The Soil of Politics: Land Resources in Ethnic Competition

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Resources matter in political competition, and control of fertile land especially so. In many countries, ethnic groups are the building blocks of political coalitions. We combine these two insights, and argue that an ethnic groups' control of fertile land — which we call "soil power" — shape their bargaining power in national politics. This in turn shapes national political outcomes. We use satellite and soil data to calculate the cumulative agricultural potential of ethnic homelands in several common datasets. We demonstrate that soil power predicts a groups' national power and its risk of discrimination, beyond that which can be explained by population share. Using maps of ethnic group homelands as they were in the 1880s and theory from the literature on ethno-linguistic fractionalization, we also evidence and formalize a new deleterious legacy of colonialism: the creation of countries in which the distribution of land resources made governance extremely hard. [149 words]

Word Count: 3998

INTRODUCTION

Resources matter in political competition. A political unit's resources – population, military might, wealth – structures how it engages in politics, strives for national supremacy, or attempts to avoid oppression. Land, and especially fertile land, is one such important resource. What role does land play in political competition?

In many countries, ethnic groups are the base units of national politics. How ethnic groups compete for state power is one of the central questions in the ethnic politics literature. Acknowledging that resources structure this competition, scholarship has focused on the effect of groups' population on political competition. Size is related to power, and the distribution of ethnic group populations — ethno-linguistic fractionalization — is the subject of thousands of studies, many of which consider

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We thank Faisal Ahmed, Carles Boix, Matias Iaryczower, Kosuke Imai, Kris Ramsay, Steven Wilkinson, Austin Wright, Yang-Yang Zhou for comments as well as participants at the 2016 Q-APS Poster Session at Princeton, the APSA 2016 panel on Imposed Regimes and the 2017 History and Politics Network workshop at NYU.

outcomes at the national level.[1] In this study, we also take ethnic groups as the base units of politics and consider how material resources shape how these groups compete. Using data from satellites and soil samples combined by climate and agriculture experts, together with high-definition maps of ethnic group homelands, we calculate and consider a new group resource: control of fertile agricultural land.

We find that control of fertile land — which we call "soil power" — shapes ethnic groups' access to power and if they are discriminated against, and may be as important as population size in explaining these outcomes. Furthermore, the two are not substitutes: including soil power measurably improves models previously relying on population size alone.

We then explore how the distribution of soil power influence a national political outcome. We find that in Sub-Saharan Africa, where country borders were largely determined by colonial powers in the 1880s, concentration of soil power predicts democratic rule. We next compare the distribution of soil power within Sub-Saharan Africa to that in other countries. We find that the distribution of soil power imposed by these borders constructed polities wherein soil-power was extremely fractionalized — beyond what existing measures of ethno-linguistic fractionalization would suggest. We thus provide the first quantitative measurement of a legacy of colonialism long hypothesized: the creation of polities in which the distribution of resources made national politics extremely hard.

ETHNICITY, RESOURCES, AND POWER

The cross-country literature on ethnic politics has focused on the effects of ethno-linguistic fractionalization (ELF — see e.g. Taylor and Hudson, 1972; Roeder, 2001; Fearon, 2003; Alesina et al 2003). The ELF is based on population shares, capturing how dispersed the population is in different ethnic groups.[2] This body of work demonstrates the effects of ethnic fractionalization on a range of outcomes.

[1] Some recent scholarship has considered material differences, but at the per capita rather than group level (see e.g. Huber & Baldwin, 2010; Kyarciou, 2013, Alesina et al, 2016). We draw inspiration from these studies in focusing on material differences, but differ in that the basic unit of politics remains the ethnic group, rather than the individual.

[2] Mathematically, the ELF is a equivalent to 1 minus the Hirschman-Herfindahl (HH) index of population, and one minus the sum of squared population shares on a within-country basis. The HH index is elsewhere extensively used as a measure of market concentration. When applied to populations, it has the neat property that it corresponds to the probability that two people chosen at random will be from the same group — the ELF score thus corresponding to the probability of two people not being from the same ethnic group.

The studies conclude, among other things, that ethnic fractionalization is bad for growth, public good provision, and corruption (Ordeshook & Shvetsova, 1994; Easterly & Levine, 1995; Alesina et al, 1999, Glaeser & Saks, 2006).

