Transhuman Pastoralism, Climate Change and Conflict in Africa

Online Appendix (Not for Publication)

Appendix A. Additional Data Details

A. Conflict Data

For ACLED and UCDP, we use as consistent a coding procedure as possible so that, in the end, the primary difference between the two measures is the lower barrier to entry in ACLED.

UCDP Conflict Variables We first assign conflict events to a grid cell by identifying the nearest cell centroid to the geographic coordinates provided for each event in UCDP. We generate three indicator variables as follows:

- I(Any): Any event.
- I(State): Any event involving the state. These are events for which the "type_of_violence" variable in the UCDP dataset is "state-based conflict" (i.e., equal to 1) or for which it is "one-sided violence" (i.e., equal to 3) and Side A is a state (i.e., "gwnoa" variable is nonmissing.)
- I(Non-State): Any event not involving the state. These are events for which the "type_of_violence" variable in the UCDP dataset is "non-state conflict" (i.e., equal to 2) or for which it is "one-sided violence" (i.e., equal to 3) and Side A is not a state (i.e., "gwnoa" variable is missing.)

Thus, for UCDP, the categories are off-the-shelf but for one adjustment. We combine one-way and two-way events for our measures of state conflict and non-state conflict.

Source Sundberg and Melander (2013).

ACLED Conflict Variables We first assign conflict events to a grid cell by identifying the nearest cell centroid to the geographic coordinates provided for each event in ACLED. To match the UCDP measure as closely as possible, we limit the conflict "event types" from the ACLED data to battles (i.e., event_type = "Battles") and violence against civilians (i.e., event_type = "Violence against civilians").

We do not include the non-violent actions / "strategic developments" (e.g., disrupted weapons use, non-violent transfer of territory, etc.) or "demonstrations" (e.g., protests and riots) categories. Within the "violent events" category, we omit "explosions/remote violence," which includes chemical weapons, air strikes, bombs, and shelling. The remaining subcategories within the "violent events" category are "battles" and "violence against civilians", which are analogous respectively to the two-sided and one-sided events in the UCDP data. Our results are almost identical when we allow for broader definitions of conflict events.

We then separate events by the actors involved in a way that mimics the UCDP definitions:

- I(Any): Any event.
- I(State): Any event involving the state, i.e., with interaction codes that either begin or end with a 1.

- I(Non-State): Any event not involving the state, i.e., with interaction codes that neither begin nor end with 1.

Source Raleigh et al. (2010).

Jihadist Conflict Variable The jihadist conflict variable is equal to 1 for UCDP events where:

- any of the words "jihad" or "Jihad" or "Islamic State" or "Boko Haram" is contained in any of the following strings: conflict_name, dyad_name, side_a, side_b, source_article, or source_headline; or
- any the following UCDP groups are contained in the side_a or side_b strings: Islamic State ("IS"), Al-Qaeda in the Islamic Maghreb ("AQIM"), Movement for Oneness and Jihad in West Africa ("MUJAO"), Benghazi Revolutionaries Shura Council, Ansar Dine, Ansaroul Islam, Mujahideen, Signed-in-Blood Battalion, Ansar al-Sharia in Libya ("ASL"), al-Murabitun, Macina Liberation Front ("FLM"), Jama'at Nasr al-Islam wal Muslimin ("JNIM"), Ansar al-Sunnah, Derna Protection Force ("DPF"), Al-Shabaab ("Shabaab"), Al Qaida ("Qaeda" or "Qaida").

Source Sundberg and Melander (2013).

B. Transhumant Pastoralism Data

The measure of transhumant pastoralism is constructed using three variables from the *Ethnographic Atlas*. This process is described in detail in the main text.

- We first create a measure of mobility using variable "v30," which describes settlement patterns. The categories for this variable are as follows: (1) nomadic or fully migratory; (2) seminomadic; (3) semisedentary; (4) compact but impermanent settlements; (5) neighborhoods of dispersed family homes; (6) separated hamlets; (7) compact and relatively permanent; and (8) complex settlements. We create two indicator variables that allow for two definitions of transhumance: a 'narrow' definition that includes only groups that are 'nomadic or fully migratory' or 'seminomadic' and a 'broad' definition that also includes groups that are 'semisedentary' or have 'compact but impermanent settlements.' The variants differ in whether groups that are semi-mobile are coded as being transhumant or not.
- We then create an index based on variable "v4," which measures an ethnic group's traditional dependance on animal husbandry for subsistence. The original variable is a 10 point scale representing intervals from "0-5% dependence" at the lower end to "86-100% dependence" at the upper end. We take the midpoint of each range and divide by 100.
- We then use variable "v40" to create an indicator for whether or not the predominant type of animal was suitable for herding. This is equal to 1 for "sheep and/or goats," "equine animals," "camels, alpacas, or llamas," and "bovine animals." It is equal to 0 for the absence or near absence of large domesticated animals and for "pigs the only large animal."
- To generate our measure of transhumant pastoralism, we compute the product of these three variables, yielding a 9-point (narrow) or 11-point (broad) scale ranging from 0 to 0.92.

Source The *Ethnographic Atlas* variables are from Murdock (1967). We assign these values to territories using the map in Murdock (1959) using a matching procedure described in Kincaide et al. (2020).

C. Rainfall and Phytomass Data

Rain Variable The rainfall variable is from the *GPCC Full Data Monthly Product Version 2020 at 0.5°: Monthly Land-Surface Precipitation from Rain-Gauges built on GTS-based and Historical Data*. The variable measures monthly average precipitation in a cell. We build a variable measuring annual average precipitation in cm/month.

Source Schneider et al. (2020).

Phytomass Variable The phytomass variable is from the *Copernicus Global Land Service*, which is Europe's flagship Earth observation program. The variable we use is "Dry Matter Productivity" measured at the 1km level. This is measured monthly in kilograms of dry matter per hectare per day (kgDM/ha/day). We build a variable measuring the annual average in kgDM/ha/day.

Source Copernicus (n.d.).[A1]

D. Temperature and Population Data

Temperature The variable for temperature is originally from Fan and van den Dool (2008). We take the variable directly from the PRIO-GRID v.2.0. It measures the annual average temperature in a cell in degrees Celsius.

Population The variable for population is originally from CIESIN and CIAT (2005). We take the variable "pop_gpw_sum" directly from the PRIO-GRID v.2.0. It measures the number of persons in a cell at a given year. In our analysis, we take the log of this value in 1990.

Source (Tollefsen, Strand and Buhaug, 2012).

E. Religion Data

The variables *Share Muslim* and *Share Christian* measure the estimated share of people in each ethnic group that are Muslims or Christians respectively in 2020.

The variables are constructed using data from the *World Religion Database*, which reports information on the populations of 18 religions for each language group in the world. The data are reported with Ethnologue identifiers which we match to Ethnographic Atlas groups. Since multiple Ethnologue groups often match to one Ethnographic Atlas group, we create Ethnographic Atlas group-level measures by taking population-weighted averages across all Ethnologue groups that match to an Ethnographic Atlas group.

Source Johnson and Grim (2021).

F. Foreign Aid and Conservation Area Data

Foreign Aid The dataset used to construct the aid variables is originally from AidData (2017) and is updated in Tierney et al. (2011). The variable *Total Agricultural Aid* measures the cumulative agricultural development aid project locations in a country as of a given year, divided by the number of cells in

[A1] Note, there is no DOI or recommended citation for this source, as far as the authors are aware.

that country. We define agricultural projects as those for which the word "Agriculture" is present in the crs_sector_name string. The variable *Total Non-Agricultural Aid* is the analogous measure of all other project locations.

The aid project subtypes used in Tables A17 and A18 are similarly constructed. The following are the search terms for each respective variable: "irrigat" (Irrigation), "forest" (Forestry), "conserv" (Conservation), and "land" or "tenure" or "titling" (Land). For all subtypes, we search within the following strings: short_description, long_description, aiddata_sector_name, aiddata_purpose_name, aiddata_activity_names, crs_sector_name, crs_purpose_name, and coalesced_purpose_name.

Source Tierney et al. (2011) and AidData (2017).

Conservation Area Data We use data from the *Protected Planet* database to measure, in a given year, the share of land area in each country that is under either protected status (from the World Database on Protected Areas) or conservation status (World Database on Other Effective Area-Based Conservation Measures). We also create a measure at the level of an ethnic-group and country pair, which allows us to create the variables used in Table A19: *Share Protected Area in Ethnicity e of Country c* and *Share Protected Area Outside of Ethnicity e in Country c*.

