Segmentary Lineage Organization and Female Political Leadership in Sub-Saharan Africa

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ABSTRACT

We study the association between kinship, conflict exposure and attitudes to female political leadership in sub-Saharan Africa. Ethnic kinship groups organized by segmentary lineage (SL) systems are more frequently involved in conflicts because lineage members are obliged to join the fight when a relative becomes embroiled in a dispute. Over human history, leadership has been required to address collective action and coordination problems associated with warfare. The Male Warrior Hypothesis argues that populations that face more frequent conflict value male leadership, as aggressive leaders are favored. However, we argue that the free-riding problems associated with warfare have been solved in SL societies. Instead, resolving conflict is important, and women are favored in this task. Moreover, female SL members take on greater roles in economic activity, which may influence attitudes to their leadership qualities. We thus propose an alternative Female Leadership Hypothesis which suggests that SL societies have more favorable views of female political leadership. Our empirical estimates lend support to the Female Leadership Hypothesis. Exposure to fatal conflicts is found to be a plausible mechanism.

Keywords: Kinship; segmentary lineage organization; conflict; female leadership; female labor force participation; Africa.
JEL Codes: J16; O12; Z10

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1. INTRODUCTION

Exposure to conflict and war may affect gender norms and provide opportunities for women in politics and the labor market and (Goldin and Olivetti, 2013; Petesch, 2018; Shatnawi and Fishback, 2018; Bakken and Buhaug, 2021).[1] Female political leadership may help policymaking by redirecting the focus to traditionally relatively ignored policy areas such as women's issues, public health and education (Hessami and Lopes da Fonseca, 2020; Lippman, 2022). Despite the high frequency of civil conflicts around the world, especially in Africa (Buvinic et al., 2013), no study has investigated the effect of conflict on contemporary attitudes to female political leadership. In this paper, we study whether individual attitudes to female leadership differ among sub-Saharan Africa ethnic groups with long-running differences in the frequency of conflict.

In sub-Saharan Africa, ethnic groups organized along segmentary lineages are involved in more frequent, more retaliatory, longer, and larger conflicts (Moscona et al., 2020). Segmentary lineages (SL) are complex kinship networks in which tribal or society allegiances are highly important during conflicts (Evans-Pritchard, 1940; Barth, 1973; Combs-Schilling, 1985; Sahlins, 1961). When a lineage member becomes involved in a conflict, it is mandatory for relatives to participate in the fight. The conflict may be internal or external to the lineage. The dispute may be between two ("minimal") subsets or segments of a lineage society, in which case the conflict is relatively small. However, if the conflict is between two different full segmentary lineages or with the government, the fighting may escalate to warfare or civil conflict. For our purposes, the SL indicator has the advantage of being an exogenous measure of conflict. To our knowledge, SL systems have not previously been used to study the association between conflict exposure and female political leadership.

We evaluate two opposing hypotheses. According to the Male Warrior Hypothesis (MWH) from evolutionary psychology, men are more aggressive than women and more likely to organize cooperation as a response to threats from other groups (Van Vugt, 2009). Through monitoring individual behavior, rewarding contributors, and sanctioning free-riders, they can solve collective action problems associated with organizing the fighting effort (Gavrilets and Fortunato, 2014). The MWH therefore suggests that SL societies, which are more frequently

[1] Exposure to violence shapes individual preferences and behavior (see, e.g., Voors et al., 2012; Callen et al., 2014; Cecchi et al., 2016).

involved in conflicts, should be associated with a stronger preference for male political leadership.

However, since SL systems have solved the collective action problem involved with mobilization at the time of conflict, male leadership that addresses conflict-related collective action is less crucial in SL societies. The task of resolving conflicts is historically a major function of leaders, and women are seen as superior in this task according to Garfield et al. (2019).[2] For example, Garfield and Hagen (2020) find that within the culture of the Ethiopian Chabu tribe, female leaders serve to resolve, instead of cause, intragroup conflicts. Women political leadership may consequently be relatively more valued in SL societies. In addition, when males are engaged in conflict away from home or are injured or pass away on the battlefield, women must shoulder greater responsibilities for local leadership and income producing activities. This should result in more favorable attitudes to female political leadership. We denote this the Female Leadership Hypothesis (FLH).

We utilize survey data from 22 sub-Saharan African countries provided by the third through the sixth round of the Afrobarometer surveys (BenYishay et al., 2017). We focus on the responses to a question that asks whether women should have equal rights to be elected to political office as men. Data on ethnic kinship groups practicing segmentary lineage come from Moscona et al. (2020), who code data from Forde (1953; 1970).

First, we provide logit and OLS fixed effects estimates of the cross-ethnicity association between the presence of segmentary lineage and attitudes to female leadership. We find robust evidence that respondents belonging to groups practicing segmentary lineage systems have more positive views of female leadership. This provides evidence against the MWH, and in favor of the proposed alternative FLH. The result holds up to a host of robustness checks, including controlling for geographic and historical covariates, and taking spatial spillovers, spatial correlation, spatial autoregression, and potential spatial noise into account.

Second, we utilize geolocated Afrobarometer data from the sixth round from BenYishay et al. (2017) for an analysis using a regression discontinuity design. We contrast survey responses by members of SL systems and members of other non-SL neighboring tribes. Again, we find support for the FLH. SL society members exhibit a more positive view of female political leadership.

[2] For example, the president of Liberia 2006-18, Ellen Johnson Sirleaf, was the first elected African female head of state. She won the Nobel Peace Prize in 2011 for her efforts to include women in the peace-making process.

Next, we investigate lethal conflicts as a possible mechanism. We utilize conflict data from the Armed Conflict Location and Event Data Project (ACLED) which provides information about all conflict events in Africa from 1997 to 2014. We use two different measures of conflict: (i) the number of lethal conflicts occurring within an ethnic group's territorial area, and (ii) the number of deaths due to conflict. Both measures suggest that conflict is a plausible mechanism. Finally, we provide some evidence that the effect of SL membership appears more general, as it has a positive association also with female labor force participation.

This paper is organized as follows. Section 2 provides a literature review, while section 3 discusses the data and empirical model. Section 4 reports the results and investigates a plausible mechanism, and section 5 provides a robustness analysis. Section 6 concludes.

2. LITERATURE REVIEW

Van Vugt (2009) suggests that men tend to organize cooperation as a response to outside threats, and are better able to solve collective action problems associated with the coordination of violent activities (see also, e.g., Gavrilets and Fortunato, 2014). For example, Laustsen and Petersen (2017) report that during the 2014 Crimea crisis, Poles and Ukrainians preferred dominant leaders (who may be more likely to be male) due to their aggressive responses. Conflicts produce a need for male combatants, which yields a preference for males (Chagnon, 1988; Oldenburg, 1992; Goli, 2022; Mavisakalyan and Minasyan, 2022).

However, populations with more frequent historical conflict exposure may view female political leaders in a more positive light, because females tend to favor peace to a greater degree, and are better able to accomplish it (O'Reilly, 2015; Garfield et al., 2019; Garfield and Hagen, 2020, Hornset and de Soysa, 2022).[3] This view may especially be the case if male leaders have engaged in recent conflicts.[4] Post-conflict reconstruction often leads to the emergence of women's organizations and networks, which increase women's representation in peace negotiations and throughout the post-conflict period (Burnet, 2008; World Bank, 2011). Webster et al. (2019) argue that changes in gender norms are more likely when gender roles are challenged during conflict. For example, Tripp (2015) reports that women's rights

[3] However, Dube and Harish (2020) find that during the 15th to 20th centuries, European polities led by queens engaged in more warfare than their male counterparts. They argue that married queens tended to rely on their spouses in supporting their rule, which enabled queens to engage more aggressively in war.

[4] Women in leadership positions may serve as a response to the "the conflict trap," where recent conflict tends to raise the probability of future conflict (Collier et al., 2003, 2008; Dincecco et al., 2019).

improved in sub-Saharan African states post-conflict. However, Kindervater and Meintjes (2018) suggest that while gains may be made in female participation and representation during conflicts, these are lost once competitive electoral politics resume after conflicts end.

The empirical literature suggests that attitudes to female labor force participation are affected by being located in conflict zones. The number of men declines due to casualties and injuries, which should increase the demand for female labor. For example, Schindler (2010) reports that the labor input provided by teenage girls, adult women, and widows was significantly greater in the post-genocide regions of Rwanda which had relatively fewer males in the population.[5] Relatedly, Crost et al. (2022) find that vocational training of girls in Northern Nigeria (similar to gaining skills in the labor market) resulted in changed gender perspectives on schooling, work, and household finances. However, Beath et al. (2012) report a lack of effect on gender attitudes in Afghanistan. One possible result of greater familiarity with women in the labor force, and consequently women's skill accumulation and networking, is more positive attitudes to female political leadership.

