	10,739	10,739	10,739

Notes: The unit of observation is a 10km-by-10km grid cell. In columns 1-3, the outcome variable is the number of conflicts that resulted in at least one death; in columns 4-6, the dependent variable is the number of conflict deaths; and in columns 7-9, the dependent variable is the number of months during the sample period with at least one conflict, all parameterized as ln(1+x). All regressions include a linear polynomial in distance to the border and ethnic group pair fixed effects (68 pairs total). Columns 2-3, 5-6, and 8-9 also include country fixed effects and columns 3, 6, and 9 include a set of geographic controls: elevation, agricultural suitability, and an indicator variable that equals one if a grid cell intersects with a national border. In Panel A, the dependent variables are constructed using all conflicts in the ACLED data; in Panel B, they are constructed using civil conflicts; in Panel C, they are constructed using non-civil conflicts; and in Panel D, they are constructed using within-group conflicts. Standard errors, clustered at the ethnicity level, are reported in parentheses.

6 and Appendix Figure A.3 show that it is often the case that within the non-segmentary lineage territory conflict is higher closer to the boundary. However, we also found no evidence of spillover effects in our OLS analysis. Thus, it remains unclear to what extent spillovers can explain this difference.

Given this, we turn to another potential explanation. The difference might also be explained by the fact that within segmentary lineage territory, when one is close to the border much less than 100% of the population belongs to a segmentary lineage group (e.g., Figure 5). We investigate this by estimating the relationship between the share of the population that belongs to a segmentary

lineage society and conflict using a "fuzzy" RD design, where the segmentary lineage indicator $I^{SL}_{e(i)}$ is used as an instrument for the actual share of the population that belongs to the segmentary lineage group. Because we require information on the distribution of the population by ethnicty, the sample is restricted to grid-cells that include respondents from the *Afrobarometer* surveys. The 2SLS fuzzy RD estimates indicate effects that are consistently about 3.5 times larger than those from the baseline RD estimates (Appendix Table A.XIII). Thus, much of the difference between the RD and OLS estimates can be explained by imperfect 'compliance' of individuals close to the ethnicity boundaries.

B. ***Validity and Sensitivity Checks***

We now check the sensitivity of our estimates to a range of robustness checks, which include: alternative specifications for the running variable, different restrictions on the window of observations that are included in the sample, and estimation using Poisson or negative binomial models. The estimates are reported in Appendix Table A.XIV, where each column reports estimates using a different restriction on the observations included in the sample (60km, 80km, or 100km from the border), and each panel reports different running variables and estimators.[25] In panel A, for reference, we report estimates for the baseline specification from Table III. In panels B and C, we use the baseline running variable, but use a negative binomial or Poisson estimator respectively. In panels D to I, we report estimates using a series of additional running variables, including latitude and longitude (and their interaction) instead of Euclidean distance; these allow us to control more directly for features that vary over two-dimensional space. In panel D, we include the baseline running variable interacted with 14 cluster indicator variables, where a cluster is defined as a set of contiguous ethnic groups. In panel E, rather than using the distance from the border as the running variable, we use latitude and longitude and interact both with the 14 cluster indicator variables. In panel F, we include quadratic polynomials in latitude and longitude, with each component of the polynomial interacted with the 14 ethnicity-cluster indicators. Panels G–I are equivalent to panels D–F, except instead of interacting distance or latitude and longitude with 14 ethnicity-cluster indicator variables, we interact them with 68 ethnicity-pair indicator variables. Although these are demanding specifications (the running variable in Panel I, for example,

[25]The estimates are for total conflicts. The estimates for civil conflicts, non-civil conflicts, and within-group conflicts are similarly robust.

consists of 340 variables), by allowing the running variable to vary for each ethnicity-pair, we are able to control for specific conflict patterns around each border segment. In the end, the estimates using any of these alternative specifications are similar to the baseline RD estimates. The estimated coefficients all remain positive and similar in magnitude, and in nearly every specification, are precisely estimated.