Source UNEP-WCMC and IUCN (2021).

G. Political Power

We build the variable *THP Power Share* using data from the *Ethnic Power Relations* (EPR) dataset. The process of constructing the variable is described in detail in Section 7C of the main text.

Before constructing the variable, we match each of the 684 African groups in the EPR to one ethnic group used in our analysis. We link these either directly by name or indirectly by using the methods described in Kincaide et al. (2020)—which were developed to match groups from the Murdock map (Murdock, 1959) to groups in the *Ethnographic Atlas* (Murdock, 1967)—as well as other online sources (such as Wikipedia).

The EPR documents the nature of political power held by ethnic groups. We use this information to construct a measure of the total amount of political power held by an ethnic group e in country c in year t, which we denote by $Power_{ect}$. The categories, and their numerical values, are given by: (0) Fully excluded from politics (self exclusion or discrimination); (1) Powerless; (2) Junior partner in government; (3) Senior partner in government; (4) Dominant power; and (5) Monopoly power.

To measure the share of total political power in a country that is held by transhumant pastoral groups, we first measure the total amount of political power in country c in year t by aggregating the power held by all ethnic groups e: $\sum_e Power_{ect}$. We then measure the amount of power held by transhumant pastoral groups by: $\sum_e TranshumantPastoral_e \times Power_{ect}$.[A2] The share of power held by transhumant pastoral groups in a country and year is then:

$$Power_{ct}^{THP} = \frac{\sum_e TranshumantPastoral_e \times Power_{ect}}{\sum_e Power_{ect}}.$$

Source Cederman et al. (2010).

[A2] We use the broad measure of transhumant pastoralism for this calculation. This decision does not affect the estimates.

H. Control Variables

Ethnicity Characteristics The ethnicity level characteristics in Table A6 are taken directly from the *Ethnographic Atlas* (EA), with the exception of the segmentary lineage variable, which is taken from Moscona et al. (2020). The jurisdictional hierarchy variable is from "v33" in the EA and the high gods indicators are from "v34" in the EA.

Source Murdock (1967) and Moscona et al. (2020).

Commodity Prices The commodity price variables used in Table A8 are from the World Bank's "Pink Sheet" of annual commodity price data. We use indices published in the "Annual Indices (Real)" tab, which contains real price indices for various commodity groups.

Source World Bank (2021)

I. Phytomass Suitability Index

Phytomass Suitability Index in Table A10 This is composed of the predicted values from a regression of the form: $Phytomass_{it} = \alpha^r + \lambda^r Rain_{it} + e^r$.

Phytomass Suitability Index in Table A11 This is composed of the predicted values from a regression of the form: $Phytomass_{it} = \alpha^{rr} + \lambda_1^{rr} Rain_{it} + \lambda_2^{rr} Rain_{it} \times Rain_{it} + e^{rr}$.

J. Variable aggregations and transformations and sample delineations

Ethnic Group Aggregation Rain, phytomass, and temperature variables at the level of an ethnic group are given by the average value across the group's constituent cells. A cell is considered part of an ethnic group if its centroid is located within the group's boundaries.

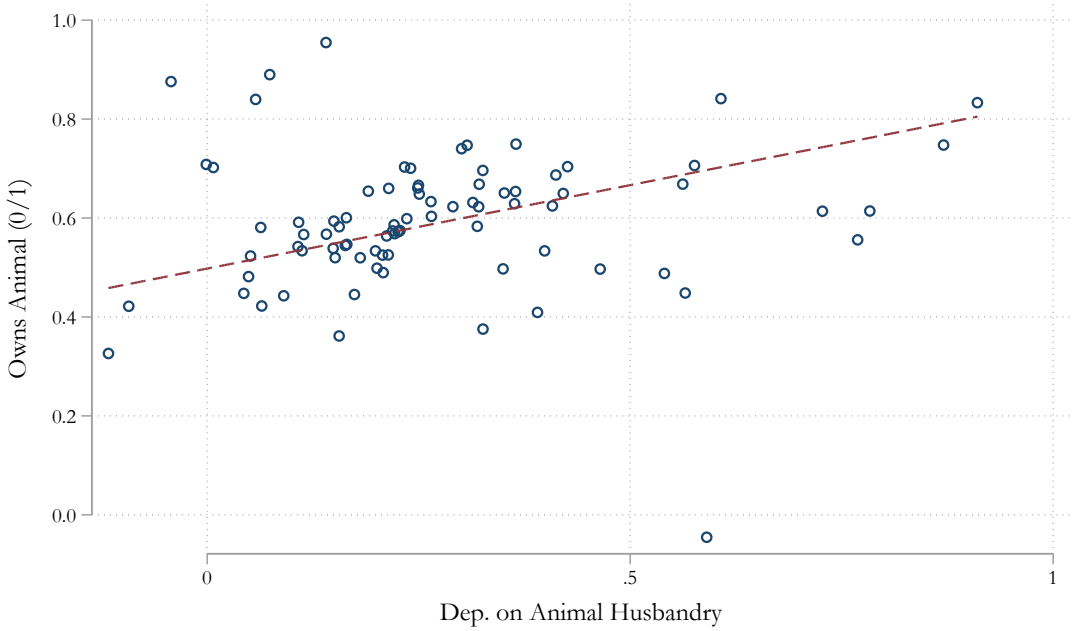
Nearest Neighbor A cell's "nearest neighbor" is the ethnic group that is closest by distance to the cell's centroid among all ethnic groups that are contiguous neighbors of the ethnic group in which the cell is nested.

Note: ethnic groups in the Murdock map do not feature among "Own Group" ethnicities (i.e., with subscript 'e') if no cell's centroid lies within its boundaries. However, these groups may still feature among "Nearest Neighbor" ethnicities provided they meet the condition above. For these groups, we assign weather variables using information on the cell whose centroid is closest to the group's boundary.

Seasons We define a cell's wet (i.e., growing) season and dry season using data from the MIRCA2000 global dataset (Portmann et al., 2010). This process is defined in detail in Section 6 under the heading "Test 5".

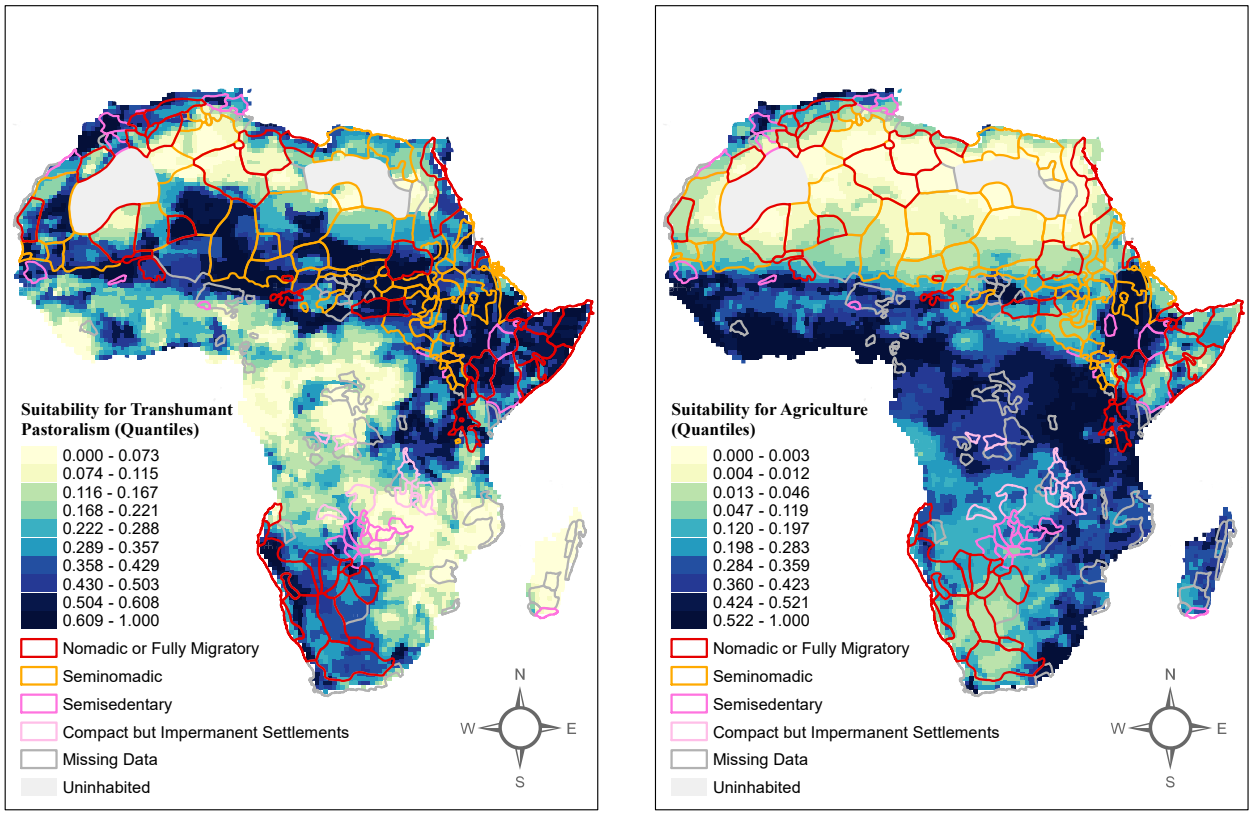
Agricultural Cells We define agricultural cells as those which are nested in ethnic groups whose traditional reliance on agriculture is greater than 35%. Non-agricultural cells are those where traditional reliance is between 0-35%. This is based on variable "v5" of the *Ethnographic Atlas* (Murdock, 1967).