Recent work has gone beyond fractionalization. Cederman et al (2009, 2011) shows the importance of the structure of ethnic competition between groups in predicting conflict. Baldwin & Huber (2010) find that between-group inequality in per capita income is a more powerful predictor of public good provision than ethnolinguistic fractionalization or cultural difference. Alesina, Michalopoulos and Papaioannou (2016) establish a strong negative association between ethnic inequality in per capita income and economic development. They find that ethnic inequality is a far more powerful explanatory variable of contemporary economic and political outcomes than standard ethnic fractionalization measures.

The mechanisms proposed in these studies generally focus on how inequality structures interactions between individuals. However, theories of ethnic politics suggest that group-level coalition building determines many of the consequences of ethnic inequality. Political competition is often understood as contestation between pre-existing societal groups, including ethnic groups (Lipset & Rokkan, 1967). Posner (2004) argues the form that ethnic competition takes — and with it, national politics — is determined by relative population shares of ethnic groups given a country's borders. Ethnicity and the balance of power between groups is central to government formation and government stability, especially in sub-Saharan Africa. Morrison, Mitchell & Paden (1989) show that instability often is the result of elite failure to provide representation or redistribution to certain ethnic group. To mediate tensions, governments turn to patronage i.e. the distribution of material resources to bring together an elite made up of heterogeneous groups and prevent challenges to their rule. Arriola (2009) shows how ministerial appointments act as commitments to inclusion in patronage coalitions and that more ethnically fragmented countries have larger cabinets. Existing theories of ethnic political competition assumes ethnic groups are the building blocks of national politics and their resources are relevant to the balance of power between them. However, these studies have relied on population size to assess distribution of power among groups, lacking broad data on ethnic groups control of material resources.

Furthermore, existing research on material differences between groups has relied satellite data

or surveys, which severely limits temporal coverage. Tracking such differences over long period of time is however important, because contemporary inequality is in part an outcome of past political battles. If one is to assess the impact of material resources on political competition, one would want measures that extend throughout the political history of a country. We aim to bridge these gaps by measuring material resources at the group level across a vast period of time. We do so by calculating the distribution of one especially important resource — fertile soil — between all ethnic groups in all countries for the entire post-World War II era.

THE SOIL OF POLITICS

We argue that ethnic homelands' agricultural potential — "soil power" — is key to ethnic groups' contention for national power. In agricultural economies, fertile soil provides the basis for material wealth. Even in countries which are no longer agricultural, it is an important basis for political power (as powerful agricultural lobbies in most industrialized countries suggests). Good soil may also be the basis for later economic development, and thus remain associated with highly productive areas for non-agrarian economies. Productive soil has been not just a politically relevant resource but an important object of contention. Other resources groups may have, for instance more sophisticated weapons or group organization/centralization, are thus often reflected and endogenous to land quality (Boix, 2015).[3] It is thus not surprising that land inequality strongly predicts economic inequality (Deninger and Squire, 1998; Frankema, 2010), nor that geographical endowments generally — of which good soil forms an important part — does the same (Alesina et al, 2016; see also Roessler et al, 2019).

Beyond material wealth, productive land is important as the basis for social and political organization for much of human history. Furthermore, we know location-specific human capital led to the formation of localized ethnicities (Michalopoulos, 2012). Coordination to control land is thus tied to ethnogenesis. In addition to allowing us to think about national politics — in which contest is not at the homeland border, but within country borders — we hope our contribution can be useful for investigations of the

[3]In the limit, one can imagine a country in which the politically relevant resources available to a group and control of agricultural land are one and the same. In such a case, the distribution of productive land and the distribution of power would be identical.

formation of ethnic identities, and the continued existence of some (but not all) of these in our present.

EMPIRICAL STRATEGY AND DATA

We make four empirical contributions. First, we propose a measure of material resources based on data on the cumulative agricultural potential – soil power – controlled by all ethnic homelands, for all commonly used data sets of ethnic homelands and the past half-century. Second, we provide a cross-national test of the stylized fact that material resources determine bargaining power between ethnic groups. We show that soil power can be linked to key group outcomes: whether the group is in power in a country, whether it is discriminated against, and that considering group's soil power provides information beyond that of population size alone. Third, we provide evidence that the distribution of soil power within a country can be linked to political development in Sub-Saharan Africa, who largely had their borders imposed by colonial powers. Fourth, we show that the distribution of such resources in sub-Saharan Africa is extremely fractionalized — much more so than that of e.g. population (i.e. the ELF). With this, we also provide empirical results on a legacy of colonialism long hypothesized: the creation of countries in which fractionalization of material power made governance extremely hard.