We also check the robustness of our findings to concerns about the precision of the measured conflict locations. This is particularly important for the RD estimates since they are derived from differences in conflict intensity between areas that are geographically close. Thus, we re-estimate equation (3) after excluding conflicts for which only the province of the conflict is known and nothing finer, which comprise 4.75% of observations. (For these observations ACLED reports the location of the conflict as being the capital of the province.) The estimates, which are reported in Appendix Table A.XV, show that our estimates are nearly identical when these observations are omitted.

One assumption of the RD approach is that unobservables vary smoothly across the borders. Although this is impossible to test directly, we glean evidence about the validity of the assumption by estimating whether there appears to be a discontinuity at the border for the following observable variables: elevation, slope, average temperature, the presence of a body of water, suitability for the cultivation of cereals, the percentage of land that is currently under cultivation, the presence of petroleum, the presence of diamonds, the number of mission stations during the early colonial period, an indicator for the presence of a colonial railway, and an indicator for the presence of a pre-colonial explorer route.[26] We check for discontinuities by estimating equation (3) with each variable as the dependent variable. Table A.XVI reports estimates using the specification from column 2 of Table III. For each of the eleven variables, the coefficient on the segmentary lineage indicator is always small in magnitude and it is never statistically different from zero.

While we find no evidence of discontinuities in geographic or historical factors, there remains the important concern that other ethnic characteristics, besides segmentary lineage organization, may also vary discontinuously at the boundaries. To threaten the validity of our RD estimates, any other ethnic differences must have an independent effect on contemporary conflict. To check

[26]Cereals include wheat, wetland rice, dryland rice, maize, barley, rye, pearl millet, foxtail millet, sorghum, oat, and buckwheat. See the Webpage Appendix for the details of each measure.

Table IV: RD estimates for other ethnicity-level characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Placebo Characterisic:	Jurisdictional Hierarchy			Historical Settlement Complexity			First Principal Component of Jurisdictional Hierarchy FE & Settlement Complexity FE			First Principal Component of Jurisdictional Hierarchy FE, Settlement Complexity FE & Patrilineal Indicator		
Dependent Variable:	Incidents	Deaths	Months	Incidents	Deaths	Months	Incidents	Deaths	Months	Incidents	Deaths	Months
Ethnicity with Larger Value	-0.0293	-0.0162	-0.0119	-0.0291	-0.0711	-0.0232	-0.0132	-0.0226	-0.0121	0.0238	0.0211	0.0103
	(0.0255)	(0.0308)	(0.0141)	(0.0229)	(0.0434)	(0.0189)	(0.0125)	(0.0180)	(0.0097)	(0.0195)	(0.0267)	(0.0119)
Ethnicity Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic Groups	74	74	74	79	79	79	98	98	98	98	98	98
Observations	9,174	9,174	9,174	10,441	10,441	10,441	15,250	15,250	15,250	15,250	15,250	15,250
R-squared	0.221	0.175	0.171	0.191	0.125	0.127	0.200	0.145	0.142	0.199	0.144	0.142

Notes: The unit of observation is a 10km-by-10km grid cell. All regressions include a linear running variable in distance to the border and both ethnicity-pair fixed effects and country fixed effects. The dependent variables are our baseline measures of conflict, each parameterized as ln(1+x). In columns 1-3, the independent variable of interest is an indicator variables that equals one if an ethnic group has a greater number of levels of jurisdictional hierarchy than its pair; in columns 4-6, it is an indicator variable that equals one if an ethnic group has greater historical settlement complexity; in columns 7-9, it is an indicator variable that equals one if an ethnic group has a greater first principal component estimated using jurisdictional hierarchy fixed effects and historical settlement complexity fixed effects; in columns 10-12, it is an indicator variable that equals one if an ethnic group has a greater first principal component estimated using jurisdictional hierarchy fixed effects, settlement complexity fixed effects, and an indicator for patrilineal societies. Standard errors, clustered at the ethnicity level, are reported in parentheses.

for this possibility, we conduct a series of 'placebo' estimates where we undertake the same procedure as for our baseline RD estimates, except that ethnicity pairs are created, and treatment and control defined, using other ethnicity-level characteristics. We then re-estimate equation (3) to obtain estimates of the impact of the other characteristics on conflict. To ensure that the estimates do not reflect the effect of segmentary lineages on conflict, the sample only includes ethnicity pairs for which both ethnicities have the same classification of segmentary lineage organization.