Appendix Figures



Notes: Partial correlation bin-scatter plot conditioning on country FEs. Coef. = 0.34; p-val. = 0.000; N = 437,013; Std Beta Coef. = 0.10.

Figure A1: Binscatter partial correlation plot showing the relationship between current pastoralism (in the DHS) and our constructed measure of traditional transhumant pastoralism of the respondent's ethnic group using data from Bahrami-Rad et al. (2021) and conditional on country fixed effects.



(a) Suitability for transhumant pastoralism

(b) Suitability for sedentary agriculture

Figure A2: Ecological conditions and transhumant pastoralism

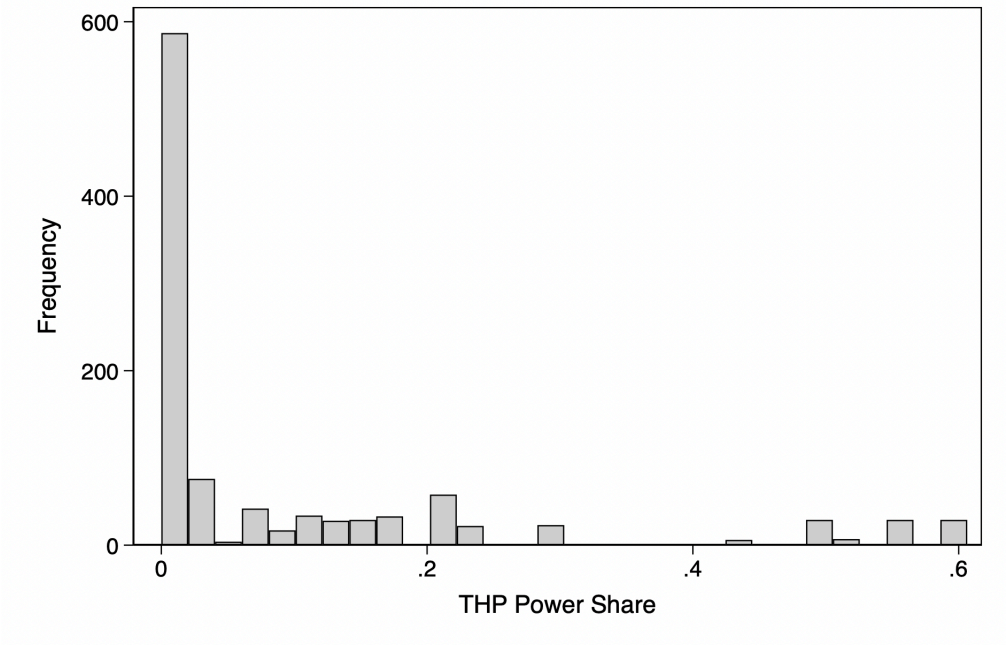


Figure A3: Histogram of power held by transhumant pastoral groups across countries and years

Appendix Tables

Table A1: Summary of Existing Information on Transhumant Pastoral Routes in Africa.

Reference for Study	Countries Studied	Method of Measurement	Number of Routes	Directions of Routes	Distance From Origin to Destination (km)	Avg Daily Distance (km)	Total Distance Covered (km)	Duration of Route (weeks)	Months of Transhumance Season
Dongmo, Vall, Diallo, Dugue, Njoya & Lossouarn (2012)	Cameroon (North)	Interview	2 (major-transhumance), 2 (minor-transhumance)	Major: 1 west, 1 south Minor: 1 north, 1 east	Major: 75-100 Minor: 40-75			10	Major: July to September Minor: February to April
Ayantunde, Asse, Said & Fall (2014)	Gambia, Guinea, Mali and Senegal (subhumid zone of West Africa)	Interview	7	South (main pattern)	Approx. 200			12-32	Dry season, 3-8 months (not specified in paper, but should be October to May)
Reeves (2014)	Cameroon (Tubah Uplands)	GPS and interviews	4	1 north, 2 southwest, 1 southeast				22	November-March
Turner, McPeak, Gillin, Kitchell, Kimambo (2016)	Senegal (East)	GPS and meetings with local leaders	4 (corridors instead of routes)	South (with several branches)	20-30		827-1,762 (length of each corridor)	28-32	October-May
Feldt & Schlecht (2016)	Madagascar (Southwest)	GPS	13	West	45	17.8		12-14	December to mid-April
Sulieman & Ahmed (2017)	Sudan (East)	Focus groups and GPS	3	North	66-290			12	Late July to October
Motta, Porphyre, Hamman, Morgan, Ngwa, Tanya, Raizman, Handel & Bronsvoort (2018)	Cameroon (central)	GPS	6	4 southwest, 1 south east, 1 northeast	53-170	3.23 - 4.14 (median)	633-763	26-32	October-May
Houessou, Dossa, Assogba, Diogo, Vanvanhossou & Schecht (2020)	Benin	Secondary data (Topographic MAP IGN, 1992; Wezel, 1999)	5	2 southwest, 2 east, 1 southeast				28-32	November-June
Zannou, Ouedraogo, Biguezoton, Lempereur, Yao, Abatih, Zoungrana, Lenaert, Toe, Fraougou & Saegerman (2020)	Benin (North)	GPS	4	3 south, 1 southwest				28	October-April
Feldt, Karg, Kadaoure, Besser & Schlecht (2020)	Cameroon (highlands)	GPS and map-based interviews	6	To lower altitude zones	18.4	9.2		12-16	Mid-December to mid-March/April

Notes: The table summarizes information from studies that measure transhumant pastoral routes in Africa.

Table A2: The Determinants of Phytomass Growth

	Phytomass		
	(1)	(2)	(3)
Rain	0.4151***		0.4092***
	(0.0357)		(0.0350)
Temp		-0.2223***	-0.2018***
		(0.0400)	(0.0383)
Share of RSS explained by weather variable(s) (in %)	3.63	0.61	4.13
F statistic	135.55	30.84	75.07
Effect of 1 Std. Dev. Shock as % of Dep. Var. Mean:			
Rain	1.63		1.61
p-value	[0.00]		[0.00]
Temp		-0.58	-0.53
p-value		[0.00]	[0.00]
Dep. Var. Mean	30.57	30.57	30.57
Cell FE	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes
Climate-Zone-Years	224	224	224
Cells	9,691	9,691	9,691
Observations	155,032	155,032	155,032

Note: This table presents phytomass (in kg/ha/day) as a function of rainfall (in cm/month) and temperature (in °C), conditional on cell fixed effects and country-by-year fixed effects. *RSS* refers to the residual sum of squares after partialling out the cell fixed effects and country-by-year fixed effects. Standard errors (in parentheses) are adjusted for serial correlation at the level of a cell and spatial correlation at the level of a climate zone. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Descriptive Statistics