Calculating Soil Power of Ethnic Homelands

To calculate the cumulative agricultural potential controlled by ethnic groups, we combined several sets of digitalized maps of ethnic homelands with estimates of agricultural productivity at the world grid level (our data sources are listed in Table 1). We relied on agricultural productivity data from Ramankutty et al. (2002), which provides data on estimated suitability for agricultural productivity on a zero to one scale at the 0.5 degree (latitude/longitude) level. We calculated the soil power of any ethnic group as the sum of the agricultural areas under their control:

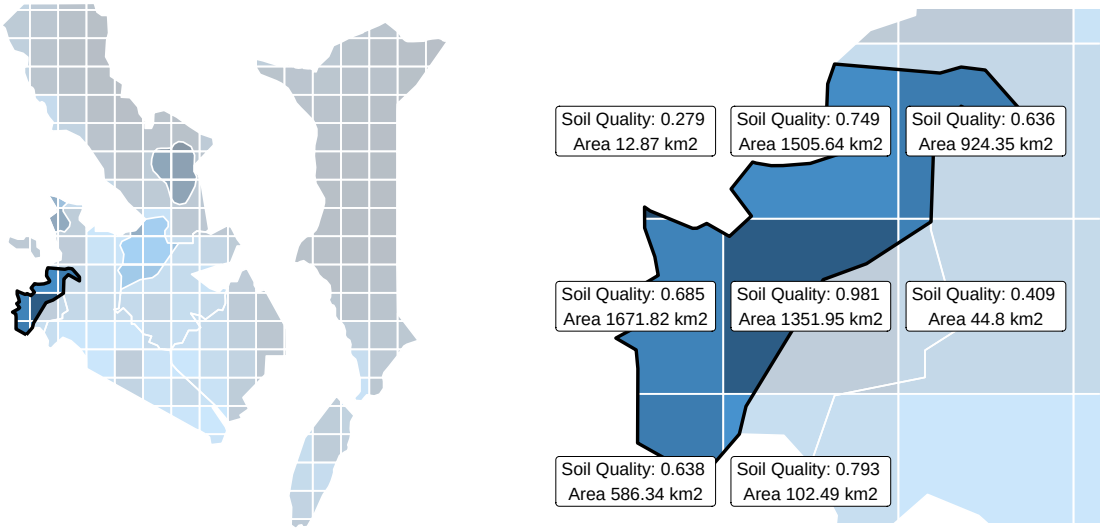
$$\text{soil power}_e \equiv \sum_i \text{area}(i \cap e) * a_i \tag{1}$$

TABLE 1. Calculating Soil Power of Ethnic Homelands

	Data type	# Areas	Geography	Year(s)	Source
Global Distribution of Cultivable Lands	Agricultural productivity	64,000	World	1960-90 (average)	Ramankutty et al. (2002)
GEO-EPR	Ethnic homelands	1,336	World	1946-2017	Vogt, Bormann, Rüegger, Cederman, Hunziker, and Girardin (2015)
Soviet Atlas Naradov Mira (GREG)	Ethnic homelands	2,007	World	ca. 1960	Weidman, Rod and Cederman (2010), based on Miklukho-Maklai (1964)
Map from *Africa: It's Peoples and their Culture History*	Ethnic homelands	835	Africa	ca. 1900	Nunn (2010), map from Murdock (1959)