The literature generally reports a positive association between conflict exposure, collective action, and political participation (Bellows and Miguel, 2009; Blattman, 2009; Grosjean, 2014; De Luca and Vertoorten, 2015; Bauer et al., 2016). However, Adhvaryu and Fenske (2022) explore the impact of conflict on political behavior in 17 sub-Saharan African countries and find that childhood exposure to war has a minor effect on later political participation and beliefs.

The anthropology literature reports that in peaceful times, segmentary lineage tribes are historically not politically unified (Sahlins, 1961). The tribal segments tend to be autonomous, and their leadership has an egalitarian character. Only when faced with external competition does political consolidation occur. According to Sahlins (1961), political leadership is therefore only weakly developed and temporary at the tribal level, and leaders retain at most only a local influence during peacetime.

This study contributes to the literature on family and kinship ties, and their implications for a multitude of political, economic, or social outcomes (e.g., Greif, 1994; Dal Bo et al., 2009; Greif and Tabellini, 2010; Alesina and Giuliano, 2014; Querubín, 2016; Ang and Fredriksson, 2017; Cruz et al., 2017; Schulz, 2022).

[5] In the US, WW I and WW II also resulted in increased female labor force participation (Goldin and Olivetti, 2013; Shatnawi and Fishback, 2018).

3. DATA AND EMPIRICAL STRATEGIES

3.1 DATA

Descriptive statistics are provided in Table C1 in Appendix C. Variable definitions and sources are provided in Table C2 in Appendix C.

A. Segmentary Lineage

Segmentary lineage is a form of kinship structure. The name of the society or tribe frequently comes from a common, often mythical, founder. Data on the presence of segmentary lineage are compiled from the Ethnographic Survey of Africa, edited by Daryll Forde between the 1940s and the 1970s. Moscona et al. (2020) coded this data based on a definition of segmentary lineage by Middleton and Tait (1958). A society is defined as having segmentary lineage if the following three characteristics are present in the society: (i) there is a recognized and known unilineal descent system; (ii) segments of the lineage take a "corporate form," meaning that they are sub-units that affect administrative functions and political positions (Fortes 1953); and (iii) lineages and genealogical relationships influence one's location of residence.

Moscona et al. (2020) document the presence of segmentary lineage in 74 African societies and an absence in 71 societies, covering an estimated 212 million people or around 38% of the population of sub-Saharan Africa. This provides some reassurance that the data provide comprehensive coverage of the relevant population.

B. Political Leaders

The dependent variable uses responses to the Afrobarometer survey question: "Which of the following statements is closest to your view? Choose Statement 1: Men make better political leaders than women, and should be elected rather than women; or Statement 2: women should have the same chance of being elected to political office as men." The respondent can choose among five possible answers: "Agree very strongly with Statement 1," "Agree with Statement 1," "Agree with Statement 2," "Agree very strongly with Statement 2," or "Agree with neither." Our binary variable takes a value equal to 1 when the respondent agrees, or agrees very strongly, with Statement 2. The variable takes a value equal to 0 when the respondent agrees or agrees very strongly with Statement 1. We drop responses of "Agree with neither" statement. This variable is available in rounds 3, 5, 6, and 7 of the Afrobarometer.

We believe that it is advantageous to study attitudes to female political leadership, rather than actual political election outcomes. Assuming attitudes are correctly measured, they reveal the true gender preferences among the population. In contrast, election outcomes are subject to factors such as party politics, policy positions, incumbency, opponents, campaign support, and a multitude of additional factors. Survey respondents' attitudes to gender in politics appear to provide a relatively "clean" outcome variable for our purposes.

C. Geocoded Data

The RD analysis hinges on the variations generated by the distance from respondents' locations to the SL border. To protect the privacy of individual survey participants, the geographic locations of individuals are not made public. However, we are able to use village-level geocoded data for round 6 of the Afrobarometer, enabling an RD analysis (BenYishay et al., 2017) although the number of observations decline.

D. Other Variables

Other control variables used in the baseline specification are: age of respondent, age squared, education, and gender. We also account for geographic controls: agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of ethnic homeland.

3.2 EMPIRICAL STRATEGIES

A. Baseline Logit and OLS Estimation

The following regression model is used in combination with both logit and OLS to estimate the association between the presence of a segmentary lineage system and attitudes to female political leadership:

$$y_{iec} = \beta_0 + \Gamma SegLin_e + \boldsymbol{X}'\boldsymbol{\rho} + \alpha_{c/e} + \theta_t + \varepsilon_{iec}, \quad (1)$$

where y_{iec} is the attitude to female political leadership of respondent i, belonging to ethnicity e, living in country c. $\alpha_{c/e}$ is a country/ethnicity fixed effect, and θ_t is a survey-round fixed effect. $\boldsymbol{X}$ is a set of individual and regional control variables. $SegLin_e$ is an indicator of whether the respondent belongs to an ethnic group that practices segmentary lineage

organization, or not. ε_{iec} is the robust standard error term. A negative (positive) sign the $SegLin_e$ coefficient Γ provides support for the MWH (FLH).

B. Regression Discontinuity Design Estimates

Next, we use a regression discontinuity (RD) design, which addresses unobservable issues that may have direct effects on female political leadership. We extend eqn. (1) by estimating the following equation:

$$y_{ivec} = \beta_0 + \Gamma^{RD} SegLin_e + f(distance_{vec}) + \boldsymbol{X'\rho} + \alpha_e + \varepsilon_{ivec}, \quad (2)$$

where $f(distance_{vec})$ is a polynomial that controls for a smooth function of village v's Euclidean distance from the border that splits SL and non-SL ethnic societies. Figure A1 in Appendix A illustrates the spatial distribution of SL and non-SL kinship societies. We report both linear and quadratic specifications (first and second order polynomials) estimated separately on both sides of the border. The bandwidths on each side are 100km or 150km, respectively.

4. Main Results and Mechanism

4.1 Baseline Results

Table 1 presents estimation results for the association between the presence of segmentary lineage systems and attitudes toward female political leadership. All columns include country- and round- fixed effects. Column (1) reports the association with no further controls, while column (2) controls for the respondent's individual characteristics. Column (3) in addition accounts for geographic controls. Here, segmentary lineage is associated with a 0.137 increase in the odds ratio of the likelihood that the respondent has a positive view of female political leadership ($e^{0.128} - 1 = 0.137$). Columns (4)-(6) repeat the same estimations using OLS. In all specifications, segmentary lineage has a positive and statistically significant association (at the 1 percent level) with attitudes favorable to female political leadership. This provides initial support for the FLH. Columns (5)-(6) report Oster's (2019) δ statistics, which indicate that unobservables are unlikely to affect our estimates.

4.2 REGRESSION DISCONTINUITY RESULTS

A. Main Results

We first verify the validity of the RD analysis by examining how ethnic affiliation changes at ethnicity boundaries using data from round 6 of the Afrobarometer Surveys. We combine the Afrobarometer Surveys with the ethnicity map from Murdock and White (1959), similar to Moscona et al. (2020). The results are illustrated in Figure A2 in Appendix A. The outcome variable is the ratio of the population that are members of a segmentary lineage society. The running variable is distance to the border (kilometers). A positive number indicates the distance inside of the segmentary lineage society territory and a negative number indicates distance outside of this area. There is an upward jump of the ratio around the cutoff, indicating that the ethnic boundaries do reflect changes in ethnic affiliation.

We now turn to the estimation of eqn. (2). The graphical evidence for how attitudes to female political leadership change due to SL society membership is shown in Figure 1. The vertical line denotes the cutoff. In Panel A, the solid lines represent linear fits on each side of the cutoff, with 95% confidence intervals. In Panel B, the solid lines represent quadratic fits. The bandwidth is 100 km. The points are observations divided into bins, and each bin is 10km (with a total of 20 bins). There is an obvious discontinuity at the cutoff in both panels, indicating that segmentary lineage organization is associated with an increase in the average level of positive views of female political leadership.

The estimated results are reported in Table 2. Column (1) and (2) use a 100km bandwidth on each side and columns (3)-(4) use 150km. Columns (1) and (3) provide linear estimates, while columns (2) and (4) include the second order polynomial. Ethnicity fixed effects are included in all columns. The estimated effect of segmentary lineage organization on attitudes to female political leadership is positive and statistically significant in every specification in Table 2. The coefficient magnitudes are similar in the first two columns, while using a second order polynomial raise the coefficient size in columns (4).