	Mean	SD	Count	Min	Median	Max
	Cell-Year Level Variables, 1989-2018					
UCDP: I(Any Conflict), 0/1	0.03	0.18	290,730	0.00	0.00	1.00
UCDP: I(State Conflict), 0/1	0.02	0.15	290,730	0.00	0.00	1.00
UCDP: I(Nonstate Conflict), 0/1	0.02	0.12	290,730	0.00	0.00	1.00
ACLED: I(Any Conflict), 0/1	0.08	0.27	213,202	0.00	0.00	1.00
ACLED: I(State Conflict), 0/1	0.05	0.22	213,202	0.00	0.00	1.00
ACLED: I(Nonstate Conflict), 0/1	0.08	0.27	213,202	0.00	0.00	1.00
Precipitation, cm/month	5.65	5.14	290,730	0.00	4.38	49.28
Phytomass, kg/ha/day	30.69	30.35	193,820	0.01	23.44	141.11
Temperature, $^{\circ}C$	24.50	3.95	251,922	7.51	24.75	39.53
Nearest Neighbor Precipitation, cm/month	5.89	5.06	282,690	0.00	4.83	34.96
Nearest Neighbor Phytomass, kg/ha/day	31.90	29.77	188,460	0.18	25.77	130.71
Nearest Neighbor Temperature, $^{\circ}C$	24.44	3.79	244,998	12.20	24.65	37.12
Nighttime Lights, 0-1	0.04	0.03	203,511	0.00	0.03	0.96
	Cell Level Variables					
Nearest Neighbor Transhumant Pastoralism (Narrow Definition), 0-1	0.19	0.30	8,487	0.00	0.00	0.92
Nearest Neighbor Transhumant Pastoralism (Broad Definition), 0-1	0.21	0.30	8,487	0.00	0.00	0.92
B-S: Land Suitability for Transhumant Pastoralism, 0-1	0.32	0.20	9,421	0.00	0.29	0.90
B-S: Land Suitability for Agriculture, 0-1	0.24	0.20	9,421	0.00	0.22	0.88
ln(Population) in 1990	9.31	2.11	9,659	-0.69	9.61	16.01
	Ethnic-Group-Year Level Variables, 1989-2018					
Precipitation, cm/month	8.54	5.20	23,400	0.00	8.27	34.96
Phytomass, kg/ha/day	44.31	28.53	15,600	0.18	43.59	130.71
Temperature, $^{\circ}C$	24.78	3.47	20,280	12.20	25.28	37.12
EPR: Political Power, 0-5	2.13	1.16	12,500	0.00	2.00	5.00
	Ethnic Group Level Variables					
Transhumant Pastoralism (Narrow Definition), 0-1	0.08	0.22	712	0.00	0.00	0.92
Transhumant Pastoralism (Broad Definition), 0-1	0.09	0.23	712	0.00	0.00	0.92
EA: Agriculture, 0-1	0.55	0.18	745	0.03	0.61	0.92
EA: Jurisdictional Hierarchy, 0-4	1.29	0.97	687	0.00	1.00	4.00
EA: Belief in High Gods, 0/1	0.45	0.50	488	0.00	0.00	1.00
Share Muslim, 0-1	0.29	0.38	689	0.00	0.05	1.00
Share Christian, 0-1	0.46	0.35	689	0.00	0.46	1.00
Segmentary Lineage, 0-1	0.50	0.25	722	0.02	0.48	0.98

Note: This table presents basic descriptive statistics. The first panel presents variables that vary at the level of a cell-year. *UCDP: I(Any Conflict)* and *ACLED: I(Any Conflict)* measure conflict incidence for all conflicts. *Precipitation* is measured in average cm per month. *Phytomass* is the average monthly growth of dry vegetation measured in kg/ha/day. This is computed using the 'Dry Matter Productivity' variable from the *Copernicus* remote sensing program. *Temperature* is from Fan and van den Dool (2008). Variables beginning with "*Nearest Neighbor*" measure, for each cell, statistics at the level of the nearest ethnic group that is contiguous to the ethnic group in which the cell lies. *Nighttime Lights* is based on data collected by US Air Force Weather Agency and processed by NOAA's National Geophysical Data Center. The second panel presents cross-sectional variables that vary at the level of a cell. *Nearest Neighbor Transhumant Pastoralism* measures the transhumant pastoralism index score of a cell's nearest neighboring group. The narrow measure includes only groups that are classified in the *Ethnographic Atlas* as 'nomadic or fully migratory' or as 'seminomadic.' The broad measure additionally includes groups that are 'semisedentary' or that have 'compact but impermanent settlements.' The *Land Suitability* variables are based on data from Beck and Sieber (2010). *Population* is measured in persons and is taken from CIESIN and CIAT (2005). The third panel presents variables that vary at the level of an ethnic-group-year. *EPR: Political Power* is the score assigned to each ethnic group in the *Ethnic Power Relations* dataset, where 0 indicates that the group is either discriminated against or completely excluded from national politics, while a score of 5 indicates that the group has a monopoly on national political power. In cases where an ethnic group shares power in multiple countries, we compute the average score. In this panel, we also present precipitation, phytomass, and temperature aggregated to the level of an ethnic-group-year. The fourth panel presents cross-sectional variables that vary at the level of an ethnic group. *Transhumant Pastoralism* is the transhumant pastoralism index score. The variable *EA: Agriculture* measures an ethnic group's historical dependence on agriculture for subsistence; the variable *EA: Jurisdictional Hierarchy* measures the number of jurisdictional layers beyond the local community within an ethnic group; *EA: Belief in High Gods* is an indicator equal to one if an ethnic group believed in a moralizing god before contact with European colonizers; all three of these variables are from the *Ethnographic Atlas*. The variables *Share Muslim* and *Share Christian* measure the estimated share of people in each ethnic group that are today Muslims or Christians respectively. This data comes from the *World Religion Database*, which we match to our *Ethnographic Atlas* data using *Ethnologue* identifiers. The variables *Temperature*, *Nighttime Lights* and *Population* are available in the PRIO-GRID v.2.0 dataset (Tollefsen et al., 2012). See Appendix A for more details on data sources.

Table A4: Balance Table, Sub-Samples by THP Classification

Variable	(1) THP > 0	(2) THP = 0	(3) Difference
	Cell-Year Level, 1989-2018		
UCDP: I(Any Conflict), 0/1	0.024	0.041	-0.017***
	(0.152)	(0.198)	(0.002)
UCDP: I(State Conflict), 0/1	0.017	0.029	-0.012***
	(0.130)	(0.168)	(0.002)
UCDP: I(Nonstate Conflict), 0/1	0.009	0.020	-0.011***
	(0.095)	(0.140)	(0.001)
ACLED: I(Any Conflict), 0/1	0.051	0.098	-0.047***
	(0.221)	(0.297)	(0.003)
ACLED: I(State Conflict), 0/1	0.034	0.063	-0.030***
	(0.180)	(0.243)	(0.002)
ACLED: I(Nonstate Conflict), 0/1	0.051	0.098	-0.047***
	(0.220)	(0.297)	(0.003)
Precipitation, cm/month	2.066	8.513	-6.447***
	(2.715)	(4.857)	(0.078)
Phytomass, kg/ha/day	9.214	47.835	-38.621***
	(17.333)	(27.446)	(0.475)
Temperature, $^{\circ}C$	25.323	23.859	1.465***
	(4.115)	(3.688)	(0.083)
Nearest Neighbor Precipitation, cm/month	2.400	8.531	-6.131***
	(2.843)	(4.768)	(0.080)
Nearest Neighbor Phytomass, kg/ha/day	11.216	47.620	-36.404***
	(17.965)	(27.075)	(0.484)
Nearest Neighbor Temperature, $^{\circ}C$	25.213	23.879	1.334***
	(3.939)	(3.542)	(0.081)
Nighttime Lights, 0-1	0.037	0.042	-0.006***
	(0.021)	(0.043)	(0.001)
Observations	115,650	148,740	290,730
	Cell Level		
Nearest Neighbor Transhumant Pastoralism (Narrow Definition), 0-1	0.357	0.070	0.287***
	(0.333)	(0.204)	(0.006)
Nearest Neighbor Transhumant Pastoralism (Broad Definition), 0-1	0.378	0.085	0.294***
	(0.323)	(0.214)	(0.006)
B-S: Land Suitability for Transhumant Pastoralism, 0-1	0.390	0.266	0.124***
	(0.196)	(0.186)	(0.004)
B-S: Land Suitability for Agriculture, 0-1	0.099	0.354	-0.255***
	(0.132)	(0.182)	(0.004)
ln(Population) in 1990	8.093	10.230	-2.137***
	(1.977)	(1.729)	(0.040)
Observations	3,855	4,958	9,691
	Ethnic-Group-Year Level, 1989-2018		
Precipitation, cm/month	3.840	9.745	-5.905***
	(3.342)	(4.885)	(0.349)
Phytomass, kg/ha/day	19.923	50.563	-30.640***
	(23.412)	(26.176)	(2.339)
Temperature, $^{\circ}C$	25.171	24.756	0.415
	(4.014)	(3.330)	(0.377)
EPR: Political Power, 0-5	1.894	2.169	-0.274**
	(1.237)	(1.093)	(0.135)
Observations	3,750	17,610	23,400
	Ethnic Group Level		
EA: Agriculture, 0-1	0.338	0.593	-0.255***
	(0.208)	(0.133)	(0.015)
EA: Jurisdictional Hierarchy, 0-4	1.555	1.240	0.315***
	(0.852)	(0.980)	(0.100)
EA: Belief in High Gods, 0/1	0.779	0.355	0.424***
	(0.417)	(0.479)	(0.050)
Share Muslim, 0-1	0.565	0.246	0.319***
	(0.478)	(0.337)	(0.039)
Share Christian, 0-1	0.278	0.484	-0.205***
	(0.361)	(0.339)	(0.037)
Segmentary Lineage, 0-1	0.476	0.509	-0.033
	(0.191)	(0.257)	(0.025)
Observations	125	587	780