The RD estimates are reported in Table IV for our three measures of total conflicts. The estimates for civil conflicts, non-civil conflicts, and localized conflicts are qualitatively identical. Each triplet of columns reports estimated effects for different ethnic characteristics. In columns 1–3, we compare adjacent ethnic pairs with the same segmentary organization coding, but with different levels of jurisdictional hierarchy beyond the local community. We define the 'treated' ethnicity to be the ethnicity of the pair with more levels of jurisdictional hierarchy. We find no estimated effect of this characteristic on conflict. Columns 4–6 report the same estimates but using historical settlement complexity as the characteristic of interest. In columns 7–9, we use the first principal component from a factor analysis that uses indicator variables for each category of the jurisdictional hierarchy and the settlement pattern variables. In columns 10–12, we use the first principal component from a factor analysis that, in addition to the variables from columns 7–9, also includes our baseline set of historical control variables (see Table II).[27]

We find that in each of the 36 specifications, the estimated effects of the alternative ethnic characteristics are all small in magnitude and statistically insignificant. Thus, although our RD estimates find a strong relationship between segmentary lineage organization and conflict, we do

[27]The factor loadings for both principal components are reported in Table B.VI in the paper's Webpage Appendix.

Table V: Segmentary lineage and retaliation.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep Var: Number of Deadly Incidents that are:					
	Retaliatory Conflicts			Non-Retaliatory Conflicts		
	One Month Window	Three Month Window	Six Month Window	One Month Window	Three Month Window	Six Month Window
Segmentary Lineage	1.594	1.349	1.346	0.995	0.964	0.958
	(0.436)	(0.404)	(0.404)	(0.223)	(0.210)	(0.204)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Historical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	141	141	141	141	141	141

Notes: The unit of observation is an ethnic group. All columns include country fixed effects, the full set of geographic controls, and the full set of historical controls. All reported coefficients are negative binomial estimates. A retaliatory conflict is defined as a conflict event that is between conflict actors who fought in the past month, three months or six months, depending on the window used. In columns 1-3, the dependent variable is the number of retaliatory conflict events in the ethnic group. In columns 4-6, it is the number of non-retaliatory conflict events in the ethnic group. Robust standard errors are reported in parentheses.

not find that other factors, like historical political centralization or economic development, affect conflict.

6. Mechanisms

A. *Escalation and Retaliation*

The estimates from the OLS and RD analysis suggest that segmentary lineage organization is associated with more conflict. We now turn to an examination of specific causal mechanisms that could explain this finding. Our analysis starts by exploring mechanisms that have been the focus of the anthropological literature; namely, retaliation and escalation, which arise due to the obligation to come to the defense of members of one's lineage.

As a test of the retaliation mechanism, we check whether segmentary lineage organizations experience more conflicts that are retaliatory. We define a conflict as being a retaliation if it occurs within a fixed amount of time (1, 3, or 6 months) of a previous conflict that involved the same actors. We use a negative binomial model to estimate equation (1) separately for conflicts that are retaliations and those that are not. The estimates, which are reported in Table V, show that while segmentary lineage organization has a positive effect on both types of conflict, it is greater for retaliatory conflicts. We also find that these differences are statistically significant (see Appendix Table A.XVII). Thus, consistent with the focus of the anthropological literature,

Table VI: Segmentary lineage and conflict of different scales.