B. Balancing Analysis

In this section we test whether the density of the running variable and the covariates in our RD analysis are balanced across the SL border. McCrary (2008) suggests a test for the null hypothesis of no discontinuity in the density of the running variable. Figure 2 plots a non-parametric regression for each half of the distribution, testing for a discontinuity at zero

(McCrary, 2008). Reassuringly, the density of each village's distance to the border appears continuous across the cutoff. The point estimate for the discontinuity is -0.3486, with a standard error of 0.2420.

The three panels in Figure 3 show the balance tests for the covariates age, education, and gender, respectively. The four panels in Figure 4 show the balance tests for the geographic covariates agricultural suitability, precipitation, temperature, and terrain roughness, respectively. We calculate village-level geographical variables in a circular area centered around the official latitude and longitude of each village, provided by Afrobarometer round 6. Given that a measure of village size is unavailable, we use different radius lengths of 0.25 km (shown in Figure 4), 0.5 km, and 1 km (results available upon request). The bandwidth is 100km. The points are observations divided into bins, and each bin is 10km (with a total of 20 bins). There is no obvious discontinuity at the cutoff for these variables. The results are highly robust.

4.3 MECHANISM

In this section, we propose that the influence of SL societies on attitudes to female political leadership works through conflict fatalities. We use two measures: (i) the log of the number of deadly conflicts during the time period 1997-2014 (from ACLED), and; (ii) the log of the number of deaths in conflicts during 1989-2014 (from UCDP-GED).

Columns (1) and (3) in Table 3 provide OLS estimates, while columns (2) and (4) report logit estimates. All columns include country- and Afrobarometer- fixed effects. The dependent variable in column (1) is the (log of) number of deadly conflicts, and the model includes individual and geographical controls. Segmentary lineage is positive and significant at the 1 % level in column (1). The positive association between segmentary lineage and number of deadly conflicts is consistent with Moscona et al. (2020). Next, the dependent variable in column (2) is attitude to female political leadership. We here add our measure of the number of deadly conflicts to our baseline model from column (3) in Table 1. Number of deadly conflicts is positive and statistically significant at the 1 % level, while segmentary lineage becomes insignificant. This suggests that the number of deadly conflicts is a mechanism between segmentary lineage and the attitude to female political leadership. Column (3) uses the log of conflict deaths as the dependent variable, and segmentary lineage is again significant at the 1 % level. In column (4), conflict deaths is significant at the 5% level, while segmentary lineage

becomes insignificant. Thus, Table 3 provides suggestive evidence that the number and lethality of deadly conflicts is a mechanism linking SL to positive attitudes to female political leadership. This provides support for the proposed female leadership hypothesis.

5. ROBUSTNESS CHECKS

5.1 ROBUSTNESS TO SPATIAL SPILLOVERS

The cultural attributes of neighboring regions tend to have similarities, which may raise doubts on the causality of estimates. To attenuate such doubts, in this section we use a series of spatial analysis tools. The overall picture that emerges is that spatial spillovers is not a concern.

A. Spatial Spillovers

Our baseline estimations assume that individuals' segmentary lineage membership only affects their own attitudes toward female political leadership. However, spatial spillover effects may play a role for our results. In particular, some individual attitudes may be influenced by the presence or absence of segmentary lineage groups in adjacent regions. We address this issue by including two spillover controls, $\sum_{k\in K} I_k^{SL}$ and $\sum_{k\in K} I_k^{Non-SL}$, following Moscona et al. (2020). Here, k represents neighbors and K is the set of neighbors, I_k^{SL} is a dummy variable equal to 1 if neighbor k is a segmentary lineage member, 0 otherwise. I_k^{Non-SL} is a dummy variable that equals 1 if neighbor k is not a segmentary lineage member, 0 otherwise. Individual i's neighbors are defined as residents in regions bordering individual i's region. The two spillover terms control the effects of segmentary lineage status of an individual's neighbors on her own attitude to female political leadership.

The estimates are reported in Table 4. All columns include the two spillover controls. Individual and geographic controls are added sequentially in columns (2) and (3). Across all three columns, the estimated segmentary lineage coefficients remain stable, indicating that our main finding is not driven by spillover effects.

To test further for spatial correlation, Table B1 in Appendix B reports Moran's I statistic and its associated z- and p- values, a standard approach to measure spatial correlation. Following Kelly (2019), we use the residuals of the baseline regression (column (3), Table 1) to calculate Moran's I. The z-value for attitudes to female political leadership equals -1.183 (p = 0.118), implying an absence of strong spatial correlation.

B. Spatial Noise Simulations

In this section we provide simulations with spatial noise as both explanatory and dependent variables. Because the spatial noise can only be generated at the regional level, we aggregate our individual-level observations to this level. The estimates reflect the relationship between shares of the population belonging to segmentary lineage societies and the average value of attitudes towards female political leadership.

The key parameter in generating spatial noise is the correlation range of the Matérn function (see Gneiting et al., 2010).[6] Dell (2010) uses 0.5, 1, and 1.5 to generate spatial noise with Peruvian data. The administrative area of each state in our data set is larger than those in Peru, however. We therefore set correlation ranges from 1 to 5. For each correlation range, we run 400 regressions for spatial noise as explanatory variable and dependent variable, respectively. We then calculate the ratio of significant estimates at the 1%, 0.1%, and 0.01% significance levels. The simulation results for the different correlation ranges are shown in Table B2 in Appendix B.

When spatial noise is used as explanatory variable, the ratio of significant estimates is extremely small. All are close to zero, which suggests spatial noise cannot generate significant results. When spatial noise is used as a dependent variable, the results are similar for low correlation ranges. However, the ratio of significant estimates rises at higher correlation ranges, see column (4). Overall, we find that our main result cannot be interpreted as an artifact of spatial correlation.

C. Spatial-autoregressive Disturbances

Our baseline results assume that individuals do not interact. However, individual gender attitudes could be influenced by geographically close neighbors. To mitigate this concern, Table B3 reports estimates of a cross-sectional spatial model with spatial-autoregressive disturbances. This model allows the disturbance term to depend on a weighted average of the disturbances corresponding to other units (see Anselin, 2006). To do so, we constructed a spatial-weight matrix with equal weight allocated to the neighbors of each observation, and a weight of zero to all other observations. This produces a 30,221 × 30,221 matrix for attitudes

[6] Kelly (2019) provides the technical details on generating a spatially correlated noise variable.

to female political leaders. The effect of segmentary lineage on attitudes to female political leaders remains similar in both magnitude and significance.

5.2 Robustness to other controls

Tables 5 and 6 account for a series of historical and contemporary factors that the literature identifies as being of potential relevance. In these tables, all columns include country- and round-fixed effects, as well as individual and geographic controls. Column (1), Table 5, includes traditional plough use from Alesina et al. (2013), which they show affects gender norms. Column (2) uses Alesina et al.'s (2013) set of historical controls: agricultural suitability, tropical climate, presence of large domestic animals, political hierarchies, and economic complexity. Column (3) includes the presence of females in agricultural activities, which reflects economic activity away from the home. Column (4) accounts for cereals being a main crop. Ember (1983) and Hansen et al. (2015) argue that cereal production influences female labor force participation. Column (5) takes the presence of matrilineal political succession into account. Finally, all controls are added in column (6). Segmentary lineage remains positive and significant in all columns, suggesting a measure of robustness. Among the controls, it is surprising that matrilineal political succession has a negative and significant association in column (6).

Table 6 considers contemporary controls. Column (1) includes the presence of Christian missions and a dummy for Islam being a majority religion (Nunn, 2010; World Religion Database). Column (2) accounts for income and income inequality by including the mean intensity of nightlights and its variation. Column (3) includes an indicator of the presence of petroleum which has been shown to affect gender norms. Column (4) adds all controls. The segmentary lineage coefficient is positive and statistically significant at least at the 5 percent level in all columns in Table 6.

5.3 Female Labor Force Participation

In this section we complement the main analysis by checking whether female labor force participation is affected by membership in SL societies. Do women tend to participate in the labor market to a greater extent as a result of the men being more likely to be involved in conflict?

Table B4 in Appendix B provides estimates using OLS (including a model that accounts for spatial spillovers) and a spatial-autoregressive model. The models suggest that segmentary lineage is associated with an increased female labor force participation rate. This is consistent with both demand and supply for female labor increasing with male supply decreasing due to warfare, casualties and injuries (see Schindler, 2010; Goldin and Olivetti, 2013; Shatnawi and Fishback, 2018). Overall, we find that SL appears to have more general effects on gender outcomes beyond attitudes to political leadership.