Note: This table presents balance tests. Column 1 shows averages across groups where our measure of *Transhumant Pastoralism* (THP) is greater than zero. Column 2 shows averages across groups where this measure is equal to zero. We use the broader definition of THP that includes all pastoral groups without fully permanent settlements. Standard errors are clustered by ethnic group. See Table A3 for variable descriptions. See Appendix A for more details on data sources.

Table A5: Effect of Rain Shock in Nearest Neighboring THP Territory on Conflict in a Cell: Broad Definition of Transhumance

	Indicator for the presence of conflict					
	UCDP			ACLED		
	(1) I(Any)	(2) I(State)	(3) I(Nonstate)	(4) I(Any)	(5) I(State)	(6) I(Nonstate)
Nearest Neighboring Ethnic Group						
Rain [γ_0^s]	-0.0005	0.0002	-0.0006	-0.0005	0.0005	-0.0007
	(0.0006)	(0.0006)	(0.0005)	(0.0011)	(0.0009)	(0.0011)
Rain × Transhumant Pastoral [γ_1^s]	-0.0082***	-0.0105***	0.0008	-0.0093**	-0.0081**	-0.0094**
	(0.0031)	(0.0028)	(0.0019)	(0.0037)	(0.0036)	(0.0037)
Own Ethnic Group						
Rain [γ_2^s]	0.0003	0.0016*	-0.0001	0.0008	0.0015	0.0006
	(0.0010)	(0.0009)	(0.0007)	(0.0014)	(0.0011)	(0.0014)
Rain × Transhumant Pastoral [γ_3^s]	-0.0050	-0.0065	-0.0009	-0.0028	-0.0080	-0.0013
	(0.0042)	(0.0042)	(0.0035)	(0.0062)	(0.0057)	(0.0062)
Own Cell						
Rain [γ_4^s]	-0.0004	-0.0006	-0.0002	-0.0005	-0.0008	-0.0003
	(0.0007)	(0.0006)	(0.0005)	(0.0010)	(0.0009)	(0.0010)
Rain × Transhumant Pastoral [γ_5^s]	0.0049	0.0062**	0.0001	0.0054	0.0056	0.0041
	(0.0033)	(0.0030)	(0.0024)	(0.0048)	(0.0039)	(0.0048)
Nearest Neighboring Ethnic Group: Additional Calculations						
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:						
Rain	-1.82	1.03	-4.13	-0.77	1.01	-0.95
p-value	[0.41]	[0.70]	[0.29]	[0.61]	[0.61]	[0.54]
Rain × Transhumant Pastoral	-27.95	-49.97	6.15	-13.27	-17.70	-13.36
p-value	[0.01]	[0.00]	[0.67]	[0.01]	[0.02]	[0.01]
Rain + Rain × Transhumant Pastoral	-29.77	-48.95	2.01	-14.04	-16.69	-14.31
p-value	[0.00]	[0.00]	[0.89]	[0.01]	[0.03]	[0.01]
Dep. Var. Mean	0.035	0.025	0.016	0.085	0.055	0.084
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	420	420	420	322	322	322
Cell Clusters	7,722	7,722	7,722	7,722	7,722	7,722
Observations	231,660	231,660	231,660	177,606	177,606	177,606

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. *Own Ethnic Group* refers to the ethnic territory that contains cell i. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A6: Robustness to Additional Controls for Ethnicity-Level Characteristics

	Indicator for the presence of conflict			
	(1)	(2)	(3)	(4)
	UCDP I(Any)	UCDP I(State)	ACLED I(Any)	ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Rain	-0.0025	-0.0010	-0.0025	-0.0026
	(0.0015)	(0.0013)	(0.0023)	(0.0023)
Rain × Transhumant Pastoral	-0.0117***	-0.0123***	-0.0094**	-0.0097**
	(0.0036)	(0.0031)	(0.0038)	(0.0038)
Rain × Jurisdictional Hierarchy	0.0004	-0.0000	-0.0002	-0.0002
	(0.0006)	(0.0005)	(0.0008)	(0.0008)
Rain × Segmentary Lineage	0.0028	0.0022	0.0030	0.0029
	(0.0019)	(0.0015)	(0.0029)	(0.0030)
Rain × High Gods: Active, Not Supportive	0.0013	0.0015	0.0030	0.0031
	(0.0023)	(0.0016)	(0.0036)	(0.0036)
Rain × High Gods: Active, Supportive	0.0014	0.0017*	-0.0010	-0.0009
	(0.0013)	(0.0011)	(0.0022)	(0.0022)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Rain	-8.52	-4.86	-3.41	-3.61
p-value	[0.10]	[0.43]	[0.28]	[0.26]
Rain × Transhumant Pastoral	-39.42	-59.20	-13.00	-13.44
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Rain + Rain × Transhumant Pastoral	-47.93	-64.06	-16.42	-17.05
p-value	[0.00]	[0.00]	[0.01]	[0.00]
Dep. Var. Mean	0.0357	0.0249	0.0869	0.0865
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	420	420	322	322
Cell Clusters	6,603	6,603	6,603	6,603
Observations	198,090	198,090	151,869	151,869

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. This regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A7: Robustness to Additional Controls for Ethnicity-Level Average Rainfall

	Indicator for the presence of conflict			
	(1)	(2)	(3)	(4)
	UCDP I(Any)	UCDP I(State)	ACLED I(Any)	ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Rain	-0.0000	-0.0004	-0.0004	-0.0004
	(0.0014)	(0.0013)	(0.0021)	(0.0021)
Rain × Transhumant Pastoral	-0.0111***	-0.0116***	-0.0100**	-0.0100**
	(0.0034)	(0.0031)	(0.0040)	(0.0039)
Rain × Average Rain (0-1)	-0.0012	0.0012	-0.0008	-0.0009
	(0.0028)	(0.0028)	(0.0042)	(0.0042)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Rain	-0.10	-1.80	-0.52	-0.62
p-value	[0.98]	[0.78]	[0.86]	[0.84]
Rain × Transhumant Pastoral	-37.91	-55.18	-14.26	-14.30
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Rain + Rain × Transhumant Pastoral	-38.01	-56.97	-14.78	-14.92
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Dep. Var. Mean	0.0351	0.0253	0.0845	0.0842
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Years	420	420	322	322
Cells	7,722	7,722	7,722	7,722
Observations	231,660	231,660	177,606	177,606

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. This regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A8: Robustness to Additional Controls for Time-Varying Characteristics