	(1)	(2)	(3)	(4)
	Number of Conflict Incidents with:			
	0 Deaths	1-10 Deaths	11-100 Deaths	100+ Deaths
Segmentary Lineage	0.758	1.139	1.333	2.254
	(0.255)	(0.263)	(0.331)	(0.501)
Mean of Dependent Var.	131.11	40.57	12.41	2.54
Country FE	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes
Historical Controls	Yes	Yes	Yes	Yes
Observations	141	141	141	141

Notes: The unit of observation is an ethnic group. The dependent variables are the number of conflict events with zero deaths (column 1), the number of conflict events with 1-10 deaths (column 2), the number of conflict events with 11-100 deaths (column 3), and the number of conflict events with over 100 deaths (column 4). All columns report negative binomial estimates. All specifications include country fixed effects and the full set of geographic and historical controls. Robust standard errors are reported in parentheses.

segmentary lineage organization does appear to have a particularly strong effect on increasing the incidence of conflicts that are retaliatory.

Following a similar logic, we also examine the effect of segmentary lineage organization on conflicts of different sizes. If retaliation and escalation are important mechanisms, then we expect that segmentary lineage organization will have a disproportionate effect on the incidence of larger-scale conflicts. To examine this, we use a negative binomial model to estimate equation (1), where the dependent variable is the the number of incidents of conflicts of a different size; namely, incidents with 0 deaths, 1-10 deaths, 11-100 deaths, or 100+ deaths. The estimates, which are reported in Table VI, show that the magnitude of the coefficient increases systematically with the scale of the conflict. Thus, consistent with escalation being important, the largest effects are for larger-scale conflicts.

We further test for both mechanisms by studying the effect of segmentary lineage organization on conflict duration, estimated using a duration model where the dependent variable is conflict offset. While our primary interest is in the effects of segmentary lineage organization on conflict offset, for completeness, we also examineconflict onset. Both are estimated using the following discrete-time logistic hazard model (Jenkins, 1995):

$$\log\left[\frac{h_{i,t}^{event}}{1-h_{i,t}^{event}}\right] = \psi(t) + \gamma I_{e(i)}^{SL} + \mathbf{X}'_{e(i)}\mathbf{\Omega} + \epsilon_{i,t}, \tag{4}$$

where e indexes ethnic groups, i episodes of interest (either conflict or peace), and t years into the episode. The sample comprises all episodes of either conflict or peace, depending on whether

we are examining offset or onset. $h_{i,t}^{event}$ is the discrete-time hazard rate: $h_{i,t}^{event} = \text{prob}(T_i = t | T_i \leq t; \mathbf{X})$, where T_i denotes the time at which the episode ends (i.e., event of interest occurs). We assume that $h_{i,t}^{event}$ follows a logistic distribution and estimate $\psi(t)$ using a third-order polynomial.

While the expected value of γ in equation (4) is clear for conflict offset, this is less clear for conflict onset. The anthropological literature has not highlighted onset as being a particularly important mechanism. Intuitively, the effects on onset might be ambiguous. As an example, one could reason that if segmentary lineage organization causes conflicts to escalate, then this greater cost of fighting might result in conflicts might be less likely to start in the first place. On the other hand, if individuals know their lineage will mobilize on their behalf should a conflict start, segmentary lineage organization might also lead to higher levels of conflict onset. Similarly, within the civil conflict context, segmentary lineage groups might be more willing to initiate conflict against the government, knowing that they have large numbers of combatants due to their ability to effectively mobilize. In a separate note, we formalize these ideas and show that, in a standard conflict model, the effect of segmentary lineage organization on conflict size/duration is unambiguously positive, while its effect on conflict onset can be positive or negative (Moscona, Nunn and Robinson, 2019). Thus, in the end, the relationship between segmentary lineage and conflict onset is an empirical question.

The estimates, which are reported in Table VII, indicate that segmentary lineage organization is associated with greater escalation of conflict. We find a robust negative relationship between segmentary lineage organization and conflict offset. Once a conflict starts, in segmentary lineage societies, each year, it is less likely to end and, therefore, tends to last longer. We also find some evidence, although much weaker, that segmentary lineage organization might be associated with the start of new conflicts. We estimate a positive relationship between segmentary lineage organization and conflict onset. However, relative to the escalation effects, the estimated onset effects are smaller in magnitude, less robust, and less precisely estimated.