6. CONCLUSION

This paper studies exposure to conflict and attitudes to female political leadership in sub-Saharan Africa. Ethnic groups organized in segmentary lineage systems are more frequently engaged in conflict due to in-group obligations to mobilize when disputes arise. We explore the Male Warrior Hypothesis, which argues that populations that face frequent conflict value male political leadership relatively highly. As an opposing theory, we propose the Female Leadership Hypothesis which suggests that, in contrast, women are viewed more favorably as political leaders when society is more often involved in conflicts. The reasons for this are females' relatively greater ability to make peace and their greater participation in economic and market activity in segmentary lineage societies.

We provide fixed effects estimates using individual-level Afrobarometer survey data from 22 sub-Saharan countries. We find a robust positive relationship between membership in a segmentary lineage society and attitudes to female political leadership, supporting the Female Leadership Hypothesis. The level of exposure to fatal conflicts is found to be a plausible mechanism. Membership in a segmentary lineage society is also associated with a positive effect on female labor force participation.

We find that extended exposure to conflict in sub-Saharan Africa can cause shifts in traditional gender roles, providing political opportunities for women. However, increased female empowerment and financial independence may also increase the incidence of intimate partner violence, a "backlash" occurring as males experience a diminishes traditional role as leaders, protectors and providers (see, e.g., Vyas and Watts, 2009; Erten and Keskin, 2021). Future work may discuss the association between segmentary lineage and intimate partner violence. National and international organizations supporting women are likely to benefit from increased knowledge of the implications of different types of kin-based systems.

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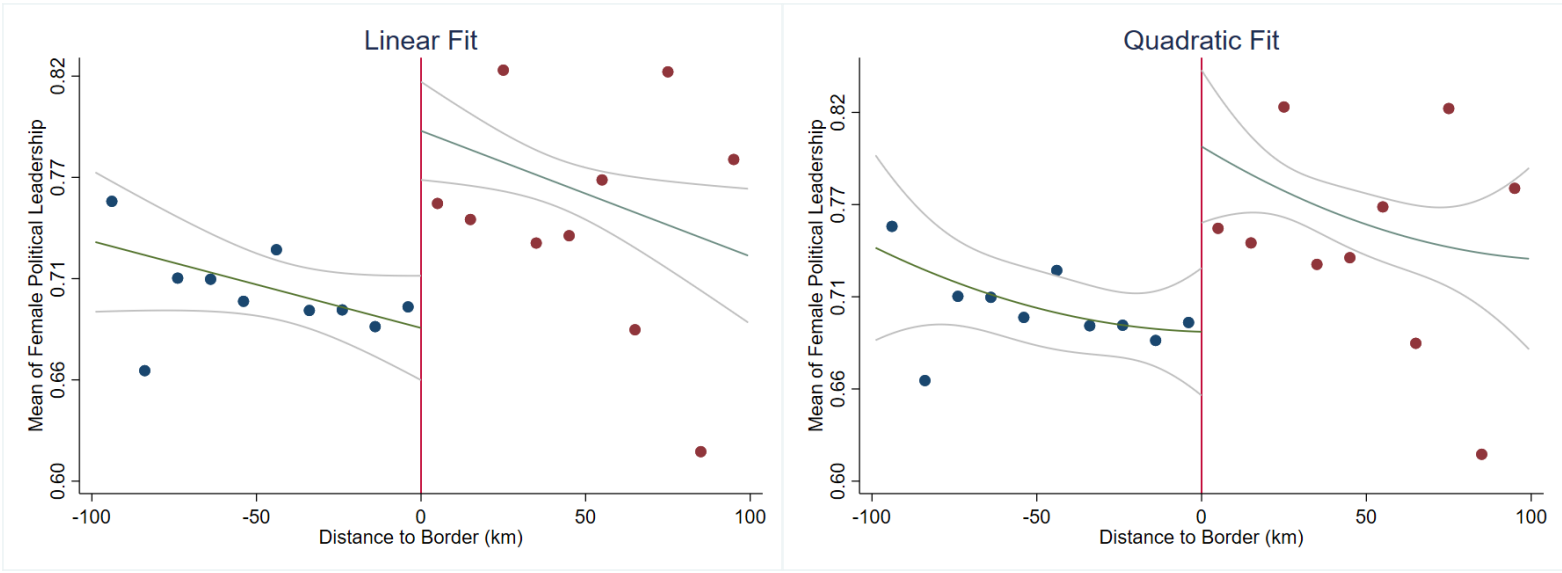
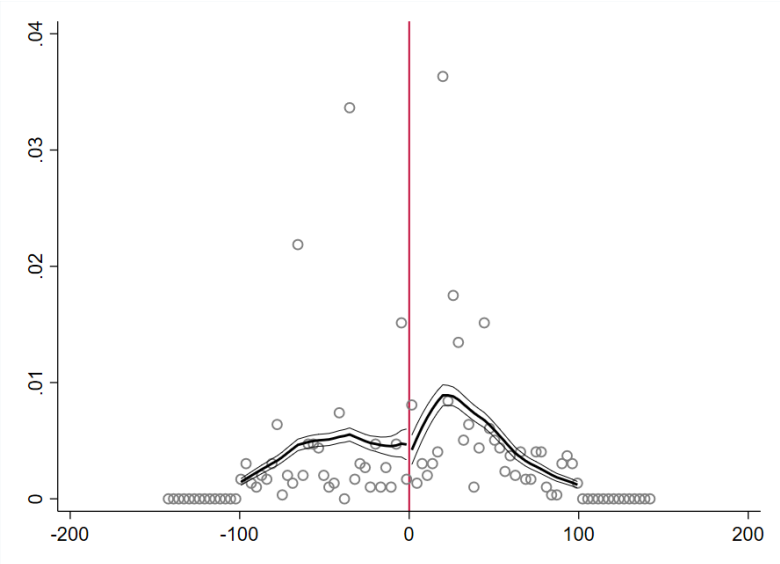
Figure 1: Effects of Segmentary Lineage on Female Political Leadership



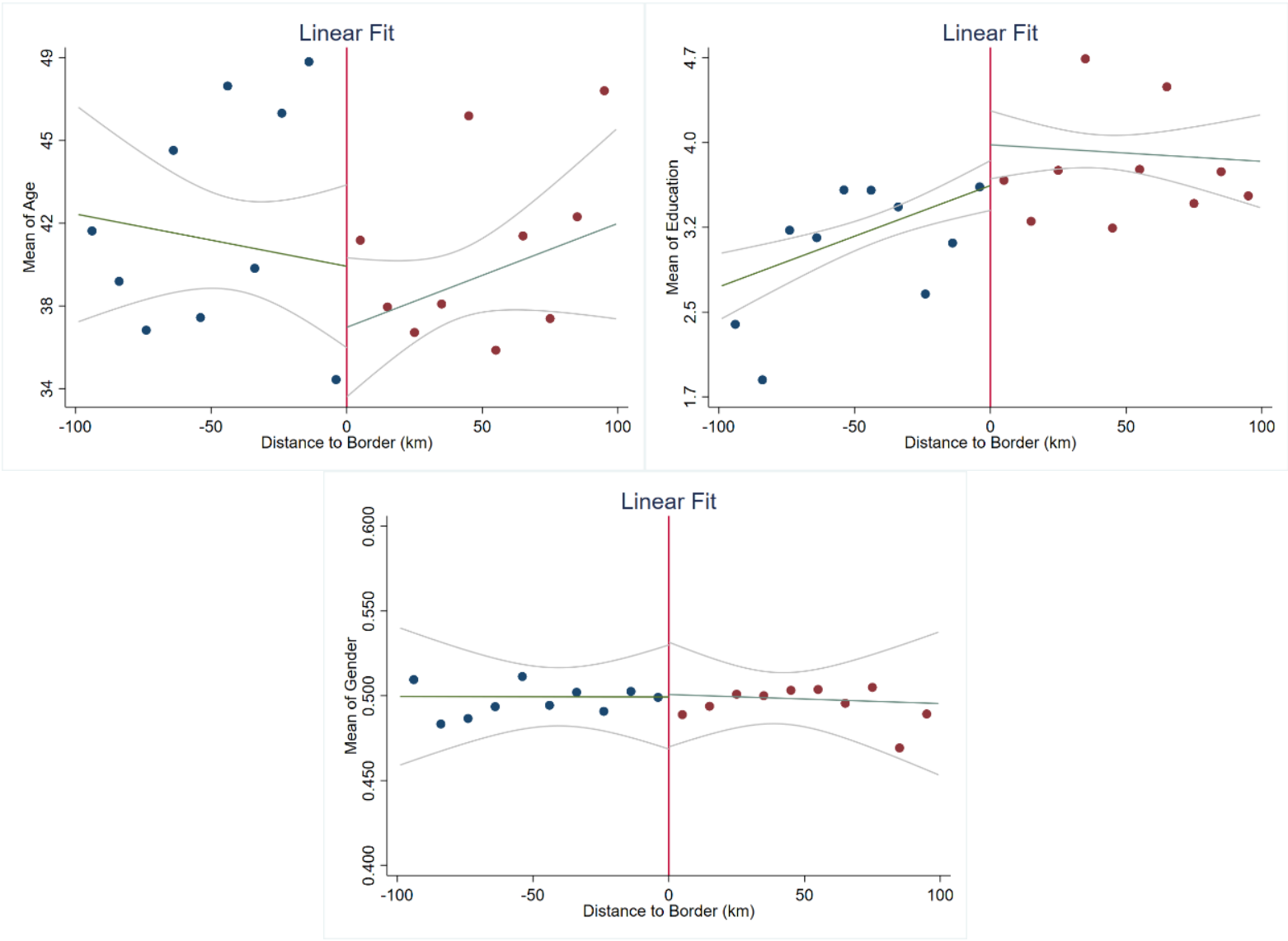
Notes: The vertical line denotes the cutoff. The solid lines represent linear/quadratic fits on each side of the cutoff age with 95% confidence intervals. The bandwidth is 100km. The points are observations divided into bins (10km each). Data source: Afrobarometer round 6, BenYishay et al. (2017).