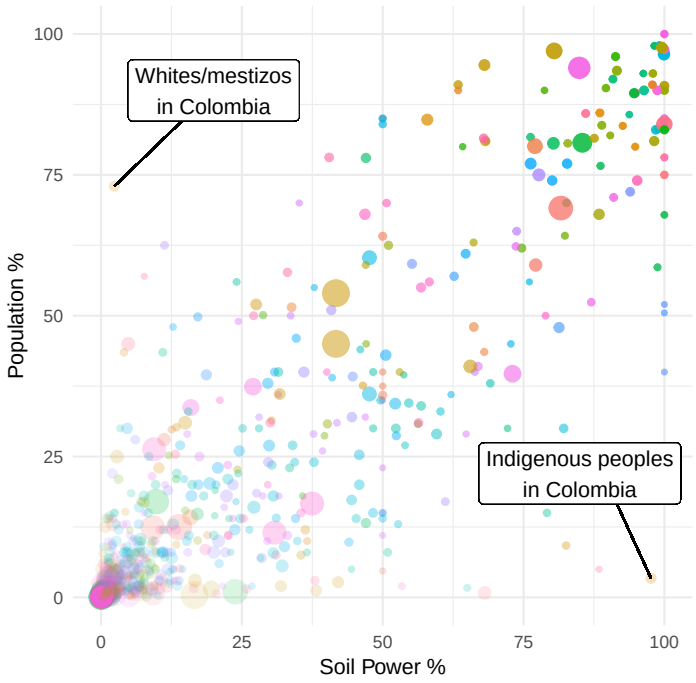
Wherein e indexes ethnic groups and i areas of different agricultural productivity equal to a_i, and area($i \cap e$) returns the size of the intersection of area i and homeland of ethnic group e. This process is visualized in Figure 1, using the Luo homeland in Kenya as an example. We summarize our calculations made using the GEO-EPR data set comparing them to population shares in Figure 2, were we also list the most powerful ethnic groups by soil power.

FIGURE 1. Calculating Soil Power of Ethnic Homelands — The Luo in Kenya, 2017



Details: The plots show our method for estimating the soil power of ethnic homelands. On the left side, we plot ethnic homeland borders in Kenya in 2017 from GEO-EPR intersected with data on estimated agricultural productivity from Ramankutty et al. (2002). The Luo homeland is given a black border. In the right side plot, we zoom in on the Luo's homeland, and extract the area they control within the different grid cells, and the estimated agricultural productivity within these cells. In both plots, darker shades indicates more productive land. "Soil quality" here denotes the estimated potential agricultural productivity of the area. It is calculated using a model that incorporates data on the area's temperature, sunshine hours, rainfall, elevation, slope, and its soil's carbon density, nitrogen content, pH, water holding capacity, and more. The soil power of the Luo is the sum of the different areas times their agricultural productivity.

FIGURE 2. Soil Power vs Population (% of Country Total) - GEO-EPR)



Most Powerful Ethnic Groups by Soil Power (2017)

1	Whites	United States	$8.25 * 10^{13}$
2	Han	China	$7.31 * 10^{13}$
3	Russians	Russia	$5.41 * 10^{13}$

ANALYSIS AND RESULTS

We first use the GEO-EPR data to investigate if soil power was predictive of national power and descrimination. We define an ethnic group as being "in power" if EPR categorized its status as "Dominant", "Monopoly", "Senior Partner", or "Junior Partner" (Girardin et al, 2015). As we show in Figure 3 and 4, soil power is a statistically significant positive predictor of national power. Furthermore it is a significant negative predictor of whether an ethnic group is discriminated against (all models are logistic regressions, with errors double-clustered on ethnic group and country). In all the regressions we provide, we include data on the population of ethnic groups as a separate predictor.

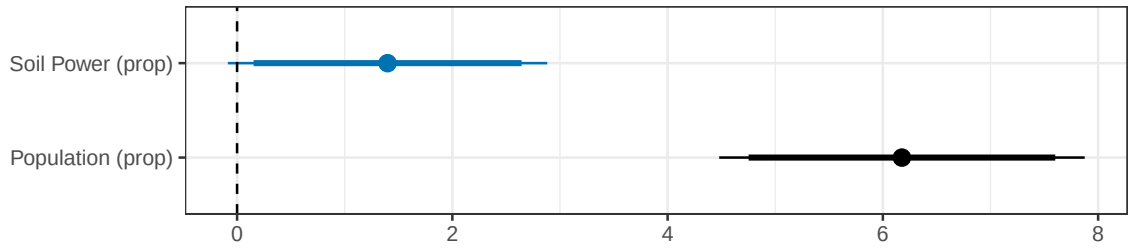
Whether one considers population proportion or a largest population indicator, including soil power improves models of who has national power to a statistically significant extent. Wald tests

double-clustered on country and ethnic group shows this to be the case at the $p < 0.06$ and $p < 0.001$ level, respectively. Similarly, having the most soil power predicts not being subjected to discrimination, and including it improves on models using a largest population indicator alone. Soil power is an important predictor of elite formation.