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Rain	-0.0006	0.0001	-0.0007	-0.0009
	(0.0006)	(0.0006)	(0.0011)	(0.0011)
Rain × Transhumant Pastoral	-0.0114***	-0.0126***	-0.0095***	-0.0094***
	(0.0034)	(0.0031)	(0.0036)	(0.0036)
Year × Transhumant Pastoral	-0.0005	-0.0003	-0.0064***	-0.0064***
	(0.0006)	(0.0006)	(0.0018)	(0.0017)
Price Index: Energy × Transhumant Pastoral	0.0006***	0.0004**	0.0005**	0.0005**
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Price Index: Metals and Minerals × Transhumant Pastoral	0.0001	0.0003	-0.0004	-0.0004
	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Price Index: Precious Metals × Transhumant Pastoral	-0.0004	-0.0005*	0.0005	0.0005
	(0.0003)	(0.0002)	(0.0005)	(0.0005)
Price Index: Agriculture × Transhumant Pastoral	-0.0001	0.0001	0.0006	0.0006
	(0.0005)	(0.0004)	(0.0007)	(0.0007)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Rain	-1.90	0.61	-1.04	-1.22
p-value	[0.39]	[0.82]	[0.49]	[0.42]
Rain × Transhumant Pastoral	-39.14	-59.85	-13.46	-13.45
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Rain + Rain × Transhumant Pastoral	-41.04	-59.25	-14.50	-14.67
p-value	[0.00]	[0.00]	[0.00]	[0.00]
Dep. Var. Mean	0.0351	0.0253	0.0845	0.0842
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	420	420	322	322
Cell Clusters	7,722	7,722	7,722	7,722
Observations	231,660	231,660	177,606	177,606

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. This regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A9: Robustness to Various Inference Procedures

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(State)
	Panel A: Clustering by country			
Nearest Neighboring Ethnic Group				
Rain	-0.0005	0.0001	-0.0007	-0.0008
	(0.0006)	(0.0006)	(0.0011)	(0.0011)
Rain × Transhumant Pastoral [γ_1^s]	-0.0110**	-0.0121***	-0.0096***	-0.0096***
	(0.0044)	(0.0038)	(0.0022)	(0.0023)
Country Clusters	49	49	49	49
	Panel B: Clustering by country and climate-zone			
Nearest Neighboring Ethnic Group				
Rain [γ_0^s]	-0.0005	0.0001	-0.0007	-0.0008
	(0.0006)	(0.0005)	(0.0010)	(0.0010)
Rain × Transhumant Pastoral [γ_1^s]	-0.0110***	-0.0121***	-0.0096***	-0.0096***
	(0.0033)	(0.0028)	(0.0014)	(0.0015)
Country Clusters	49	49	49	49
Climate-Zone Clusters	14	14	14	14
	Panel C: Spatial HAC within 1000km			
Nearest Neighboring Ethnic Group				
Rain [γ_0^s]	-0.0005	0.0001	-0.0007	-0.0008
	(0.0007)	(0.0006)	(0.0010)	(0.0010)
Rain × Transhumant Pastoral [γ_1^s]	-0.0110***	-0.0121***	-0.0096**	-0.0096**
	(0.0040)	(0.0035)	(0.0043)	(0.0043)
Dep. Var. Mean	0.035	0.025	0.085	0.084
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Observations	231,660	231,660	177,606	177,606

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. *Own Ethnic Group* refers to the ethnic territory that contains cell i. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a country. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A10: Phytomass Suitability Index (Predicted by Rain)

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Phytomass Suitability Index	-0.0001	0.0000	-0.0001	-0.0002
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Phytomass Suitability Index × Transhumant Pastoral	-0.0021***	-0.0023***	-0.0018**	-0.0018**
	(0.0006)	(0.0006)	(0.0007)	(0.0007)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Phytomass Suitability Index Shock as % of Dep. Var. Mean:				
Phytomass Suitability Index	-1.88	0.57	-0.95	-1.13
p-value	[0.40]	[0.83]	[0.53]	[0.46]
Phytomass Suitability Index × Transhumant Pastoral	-37.51	-57.26	-13.60	-13.64
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Phytomass Suitability Index + Phytomass Suitability Index × Transhumant Pastoral	-39.39	-56.68	-14.55	-14.76
p-value	[0.00]	[0.00]	[0.01]	[0.00]
Dep. Var. Mean	0.035	0.025	0.085	0.084
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	420	420	322	322
Cell Clusters	7,722	7,722	7,722	7,722
Observations	231,660	231,660	177,606	177,606

Note: In these specifications, the Phytomass Suitability Index is phytomass predicted by rainfall. These regressions use the full sample of observations for which there is data on rainfall. The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. This regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A11: Phytomass Suitability Index (Predicted by Rain and Rain Squared)

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Phytomass Suitability Index	-0.0001	0.0000	-0.0002	-0.0002
	(0.0002)	(0.0001)	(0.0002)	(0.0002)
Phytomass Suitability Index × Transhumant Pastoral	-0.0018***	-0.0020***	-0.0014**	-0.0014**
	(0.0005)	(0.0005)	(0.0006)	(0.0006)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Phytomass Suitability Index Shock as % of Dep. Var. Mean:				
Phytomass Suitability Index	-0.94	0.25	-1.23	-1.33
p-value	[0.70]	[0.93]	[0.42]	[0.39]
Phytomass Suitability Index × Transhumant Pastoral	-28.07	-43.06	-9.20	-9.17
p-value	[0.00]	[0.00]	[0.02]	[0.02]
Phytomass Suitability Index + Phytomass Suitability Index × Transhumant Pastoral	-29.01	-42.80	-10.44	-10.50
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Dep. Var. Mean	0.035	0.025	0.085	0.084
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	420	420	322	322
Cell Clusters	7,722	7,722	7,722	7,722
Observations	231,660	231,660	177,606	177,606

Note: In these specifications, the Phytomass Suitability Index is phytomass predicted by rainfall and rainfall squared. These regressions use the full sample of observations for which there is data on rainfall. The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. This regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A12: Allowing for Rainfall and Temperature in the Same Specification

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Rain	-0.0004	0.0002	-0.0002	-0.0004
	(0.0007)	(0.0006)	(0.0011)	(0.0012)
Rain × Transhumant Pastoral	-0.0116***	-0.0125***	-0.0071**	-0.0075**
	(0.0035)	(0.0033)	(0.0036)	(0.0035)
Temperature	0.0020	0.0029**	0.0028	0.0026
	(0.0016)	(0.0013)	(0.0027)	(0.0027)
Temperature × Transhumant Pastoral	0.0017	0.0040	0.0026	0.0026
	(0.0037)	(0.0035)	(0.0045)	(0.0044)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Rain	-1.66	1.18	-0.41	-0.72
p-value	[0.50]	[0.68]	[0.84]	[0.72]
Rain × Transhumant Pastoral	-42.99	-63.49	-12.53	-13.18
p-value	[0.00]	[0.00]	[0.05]	[0.03]
Rain + Rain × Transhumant Pastoral	-44.65	-62.31	-12.94	-13.90
p-value	[0.00]	[0.00]	[0.03]	[0.02]
Effect of 1 Std. Dev. Temp Shock as % of Dep. Var. Mean:				
Temp	7.24	14.83	4.87	4.65
p-value	[0.23]	[0.03]	[0.30]	[0.33]
Temp × Transhumant Pastoral	6.23	20.28	4.62	4.51
p-value	[0.65]	[0.25]	[0.56]	[0.56]
Temp + Phytomass × Transhumant Pastoral	13.47	35.11	9.49	9.17
p-value	[0.32]	[0.05]	[0.17]	[0.17]
Dep. Var. Mean	0.032	0.024	0.068	0.068
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	364	364	252	252
Cell Clusters	7,722	7,722	7,722	7,722
Observations	200,728	200,728	138,968	138,968

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. This regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A13: Effects of Neighbor's Phytomass on Conflict during the Wet and Dry Seasons