Figure 2: Effects of Segmentary Lineage on Female Political Leadership



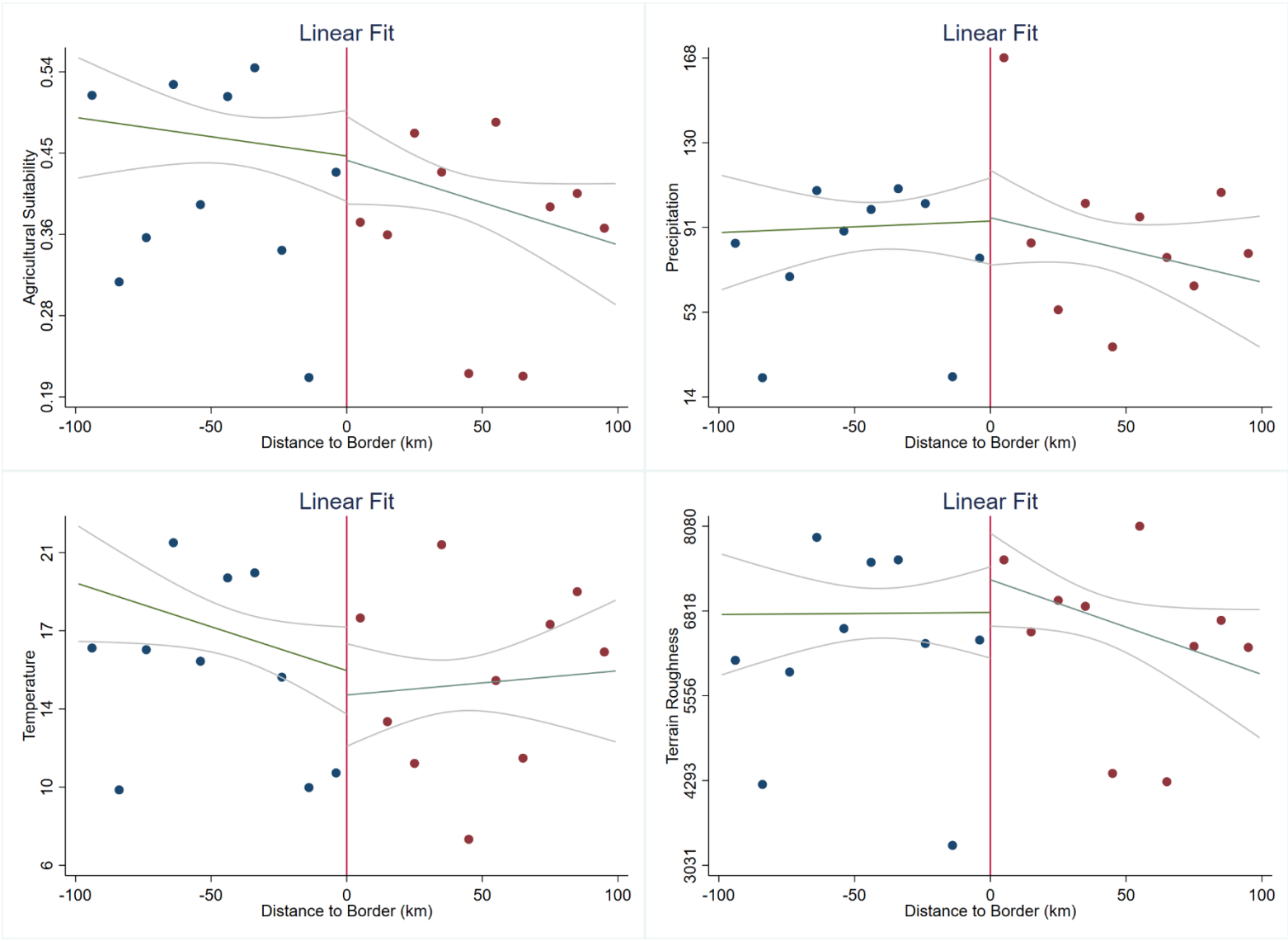
Notes: The figure shows the distribution of villages around the SL and non-SL cutoff. The vertical line denotes the cutoff. A non-parametric regression is plotted for each half of the distribution, testing for a discontinuity at zero (McCrary, 2008). The point estimate for the discontinuity is -0.3486, the standard error equals 0.2420. Data source: Afrobarometer round 6, BenYishay et al. (2017).

Figure 3: Effects of Segmentary Lineage on Pre-determined Variables



Notes: The panels show the effects of SL on three pre-determined variables: age, education, and gender. The vertical line denotes the cutoff. The solid lines represent linear fits on each side of the cutoff age with 95% confidence intervals. The bandwidth is 100km. The points are observations divided into bins (10km each). Data source: Afrobarometer round 6, BenYishay et al. (2017).

Figure 4: Effects of Segmentary Lineage on Pre-determined Geographical Variables



Notes: The panels show the association of segmentary lineage with agricultural suitability, precipitation, temperature, and terrain roughness, respectively. The vertical line denotes the border cutoff. The solid lines represent linear fits on each side of the the border, with 95% confidence intervals. The bandwidth is 100km. The plotted points are observations divided into bins (10km each). The number of observations is 756 villages. Data sources: BenYishay et al. (2017); Beck and Sieber (2010); Fick and Hijmans (2017); FAO (2012).

Table 1: Segmentary lineage and attitudes to female political leadership

	Attitude to female political leadership					
	(1)	(2)	(3)	(4)	(5)	(6)
Segmentary lineage	0.184***	0.133***	0.128***	0.038***	0.028***	0.026***
	(0.039)	(0.040)	(0.045)	(0.008)	(0.008)	(0.009)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Afrobarometer round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	No	Yes	Yes	No	Yes	Yes
Geographic controls	No	No	Yes	No	No	Yes
Observations	30,219	30,219	30,219	30,219	30,219	30,219
R^2	-	-	-	0.050	0.071	0.072
Oster's δ	-	-	-	-	-2.07	-1.85
Method of estimation	Logit	Logit	Logit	OLS	OLS	OLS
Mean of sample	0.702	0.702	0.702	0.702	0.702	0.702

Notes: This table presents baseline estimates of attitude of female political leadership on segmentary lineage. Logit estimations are provided in columns (1) – (3), and OLS in columns (4) – (6). Individual controls are age, age squared, education, and gender. Geographic controls are agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Regression discontinuity results

	Attitude to female political leadership			
	(1)	(2)	(3)	(4)
Segmentary lineage	0.0794*	0.0801#	0.0861**	0.151**
	(0.0422)	(0.0541)	(0.0287)	(0.0743)
Bandwidth (km)	-100 to 100	-100 to 100	-150 to 150	-150 to 150
First order polynomial	Yes	No	Yes	No
Second order polynomial	No	Yes	No	Yes
Ethnicity FE	Yes	Yes	Yes	Yes
Observations	7,275	7,275	8,905	8,905
R^2	0.055	0.058	0.054	0.055