We turn next to evidence for the social obligations that underlie the retaliation and escalation mechanisms; namely, that individuals have an obligations to help out and avenge wrong-doings towards family members. While we do not have direct measures of the strength of obligations pertaining to participation in conflict, we do have measures of the strength of ties to one's kin as measured by one's self-reported trust of family members relative to non-family members. This relationship has been previously documented in Moscona, Nunn and Robinson (2017), but we

Table VII: Segmentary lineage and conflict offset (duration) or conflict onset.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Conflict Offset				Conflict Onset			
	All	Civil	Non-civil	Local	All	Civil	Non-civil	Local
Segmentary Lineage	-0.828	-1.021	-0.743	-0.662	0.325	0.496	0.53	0.393
	(0.238)	(0.270)	(0.255)	(0.259)	(0.283)	(0.259)	(0.238)	(0.249)
Marginal Effect at Mean	*-0.083*	*-0.186*	*-0.125*	*-0.127*	*0.049*	*0.060*	*0.072*	*0.042*
Third-degree polynomial of duration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Historical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.18	0.28	0.23	0.30	0.23	0.20	0.21	0.17
Ethnic Groups	125	115	116	112	113	130	126	131
Observations	1,164	937	893	725	1,094	1,410	1,346	1,600

Notes: The unit of observation is an ethnic group and year. Columns 1-4 report estimates of a discrete time hazard model for the incidence of conflict offset. In this context, survival is continued conflict. Columns 5-8 report estimates of a discrete time hazard model for incidence of conflict onset. In this setting, survival is continued peace. Coefficient from the logistic model are reported, along with marginal effects evaluated at the mean in italics. Standard errors, clustered at the ethnicity level, are reported in parentheses.

revisit the findings here. The estimates, which are reported in Appendix Table A.XVIII, show that segmentary lineage groups have a larger (positive) difference in their trust of family members relative to their trust in various non-family individuals. This shows that, as expected, members of segmentary lineage groups have particularly strong ties with family members relative to their ties with non-kin.

Overall, the estimates reported here (retaliation, scale, duration, and trust in family) are consistent with the escalation and retaliation channels that are emphasized in the ethnographic literature. Once a conflict starts, it is much more likely to escalate and turn into a large, prolonged conflict with many battle deaths.

B. *Other potential mechanisms*

We now turn to tests of mechanisms that, although not necessarily highlighted in the existing anthropological literature, could explain part of the relationship between segmentary lineage organization and conflict. The first set of outcomes that we examine are proxies of the economic prosperity of ethnic groups. If ethnic groups that have segmentary lineage organization tend to be less developed economically, with lower incomes, less wealth, less education, and less access to public goods, this might affect the likelihood that they participate in conflict.

We undertake three empirical strategies that test for this mechanism. The first is to measure economic prosperity using the household wealth index from the *Demographic and Health Surveys*

(DHS). We link households to ethnic groups using the reported ethnicity of the household head. In our regressions, we examine cross-household variation, controlling for the age and age squared of the household head, and clustering at the ethnicity level. The second is to use the average density of nightlights in the territory of each ethnic group as a measure of prosperity. The third is to use respondents' years of education as a proxy of economic prosperity and to estimate individual-level regressions that link individuals to ethnic groups using their self-reported ethnicity. All three strategies generate similar conclusions. As reported in Appendix Table A.XIX, we find no evidence that segmentary lineage groups are less economically prosperous. If anything, they tend to have more wealth, higher nightlight density, and are more educated, although these estimates are often imprecisely estimated and not different from zero.

We also examine individual-level variation in the presence of public goods using data from the *Afrobarometer*. The estimates, which are reported in Appendix Table A.XX, show that there is no relationship between an individual's belonging to a segmentary lineage ethnic group and the presence of public goods in their location of residence. The coefficients for some public goods are positive and some are negative. The average effect across all public goods is close to zero and statistically insignificant.

Another potential mechanism is economic inequality, which could lead to greater conflict, particularly conflict within groups. We consider this possibility using two measures of an ethnic group's inequality: the standard deviation of night light density within an ethnic group's territory and the Gini coefficient of the wealth index of households in the DHS. The estimates, which are reported in Appendix Table A.XXI, indicate no consistent relationship between segmentary lineage organization and inequality. Some estimates are positive, others are negative, and they are insignificant in all cases but one. Thus, it is unlikely that greater inequality is an important channel.