	Wet Season UCDP Conflict		Dry Season UCDP Conflict	
	(1)	(2)	(3)	(4)
	Incidence Year Equiv.	No. Events Year Equiv.	Incidence Year Equiv.	No. Events Year Equiv.
	Panel A. Annual Rainfall and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Annual Phytomass	0.0009	0.0037	0.0009	0.0034
	(0.0015)	(0.0035)	(0.0015)	(0.0033)
Annual Phytomass × Transhumant Pastoral	-0.0089**	-0.0385*	-0.0009	-0.0155
	(0.0041)	(0.0219)	(0.0044)	(0.0175)
Effect of 1 Std. Dev. Phytomass Shock as % of Dep. Var. Mean:				
Annual Phytomass × Transhumant Pastoral	-30.71	-70.21	-2.87	-25.72
p-value	[0.03]	[0.08]	[0.84]	[0.37]
	Panel B. Seasonal Phytomass and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Seasonal Phytomass	0.0006	-0.0000	0.0006	-0.0006
	(0.0012)	(0.0036)	(0.0012)	(0.0056)
Seasonal Phytomass × Transhumant Pastoral	-0.0064**	-0.0218*	-0.0030	-0.0301
	(0.0032)	(0.0128)	(0.0042)	(0.0223)
Effect of 1 Std. Dev. Phytomass Shock as % of Dep. Var. Mean:				
Seasonal Phytomass × Transhumant Pastoral	-32.56	-57.92	-12.40	-65.71
p-value	[0.05]	[0.09]	[0.48]	[0.18]
Dep. Var. Mean	0.096	0.182	0.106	0.200
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	280	280	280	280
Cell Clusters	4,632	4,632	4,632	4,632
Observations	92,640	92,640	92,640	92,640

Note: The unit of observation is a 0.5-degree grid-cell and year. "Incidence" is per-month UCDP conflict incidence in either the wet season or the dry season as defined in the main text. "Number" is the per-month number of UCDP conflict events. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. *Own Ethnic Group* and *Own Cell* covariates are included in the regressions but not reported. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A14: Summary of Seasonal Regressions, Agricultural Cells Only

	Wet Season UCDP Conflict		Dry Season UCDP Conflict	
	(1)	(2)	(3)	(4)
	Incidence Year Equiv.	No. Events Year Equiv.	Incidence Year Equiv.	No. Events Year Equiv.
	Panel A.1. Annual Rainfall and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Annual Rain	0.0005	0.0042	-0.0025	-0.0034
	(0.0024)	(0.0050)	(0.0033)	(0.0124)
Annual Rain × Transhumant Pastoral	-0.0361**	-0.0918*	-0.0029	-0.0262
	(0.0173)	(0.0472)	(0.0162)	(0.0499)
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Annual Rain × Transhumant Pastoral	-49.64	-72.94	-3.56	-18.14
p-value	[0.04]	[0.05]	[0.86]	[0.60]
	Panel A.2. Seasonal Rainfall and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Seasonal Rain	0.0011	0.0062	-0.0021	-0.0048
	(0.0015)	(0.0038)	(0.0023)	(0.0061)
Seasonal Rain × Transhumant Pastoral	-0.0229*	-0.0603*	-0.0067	-0.0199
	(0.0134)	(0.0359)	(0.0169)	(0.0272)
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Seasonal Rain × Transhumant Pastoral	-53.30	-80.99	-10.42	-17.47
p-value	[0.09]	[0.09]	[0.69]	[0.47]
Dep. Var. Mean	0.087	0.151	0.098	0.174
Climate-Zone-Year Clusters	390	390	390	390
Cell Clusters	3,897	3,897	3,897	3,897
Observations	116,910	116,910	116,910	116,910
	Panel B.1. Annual Phytomass and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Annual Phytomass	0.0001	0.0041	0.0006	0.0033
	(0.0017)	(0.0037)	(0.0018)	(0.0039)
Annual Phytomass × Transhumant Pastoral	-0.0095*	-0.0196***	0.0041	0.0090
	(0.0053)	(0.0070)	(0.0061)	(0.0093)
Effect of 1 Std. Dev. Phytomass Shock as % of Dep. Var. Mean:				
Annual Phytomass × Transhumant Pastoral	-35.25	-41.50	13.09	16.07
p-value	[0.08]	[0.01]	[0.51]	[0.33]
	Panel B.2. Seasonal Phytomass and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Seasonal Phytomass	0.0004	0.0027	-0.0001	-0.0036
	(0.0013)	(0.0030)	(0.0014)	(0.0062)
Seasonal Phytomass × Transhumant Pastoral	-0.0061	-0.0100	-0.0017	-0.0119
	(0.0050)	(0.0062)	(0.0047)	(0.0131)
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Seasonal Phytomass × Transhumant Pastoral	-33.27	-30.96	-7.10	-28.16
p-value	[0.22]	[0.11]	[0.72]	[0.37]
Dep. Var. Mean	0.089	0.156	0.103	0.185
Climate-Zone-Year Clusters	260	260	260	260
Cell Clusters	3,897	3,897	3,897	3,897
Observations	77,940	77,940	77,940	77,940
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes

Note: This table presents separate regressions for each column and panel. The unit of observation is a 0.5-degree grid-cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. Each regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A15: Summary of Seasonal Regressions, Non-Agricultural Cells Only

	Wet Season UCDP Conflict		Dry Season UCDP Conflict	
	(1)	(2)	(3)	(4)
	Incidence Year Equiv.	No. Events Year Equiv.	Incidence Year Equiv.	No. Events Year Equiv.
	Panel A.1. Annual Rainfall and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Annual Rain	0.0057	0.0082	0.0039	0.0246
	(0.0117)	(0.0204)	(0.0126)	(0.0192)
Annual Rain × Transhumant Pastoral	-0.0197	-0.2018	-0.0137	-0.1432
	(0.0189)	(0.1728)	(0.0156)	(0.1288)
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Annual Rain × Transhumant Pastoral	-23.01	-102.26	-16.60	-78.22
p-value	[0.30]	[0.24]	[0.38]	[0.27]
	Panel A.2. Seasonal Rainfall and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Seasonal Rain	0.0033	-0.0230	0.0075	0.0695
	(0.0092)	(0.0270)	(0.0085)	(0.0565)
Seasonal Rain × Transhumant Pastoral	-0.0045	-0.0944	-0.0039	-0.0426
	(0.0152)	(0.0996)	(0.0124)	(0.0561)
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Seasonal Rain × Transhumant Pastoral	-8.78	-80.91	-6.10	-29.59
p-value	[0.77]	[0.34]	[0.75]	[0.45]
Dep. Var. Mean	0.103	0.237	0.099	0.220
Climate-Zone-Year Clusters	390	390	390	390
Cell Clusters	735	735	735	735
Observations	22,050	22,050	22,050	22,050
	Panel B.1. Annual Phytomass and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Annual Phytomass	0.0018	-0.0032	-0.0030	-0.0051
	(0.0029)	(0.0101)	(0.0025)	(0.0071)
Annual Phytomass × Transhumant Pastoral	-0.0061	-0.0565	-0.0033	-0.0414
	(0.0056)	(0.0480)	(0.0060)	(0.0385)
Effect of 1 Std. Dev. Phytomass Shock as % of Dep. Var. Mean:				
Annual Phytomass × Transhumant Pastoral	-15.57	-59.02	-9.14	-48.67
p-value	[0.28]	[0.24]	[0.58]	[0.28]
	Panel B.2. Seasonal Phytomass and Conflict by Seasons			
Nearest Neighboring Ethnic Group				
Seasonal Phytomass	-0.0010	-0.0173	0.0016	0.0132
	(0.0021)	(0.0154)	(0.0030)	(0.0119)
Seasonal Phytomass × Transhumant Pastoral	-0.0033	-0.0186	-0.0092	-0.0861
	(0.0038)	(0.0183)	(0.0079)	(0.0724)
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Seasonal Phytomass × Transhumant Pastoral	-12.41	-28.38	-33.64	-133.23
p-value	[0.39]	[0.31]	[0.24]	[0.24]
Dep. Var. Mean	0.130	0.317	0.119	0.282
Climate-Zone-Year Clusters	260	260	260	260
Cell Clusters	735	735	735	735
Observations	14,700	14,700	14,700	14,700
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes

Note: This table presents separate regressions for each column and panel. The unit of observation is a 0.5-degree grid-cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. Each regression controls for the corresponding variables at the *Own Ethnic Group* level and the *Own Cell* level. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A16: Descriptive Statistics for Country-Year Level Variables

	Country-Year Level Variables					
	Mean	SD	Count	Min	Median	Max
Total Agriculture Aid	3.87	8.56	1,421	0.00	0.97	97.40
Total Non-Agriculture Aid	52.36	121.44	1,421	0.00	11.78	1176.00
Irrigation Projects	0.41	0.81	1,421	0.00	0.11	7.67
Forestry Projects	0.88	1.75	1,421	0.00	0.25	17.00
Conservation Projects	0.50	1.14	1,421	0.00	0.10	12.33
Land Projects	0.47	1.09	1,421	0.00	0.11	13.00
Share Protected Area in Country	0.14	0.10	1,764	0.00	0.12	0.54
THP Power Share	0.10	0.16	1,053	0.00	0.00	0.61

Note: This table presents basic descriptive statistics for the country-year level variables used in our heterogeneity analyses. See Appendix A for more details on data sources.