Notes: This table presents regression discontinuity estimates of attitude of female political leadership on segmentary lineage. Individual controls are age, age squared, education, and gender. Geographic controls are agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Standard errors are clustered on (64) ethnicities, reported in parentheses. # < 0.15, * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 3: The conflict mechanism

	Log deadly conflicts	Attitude to female political leadership	Log conflict deaths	Attitude to female political leadership
	(1)	(2)	(3)	(4)
Segmentary lineage	1.634***	0.051	2.501***	0.079
	(0.025)	(0.052)	(0.039)	(0.050)
Log deadly conflict (ACLED)		0.048***		
		(0.016)		
Log conflict deaths (UCDP-GED)				0.020**
				(0.009)
Country FE	Yes	Yes	Yes	Yes
Afrobarometer round FE	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Observations	30,219	30,219	30,219	30,219
Mean of sample	0.738	0.072	0.721	0.072
Method of estimation	OLS	Logit	OLS	Logit

Notes: Columns (1) and (3) provide OLS estimates, and columns (2) and (4) provide logit estimates. Individual controls are age, age squared, education, and gender. Geographic controls are agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Controlling for spatial spillovers

	Attitude to female political leadership		
	(1)	(2)	(3)
Segmentary lineage	0.0382***	0.0285***	0.0295***
	(0.00821)	(0.00817)	(0.00872)
$\sum_{k \in K} I_k^{SL}$	Yes	Yes	Yes
$\sum_{k \in K} I_k^{Non-SL}$	Yes	Yes	Yes
Individual controls	No	Yes	Yes
Geographic controls	No	No	Yes
Observations	30,221	30,221	30,221
R^2	0.050	0.071	0.071

Notes: This table presents OLS estimates. Individual controls are age, age squared, education, and gender. Geographic controls are agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Historical controls

	Attitude to female political leadership					
	(1)	(2)	(3)	(4)	(5)	(6)
Segmentary lineage	0.181***	0.178***	0.306***	0.186***	0.428***	0.752***
	(0.060)	(0.063)	(0.092)	(0.061)	(0.128)	(0.264)
Traditional plough use	-0.192					0.400
	(0.153)					(0.770)
Agricultural suitability		0.318***				0.756
		(0.098)				(0.483)
Tropical climate		0.000				0.000
		(.)				(.)
Presence of large		0.182				0.532***
animals		(0.120)				(0.206)
Political hierarchies		0.039				-0.288**
		(0.028)				(0.126)
Economic complexity		-0.007				-0.205***
		(0.023)				(0.070)
Females in agriculture			-0.173**			-0.931*
			(0.084)			(0.509)
Major crop: cereal				0.149*		1.215**
				(0.080)		(0.595)
Political succession:					-0.138	-1.190***
matrilineal					(0.091)	(0.245)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Afrobarometer round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,763	23,657	16,611	23,763	15,648	13,425
Mean of sample	0.709	0.710	0.710	0.709	0.704	0.704

Notes: This table presents logit estimates. Individual controls are age, age squared, education, and gender. Geographic controls are ruggedness, river dummy, mean temperature, and mean elevation of ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

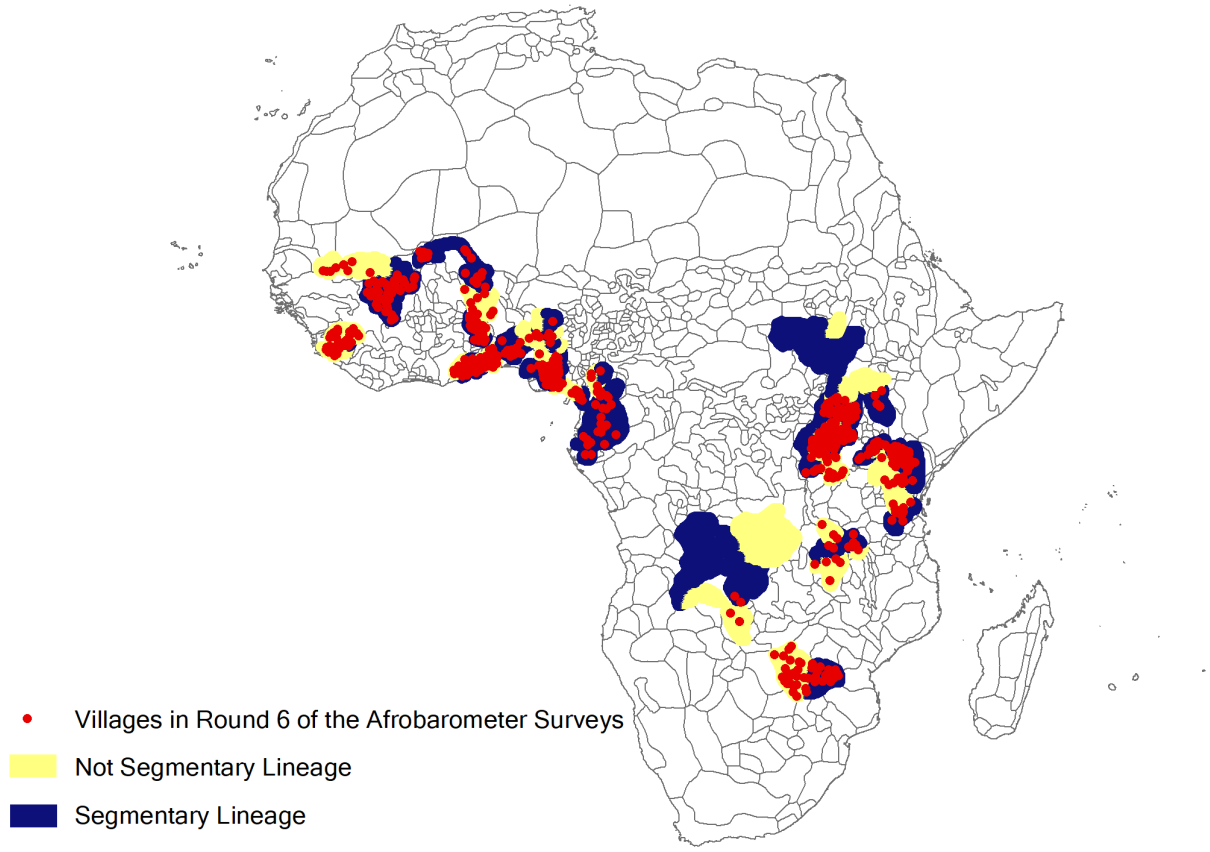
Table 6: Contemporary controls

	Attitude to female political leadership			
	(1)	(2)	(3)	(4)
Segmentary lineage	0.102**	0.125***	0.127***	0.102**
	(0.045)	(0.046)	(0.045)	(0.047)
Christian missions	0.386***			0.412***
	(0.054)			(0.057)
Islam majority religion	-0.123*			-0.167**
	(0.074)			(0.083)
Nightlights, log		0.002		0.000
		(0.055)		(0.068)
Nightlights variation, log		-0.059		0.074
		(0.069)		(0.081)
Petroleum presence			0.027	0.001
			(0.068)	(0.085)
Country FE	Yes	Yes	Yes	Yes
Afrobarometer round FE	Yes	Yes	Yes	Yes
Individual's controls	Yes	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes	Yes
Observations	30,219	30,219	28,321	28,321
Mean of sample	0.702	0.702	0.697	0.697

Notes: This table presents logit estimates. Individual controls are age, age squared, education, and gender of the respondents. Geographic controls are ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