A factor that is related to wealth and inequality is risk-sharing, which could affect conflict. Although information needed to measure the prevalence of risk-sharing is difficult to obtain, there is one question in the *Afrobarometer* that does provide some information that is relevant. They ask respondents whether they have received remittances from "friends or relatives outside of the country" in the past year. While the question includes "friends" in addition to "family", evidence indicates that within Africa, the vast majority of overseas remittances are between family members (e.g., Bloch, 2005). Thus, the question provides some indication of international risk-sharing

between family members. The estimates, which are reported in Appendix Table A.XXII, show that although segmentary lineage groups are more likely to have received overseas remittances, the estimated effects are imprecisely estimated and are never statistically significant.

The next mechanism that we consider is an ethnic group's involvement in national politics. If segmentary lineage groups tend to have less access to national power, then this might explain the greater prevalence of civil conflicts among these groups. We use two measures to test for this. The first measure is constructed using the *Ethnic Power Relations* (EPR) database, which identifies the extent to which each "politically relevant" ethnic group is "excluded from state power at the national level." It categorizes excluded groups into those who are powerless due to active discrimination by the government and those who are powerless but not because of active discrimination. We examine the relationship between segmentary lineage organization and the share of years from 1960–2017 that an ethnic group was: excluded from power for any reason, powerless because of active discrimination, or powerless but not because of discrimination.

The second measure that we use is from Francois, Rainer and Trebbi (2015), who provide annual information from ten African countries since independence on the share of all cabinet positions in the national government (and the share of top cabinet positions) that are held by each ethnic group. With this measure, we examine the determinants of each ethnic group's representation in government while conditioning on their representation in the total population.

Our findings are similar regardless of which measures we use. We find no evidence of a relationship between segmentary lineage organization and representation in national politics. The estimated relationships, which are reported in Appendix Tables A.XXIII and A.XXIV, are all small in magnitude and statistically insignificant.

7. Implications of Findings and Their External Relevance

Our findings provide insight into a previously untested determinant of conflict. Although our results hold for all forms of conflict, they are potentially the most informative for civil conflicts since they help us understand why some armed non-state actors have been better able to recruit soldiers than others. An example of a group that has been successful in this dimension is Boko Haram of Northern Nigeria. It has been very difficult to explain their success using standard determinants. Our findings suggest that a missing element may be the social structure of the societies involved. Boko Haram has recruited primarily from the Kanuri people who historically

constituted a segmentary lineage society. This connection has been highlighted by Akbar Ahmed (2013b, p. 129), who documents that they tend to recruit where segmentary lineage structures are most prominent.

Our analysis has been restricted to Africa because of the rich ethnographic data and geo-coded sub-national conflict data. However, it is likely that the documented relationship is also present outside of Africa. For example, Osama bin Laden and many individuals recruited to Al Qaeda were, and are, Yemeni, who are also "are organized around a segmentary lineage system, with elders and councils, a spirit of egalitarianism, and a code of honor guiding society that emphasizes courage, loyalty, hospitality, and revenge" (Ahmed, 2013b, p. 110). Thus, the same logic of lineage-based obligation and revenge among segmentary groups in Africa also applies to the Yemeni. According to Paul Dresch (1989), "If a man from a village in Khamis Abu Dhaybah or Kharif kills someone from Arhab [a district in Yemen]... a debt exists between the two tribes... a man's immediate kin are involved (those who Islamic law recognizes as always al-dam), but men much further from the particular antagonist may also be drawn in. If a man from section A of our tribe kills someone from another tribe, that other tribe might perhaps kill someone in a quite different section of ours, section B" (pp. 84–85).