Table A17: Heterogeneity by the Presence of International Aid Projects: Sub-Categories

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Nearest Neighboring Ethnic Group				
Rain × Transhumant Pastoral	-0.0115***	-0.0117***	-0.0103**	-0.0100**
	(0.0044)	(0.0041)	(0.0050)	(0.0049)
Rain × Transhumant Pastoral × Irrigation Projects	0.0145	-0.0066	-0.0281	-0.0261
	(0.0295)	(0.0284)	(0.0398)	(0.0395)
Rain × Transhumant Pastoral × Forestry Projects	0.0386*	0.0103	0.0540	0.0474
	(0.0222)	(0.0188)	(0.0372)	(0.0368)
Rain × Transhumant Pastoral × Conservation Projects	0.0079	-0.0079	-0.0188	-0.0237
	(0.0273)	(0.0184)	(0.0355)	(0.0351)
Rain × Transhumant Pastoral × Land Projects	-0.0481	-0.0071	-0.0131	-0.0146
	(0.0575)	(0.0532)	(0.0596)	(0.0594)
Rain × Transhumant Pastoral × Other Agriculture Projects	-0.0181*	-0.0067	-0.0173	-0.0146
	(0.0099)	(0.0088)	(0.0140)	(0.0138)
Rain × Transhumant Pastoral × Other Non-Agriculture Projects	0.0006	0.0003	0.0008	0.0008
	(0.0005)	(0.0004)	(0.0005)	(0.0005)
Dep. Var. Mean	0.032	0.024	0.068	0.068
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	364	364	252	252
Cell Clusters	7,722	7,722	7,722	7,722
Observations	200,772	200,772	138,996	138,996

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell i. Relevant covariates at the *Own Ethnic Group* and *Own Cell* levels are controlled for but not reported. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A18: Heterogeneous Treatment Effects, Controlling for Country FE and Year FE interacted with Main Interaction of Interest

	Indicator for the presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
	Panel A: Het. by Intl. Agricultural Aid			
Nearest Neighboring Ethnic Group				
Rain × Transhumant Pastoral × Total Agriculture Aid	-0.0161*	-0.0177**	-0.0031	-0.0030
	(0.0083)	(0.0080)	(0.0114)	(0.0116)
Rain × Transhumant Pastoral × Total Non-Agriculture Aid	0.0011*	0.0011*	-0.0005	-0.0005
	(0.0006)	(0.0006)	(0.0008)	(0.0008)
	Panel B: Het. by Intl. Aid Types			
Nearest Neighboring Ethnic Group				
Rain × Transhumant Pastoral × Irrigation Projects	0.0251	-0.0069	0.0342	0.0378
	(0.0367)	(0.0346)	(0.0524)	(0.0520)
Rain × Transhumant Pastoral × Forestry Projects	0.0020	-0.0132	0.1487**	0.1422**
	(0.0269)	(0.0255)	(0.0656)	(0.0651)
Rain × Transhumant Pastoral × Conservation Projects	0.0145	-0.0045	-0.0443	-0.0491
	(0.0324)	(0.0231)	(0.0405)	(0.0398)
Rain × Transhumant Pastoral × Land Projects	-0.0890	-0.0356	-0.1500*	-0.1555**
	(0.0606)	(0.0542)	(0.0786)	(0.0784)
Rain × Transhumant Pastoral × Other Agriculture Projects	-0.0157	-0.0098	-0.0159	-0.0127
	(0.0129)	(0.0128)	(0.0188)	(0.0186)
Rain × Transhumant Pastoral × Other Non-Agriculture Projects	0.0009	0.0009	0.0003	0.0003
	(0.0007)	(0.0007)	(0.0008)	(0.0008)
	Panel C: Het. by Conservation Land, Country-Level			
Nearest Neighboring Ethnic Group				
Rain × Transhumant Pastoral × Share Protected Area in Country	-0.1398***	-0.1508***	-0.2368***	-0.2340***
	(0.0461)	(0.0443)	(0.0613)	(0.0612)
	Panel D: Het. by Conservation Land, Subnational			
Nearest Neighboring Ethnic Group				
Rain × Transhumant Pastoral × Share Protected Area in Ethnicity e of Country c	0.0416**	0.0470***	0.0387	0.0380
	(0.0176)	(0.0166)	(0.0270)	(0.0272)
Rain × Transhumant Pastoral × Share Protected Area in Rest of Country c	-0.1563***	-0.1732***	-0.2714***	-0.2678***
	(0.0522)	(0.0499)	(0.0675)	(0.0674)
	Panel E: Het. by THP Political Power			
Nearest Neighboring Ethnic Group				
Rain × Transhumant Pastoral × THP Power Share	0.0954**	0.0762**	0.2811***	0.2810***
	(0.0380)	(0.0348)	(0.0755)	(0.0756)
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Rain × Transhumant Pastoral × Country FE	Yes	Yes	Yes	Yes
Rain × Country FE	Yes	Yes	Yes	Yes
Rain × Transhumant Pastoral × Year FE	Yes	Yes	Yes	Yes
Rain × Year FE	Yes	Yes	Yes	Yes
Transhumant Pastoral × Year FE	Yes	Yes	Yes	Yes

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell *i*. Relevant covariates at the *Own Ethnic Group* and *Own Cell* levels are controlled for but not reported. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A19: Heterogeneity by the Presence of Conservation Lands Using Subnational Variation

	Indicator for presence of conflict			
	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Nonstate)
Nearest Neighboring Ethnic Group				
Rain	0.0036***	0.0035***	-0.0004	-0.0005
	(0.0013)	(0.0012)	(0.0018)	(0.0018)
Rain × Transhumant Pastoral	-0.0104**	-0.0093**	-0.0018	-0.0016
	(0.0048)	(0.0046)	(0.0054)	(0.0054)
Rain × Transhumant Pastoral × Share Protected Area in Ethnicity e of Country c	0.0574***	0.0603***	0.0546*	0.0530*
	(0.0193)	(0.0181)	(0.0278)	(0.0279)
Rain × Transhumant Pastoral × Share Protected Area Outside of Ethnicity e in Country c	-0.0633*	-0.0816**	-0.1061***	-0.1060***
	(0.0357)	(0.0351)	(0.0367)	(0.0368)
Nearest Neighboring Ethnic Group: Additional Calculations				
Effect of 1 Std. Dev. Rain Shock as % of Dep. Var. Mean:				
Rain × Transhumant Pastoral when Ethnicity Protected Area at 10th pctile	-35.6	-44.2	-2.6	-2.3
p-value	[0.03]	[0.04]	[0.73]	[0.76]
Rain × Transhumant Pastoral when Ethnicity Protected Area at 90th pctile	56.4	89.6	33.7	33.1
p-value	[0.12]	[0.05]	[0.08]	[0.09]
Rain × Transhumant Pastoral when Rest of Country Protected Area at 10th pctile	-45.2	-61.3	-9.3	-9.0
p-value	[0.00]	[0.00]	[0.18]	[0.20]
Rain × Transhumant Pastoral when Rest of Country Protected Area at 90th pctile	-109.5	-176.0	-54.0	-53.9
p-value	[0.00]	[0.00]	[0.00]	[0.00]
Dep. Var. Mean	0.035	0.025	0.085	0.084
Cell FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Climate-Zone-Year Clusters	420	420	322	322
Cell Clusters	7,718	7,718	7,718	7,718
Observations	231,540	231,540	177,514	177,514

Note: The unit of observation is a 0.5-degree grid-cell and year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. *Nearest Neighboring Ethnic Group* refers to the nearest neighboring ethnic territory to cell *i*. Relevant covariates at the *Own Ethnic Group* and *Own Cell* levels are controlled for but not reported. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a grid-cell and a climate zone-year. * p < 0.1, ** p < 0.05, *** p < 0.01.