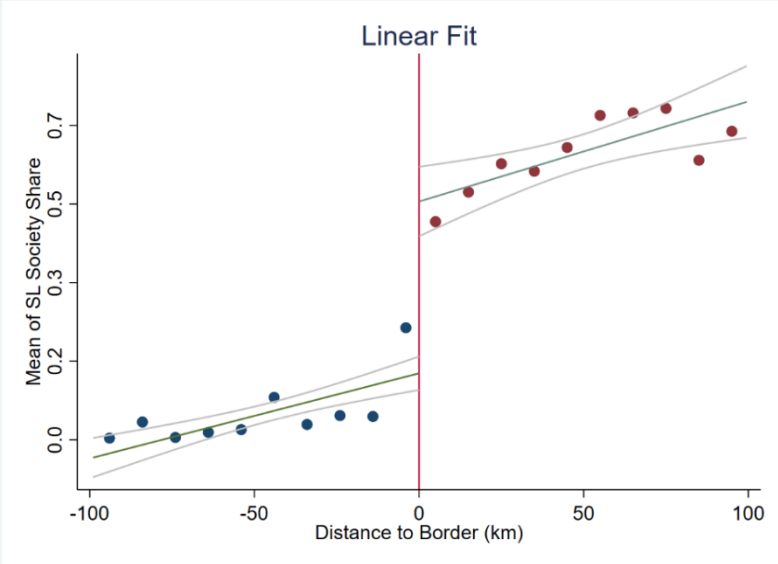
APPENDIX A: FIGURES

Figure A1: Segmentary lineage organization: ethnic groups and villages



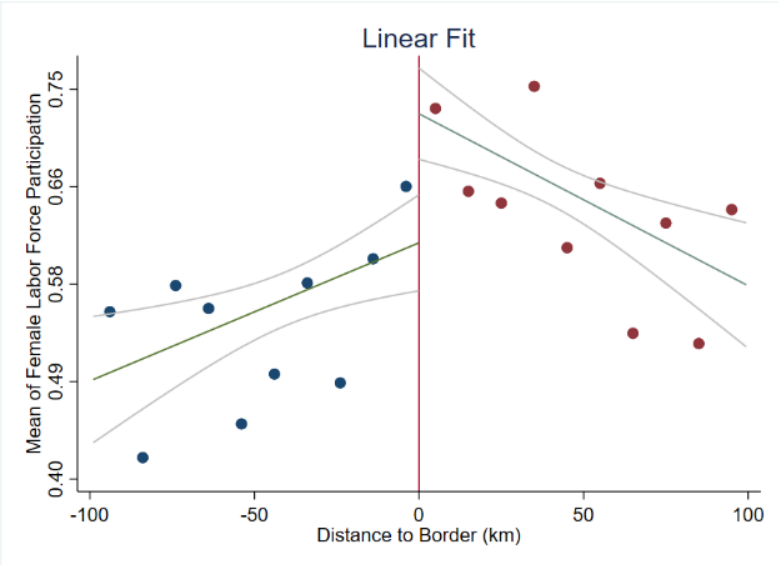
Notes: This map shows locations of villages in round 6 of the Afrobarometer and the presence or absence of segmentary lineage organization. The boundaries are for ethnic groups included in the *Ethnographic Atlas* (Murdock, 1967).

Figure A2: The relationship between self-reported ethnicity and geographic location



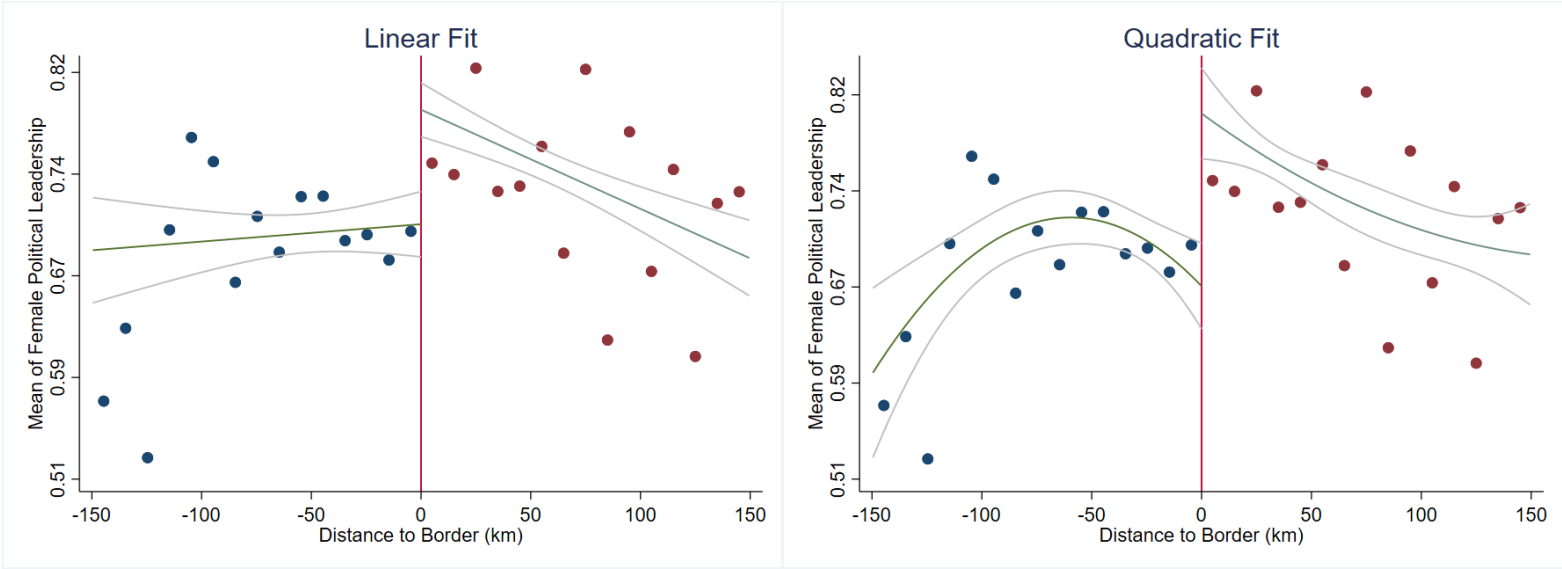
Notes: This figure is a replication of Moscona et al. (2020). The vertical line denotes the cutoff. The solid lines represent linear fits on each side of the border line with 95% confidence intervals. The bandwidth is 100km. The points are observations divided into bins (10km each). Data sources: Moscona et al. (2020); Afrobarometer round 6, BenYishay et al. (2017).

Figure A3: Effects of Segmentary Lineage on Female Labor Force Participation



Notes: The vertical line denotes the cutoff. The solid lines represent linear fits on each side of the cutoff with 95% confidence intervals. The bandwidth is 100km. The points are observations divided into bins (10km each). Data source: Afrobarometer round 6, BenYishay et al. (2017).

Figure A4: Using 150km Bandwidth



Notes: The vertical line denotes the cutoff. The solid lines represent linear/quadratic fits on each side of the cutoff age with 95% confidence intervals. The bandwidth is 150km. The points are observations divided into bins (10km each). Data source: Afrobarometer round 6, BenYishay et al. (2017).

APPENDIX B: SPATIAL ANALYSIS

Table B1: Z-value of Moran's I

	Attitude to female political leadership		
	Moran's I	z	p-value
Residual	-0.000	-1.183	0.118

Notes: This table presents Z-value of Moran's I.

Table B2: Spatial noise simulations

Correlation range	Spatial noise as explanatory variable			Spatial noise as dependent variable		
	P=0.01	P=0.001	P=0.0001	P=0.01	P=0.001	P=0.0001
	(1)	(2)	(3)	(4)	(5)	(6)
1	0.01	0.00	0.00	0.02	0.00	0.00
2	0.01	0.00	0.00	0.06	0.03	0.00
3	0.02	0.00	0.00	0.10	0.05	0.02
4	0.02	0.00	0.00	0.17	0.08	0.04
5	0.03	0.00	0.00	0.14	0.06	0.03

Notes: This table presents simulation estimates. Individual-level observations are aggregated to the regional level. The numbers represent the ratios of significant estimates for difference correlation ranges at different significant levels.