It is possible that a better understanding of segmentary lineage societies will shed new light on key international security issues. Ahmed (2013b) points out a broad correlation between areas of high-intensity Islamist violence and areas where society is structured based on segmentary lineage organization. In a 2013 speech, he argued the following: "Here is a correlation for you. Ask yourselves: where are [US] drones most used? They are really segmentary lineage systems: the Pashtuns in Afghanistan and Pakistan tribal areas, mainly in Waziristan; among the Somali segmentary lineage system; the Yemenis' segmentary lineage system; the Kurds in eastern Turkey, segmentary lineage system; the Tuareg in West Africa, segmentary lineage system. An immediate correlation. So there is some connection that we can identify... Take a look at these mutant militant groups that are emerging: the TTP (Tehrik-i-Taliban Pakistan), for example. Where is it coming out of? It's coming out of a specific tribe, a specific clan. Al Shabaab: tribal. Tribal: Boko Haram in West Africa. Again, because we tend to jump on Islam as the explanation for what's going on, we are missing this whole tribal basis of the discussion. All of these are coming out of straight segmentary lineage system backgrounds" (Ahmed, 2013a).

Philip Salzman extends this reasoning and argues that Islam, at its inception, was structured as

an amalgamation of segmentary lineage societies and was designed to unite these tribes against outsiders (Salzman, 2007, pp. 137–138). Thus, the entire Islamic world comprises the largest tribal segment that is compelled to unite against any non-Muslim – infidels, the West, or the dar al-harb. For Salzman, an understanding of segmentary organization is crucial to understanding all Islam-fueled violence.

Such arguments are not confined to the writings of academics. Philip Zeman (2009), a strategist with the U.S. Marine Corps, has argued that there is a strong relationship between segmentary organization and "terror." Members of Islamist extremist groups commonly come from societies with strong segmentary traditions, and there are explicit links between tribal organization and violent extremism. Thus, for national-security purposes, there is a "need for in-depth understanding of tribal systems and influences" (Zeman, 2009, p. 682).

8. Conclusion

We have tested a long-standing hypothesis about the relationship between segmentary lineage organization and conflict. A rich ethnographic literature suggests that this organizational form creates an obligation to come to the defense of one's lineage mates when they become involved in a conflictual situation. Thus, segmentary lineages result in large numbers of men being mobilized for warfare any time there is a dispute or conflict.

To investigate these ideas, we collected information from existing ethnographic sources on the social structure of 145 ethnic groups within sub-Saharan Africa. We began our analysis by examining the cross-ethnicity relationship between the historical presence of a segmentary lineage system and conflict today. We found a strong positive relationship between the presence of segmentary lineages in a society and every type of conflict examined; namely, all conflicts, civil conflicts, conflicts other than civil conflicts, and localized within-group conflicts. We then examined pairs of neighboring ethnic groups where one ethnic group is traditionally organized into segmentary lineages and the other is not. Examining variation across 10km-by-10km grid-cells, we estimated the effect of segmentary lineage organization on conflict using a regression discontinuity (RD) estimator. The strategy allows us to better control for any omitted factors that change smoothly over space, such as geographic factors, ecological characteristics, or historical shocks. Consistent with the OLS estimates, here too we found a strong positive relationship between segmentary lineage organization and all measures of conflict.

Motivated by the ethnographic literature which suggests that the primary mechanisms through which segmentary lineages affect conflict are retaliation and escalation, we then turned to an examination of channels. We tested for the importance of retaliation by identifying conflicts that occur shortly after a previous conflict between the same actors. We found that while segmentary lineage is associated with both retaliatory and non-retaliatory conflicts, the magnitude of the association is larger for retaliatory conflicts. To examine the escalation mechanism, we studied the effect of segmentary lineage on conflict onset and duration. We found strong evidence that segmentary lineage organization tends to increase the duration of conflicts after they start. By contrast, the estimated effects on conflict onset, although positive, are smaller in magnitude and often insignificant. Consistent with this, we also found that the effect of segmentary lineage on larger-scale conflicts with more battle deaths was greater than smaller-scale conflicts with fewer battle deaths.

Although our analysis focuses specifically on the African context, our results are potentially applicable outside of Africa, especially in the Middle East, where there are many examples of prolonged conflicts involving groups that are traditionally organized into segmentary lineages. Thus, it is possible that segmentary lineage organization may be an important determinant of conflict not just within Africa, but also globally.

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