Table B3: Spatial-autoregressive model

	Attitude to female political leadership		
	(1)	(2)	(3)
Segmentary lineage	0.0378***	0.0294***	0.0283***
	(0.00804)	(0.00809)	(0.00884)
Individual controls	No	Yes	Yes
Geographic controls	No	No	Yes
Observations	30,221	30,221	30,221

Notes: Individual controls are age, age squared, education, and gender. Geographic controls are agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B4: Segmentary lineage and female labor force participation

Female labor force participation			
	(1)	(2)	(3)
Segmentary lineage	0.033***	0.0312***	0.0360***
	(0.011)	(0.0113)	(0.0111)
Country FE	Yes	Yes	Yes
Afrobarometer round FE	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes
$\sum_{k \in K} I_k^{SL}$		Yes	
$\sum_{k \in K} I_k^{Non-SL}$		Yes	
Observations	17,864	17,864	17,864
R^2	0.29	0.295	-
Method of estimation	OLS	OLS	SAM

Notes: OLS is used in columns (1) and (2) and a spatial-autoregressive model in column (3). Individual controls are age, age squared, education, and gender. Geographic controls are agricultural suitability, ruggedness, river dummy, mean temperature, and mean elevation of the ethnic homeland. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

APPENDIX C: VARIABLES AND DATA SOURCES

Table C1: Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
Attitude to female political leadership	30,219	0.70	0.48	0.00	1.00
Segmentary lineage	30,219	0.50	0.50	0.00	1.00
Deadly conflict incidents, log	30,219	32.41	15.92	1.00	130.00
Conflict deaths, log	30,219	3.83	2.30	0.00	11.00
Age	30,219	1.73	0.64	1.00	3.00
Education	30,219	6.20	1.32	0.00	9.00
Gender	30,219	31.01	20.87	3.34	79.06
Agricultural suitability	30,219	0.79	0.41	0.00	1.00
Ruggedness	30,219	24.01	3.22	14.69	29.40
River dummy	30,219	0.38	0.34	0.01	1.68
Temperature	30,219	2.67	1.58	0.00	6.69
Elevation	30,219	3.13	2.84	0.00	13.08
Traditional plough use	23,763	0.02	0.13	0.00	1.00
Agricultural suitability	25,661	0.76	0.29	0.00	1.00
Tropical climate	25,661	1.00	0.00	1.00	1.00
Presence of large animals	23,763	0.98	0.16	0.00	1.00
Political hierarchies	23,763	2.69	0.96	1.00	4.00
Economic complexity	23,657	6.32	1.25	1.00	8.00
Females in agriculture	16,611	0.67	0.47	0.00	1.00
Major crop: cereal	23,763	0.64	0.48	0.00	1.00
Political succession: matrilineal	15,648	0.20	0.40	0.00	1.00
Christian missions	30,219	0.82	0.39	0.00	1.00
Islam majority religion	30,219	0.20	0.40	0.00	1.00
Nightlights, log	30,219	0.55	0.58	0.00	3.52
Nightlights variation, log	30,219	2.03	0.61	0.00	4.47
Petroleum presence	28,321	0.12	0.32	0.00	1.00
Female labor force participation	16,611	0.67	0.47	0.00	1.00

Table C2: Variable definitions and sources

Segmentary lineage: A society is defined as having segmentary lineage if the following three characteristics are present in the society: (i) there is a recognized and known unilineal descent system; (ii) segments of the lineage take a "corporate form," meaning that they are sub-units that affect administrative functions and political positions; and (iii) lineages and genealogical relationships influence one's location of residence. Source: Moscona et al. (2020).

Attitude to female political leadership: "Do you agree or disagree with the following statements? Political leadership. Statement 1: "Men make better political leaders than women, and should be elected rather than women," versus Statement 2: "Women should have the same chance of being elected to political office as men." Responses can take values 1 = agree very strongly with statement 1, 2 = agree with statement 1, 3 = agree with neither, 4 = agree with statement 2, 5 = agree strongly with statement 2. Source: Afrobarometer rounds 3, 5, 6, and 7; BenYishay et al. (2017).

Age: Age of the respondent. Source: Afrobarometer rounds 3, 5, 6, and 7; BenYishay et al. (2017).

Gender: Gender of the respondent. Source: Afrobarometer rounds 3, 5, 6, and 7; BenYishay et al. (2017).

Education: The highest level of education completed. 0 = no formal schooling; 1 = informal schooling only (including Koranic schooling); 2 = some primary schooling; 3 = primary school completed; 4 = some secondary school/high school; 5 = secondary school completed/high school completed; 6 = post-secondary qualifications, other than university, e.g. a diploma or degree from a polytechnic or college; 7 = some university; 8 = university completed; 9 = post graduate. Source: Afrobarometer rounds 3, 5, 6, and 7; BenYishay et al. (2017).

Traditional plough use: The estimated proportion of citizens with ancestors that used the plough in pre-industrial agriculture. The variable ranges from 0 to 1. Source: Alesina et al. (2013).

Agricultural suitability: The fraction of land suitable for the cultivation of barley, wheat, rye, sorghum, foxtail millet, or pearl millet is used to calculate the average suitability of the land within 200 kms of the centroid of an ethnic group's historical location. Based on information from the FAO's Global Agro-Ecological Zones (GAEZ) v3.0 database. Source: FAO (2012), Alesina et al. (2013).

Tropical climate: The proportion of land within a 200 km radius of an ethnic group's centroid that is classified by the GAEZ 2002 database as being either tropical or subtropical. Source: FAO (2012), Alesina et al. (2013).

Presence of large animals: The variable codes the type of animal husbandry practiced into seven categories, 0-6: absence of large domesticated animals; pigs are the only large animals; presence of sheep and/or goats without any

larger domesticated animals; presence of equine animals; presence of deer; presence of camels, alpacas or llamas; and presence of bovine animals. Source: Alesina et al. (2013).

Political hierarchies: The number of jurisdictional hierarchies in a society. The variable takes on the values of 1 to 5, with 1 indicating no levels of hierarchy beyond the local community and 5 indicating four levels. Source: Alesina et al. (2013).

Economic complexity. Each ethnic group's settlement pattern is categorized into categories, taking values 1-8: nomadic or fully migratory, semi-nomadic, semi-sedentary, compact but temporary settlements, neighborhoods of dispersed family homes, separated hamlets forming a single community, compact and relatively permanent, complex settlements. Source: Alesina et al. (2013).

Income in 2000: per-capita GDP in 2000 from the World Bank WDI. Source: Alesina et al. (2013).

Mean temperature: Average daily temperature (degrees Celsius) measured between 1950 and 1959. Source: Terrestrial Air Temperature and Precipitation: 1900-2006 Gridded Monthly Time Series, Version 1.10.

Elevation: The average elevation of a country, in thousands of kms above sea level, calculated using geospatial data at a 1-degree resolution. Source: G-ECON (2008).

Ruggedness: The calculation for ruggedness takes a point on the earth's surface and measures the difference in elevation between this point and each of the eight major directions of the compass (north, northeast, east, southeast, south, southwest, west, and northwest). The index at the central point is given by the square root of the sum of the squared differences in elevation between the central point and the eight adjacent points. Source: Nunn and Puga (2012).

Major crop: cereal: Indicates that cereals are the major crops cultivated. Source: Murdock and White (1969).

Females in agriculture: Traditional female relative to male participation in agriculture. Participation is grouped into five categories: (1) males only; (2) males appreciably more; (3) equal participation (combines two categories: equal participation and differentiated but equal participation); (4) females appreciably more; and (5) females only. Sources: Murdock (1967); Murdock and White (1969).

River dummy: A dummy variable indicating the presence of a perennial river Source: Fenske (2014).

Matrilineal political succession: An indicator variable equal to 1 if succession to the office of local headman is determined by "matrilineal heir". I.e., variable v72 in the Ethnographic Atlas equals 2. Source: Murdock (1967).

Petroleum presence. An indicator variable equal to one if there is an oil field in the grid cell. Source: PRIO (2009).

Muslim majority. A dummy variable equal to 1 if the majority of an ethnic group's population is Muslim. Coded individually for each ethnic group. Source: WRD (2022).

Mission stations. The number of Catholic and Protestant mission stations in each grid cell calculated using a digitized geo-coded map. Source: Nunn (2010), Roome (1925).

Deadly conflicts incidents: Number of deadly conflict incidents 1997-2014. A deadly conflict is defined as a conflict incident with at least one battle death. Source: Armed Conflict Location and Event Data Project (ACLED) and Moscona et al. (2020). Available at https://www.acleddata.com.

Number of deaths in conflicts: Number of conflict deaths 1997-2014. Source: Armed Conflict Location and Event Data Project (ACLED). Available at https://www.acleddata.com.

Uppsala Conflict Data Program (UCDP): The location, date, and other characteristics of conflict events beginning in 1989. Only include conflict events with at least one associated fatality. Source: UCDP (2022).

Agricultural Suitability – village level: Maximum entropy modelling (Maxent) and a variety of agro-ecological data are used to calculate agricultural suitability. The result of the Maxent models is interpreted as the probability of occurrence of agriculture. Source: Beck and Sieber (2010).

Precipitation – village level: Average June precipitation, 1970-2000. Source: WorldClim 2.1, Fick and Hijmans (2017). Available at http://worldclim.org.

Temperature – village level: Average June temperature, 1970-2000. Source: WorldClim 2.1, Fick and Hijmans (2017). Available at http://worldclim.org.

Terrain Roughness (Terrain Slope Index) – village level: Terrain slope from Global Agro-Ecological Zones (GAEZ). Source: FAO (2012).