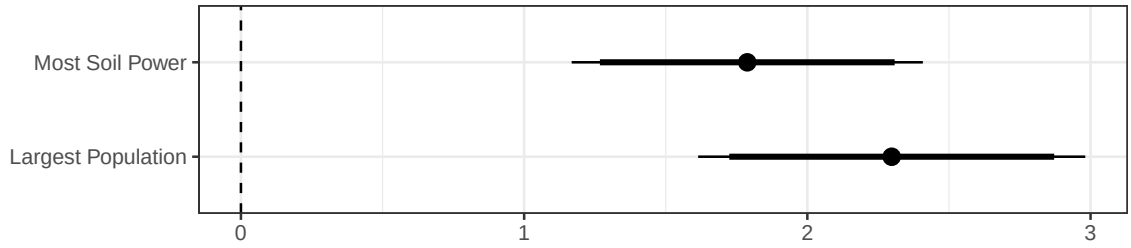
The distribution of soil power within a country also has downstream effects on political development. In Table 2, we show that the distribution of soil power at the national level is a good predictor of post-independence democracy in Sub-Saharan Africa. This is the case even when including in the models the country's ethno-linguistic fractionalization (ELF; distribution of population by ethnic groups), indicators for colonial history, a range of data on geographical features and resources, and proxies for several prominent alternative explanations, including the share of the population belonging to ethnic groups split between countries and the number enslaved and sold abroad in the 19th century. The effect of the distribution of soil power at the national level — largely a product of which areas and groups fell within colonial borders — is large, as shown in Figure 6.

Finally, we investigate how former colonies and Sub-Saharan African countries in particular differ from other countries in their distribution of soil power at the national level. Using maps from the early 1960s Soviet Atlas Naradov Mira, we calculate and plot the distribution of soil power for all countries. As seen in 7, the distribution of soil power in countries with borders decided by colonial powers are vastly different than that in countries which were never colonized. Most striking is the difference between Europe and Sub-Saharan Africa, the former being the countries with highest soil power concentration and the latter that with the least, and virtually no overlap on the 0-1 scale. Coupled with our finding that within Sub-Saharan Africa — that low soil power concentration is associated with less democratic rule — we argue this provides the first cross-country evidence of a long-hypothesized colonial legacy: borders within which the distribution of land resources made democratic governance extremely hard.

FIGURE 3. Determinants of Ethnic Group Power



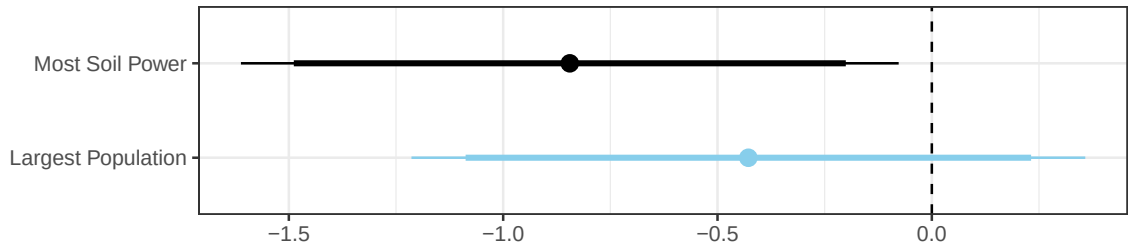
GLM Coefficient Estimates with 90 % and 95 % C.I.s based on Country and Group−clustered S.E.
(N = 35310, AIC = 19832.26)



GLM Coefficient Estimates with 90 % and 95 % C.I.s based on Country and Group−clustered S.E.
(N = 35310, AIC = 23711.231)

Details: The plot shows the results of logistic regressions wherein the dependent variable is whether the ethnic group is in power or not. As seen, soil power is a statistically significant predictor of power, even when an ethnic group's population size is accounted for.

FIGURE 4. Determinants of Ethnic Group Discrimination



GLM Coefficient Estimates with 90 % and 95 % C.I.s based on Country and Group−clustered S.E.
(N = 34877, AIC = 26317.466)

Details: The plot shows the results of logistic regressions wherein the dependent variable is whether the ethnic group is being discriminated. As seen, having the most soil power is the best predictor of not being discriminated against. Wald tests shows a model including the soil power indicator to be superior to one with top population alone at the $p < 0.03$ level. (Models with population share or soil power proportion were not significantly improved by including the other).

FIGURE 5. Murdock's (1959) map of of 835 ethnic homelands in Africa. The graphic (including the color shadings) is as made available by Harvard DataVerse (2016). This highly detailed map forms the basis for our analysis of ethnic group resources and democracy in Sub-Saharan Africa. Right shows ethnic groups in East Africa (Lake Victoria in white).

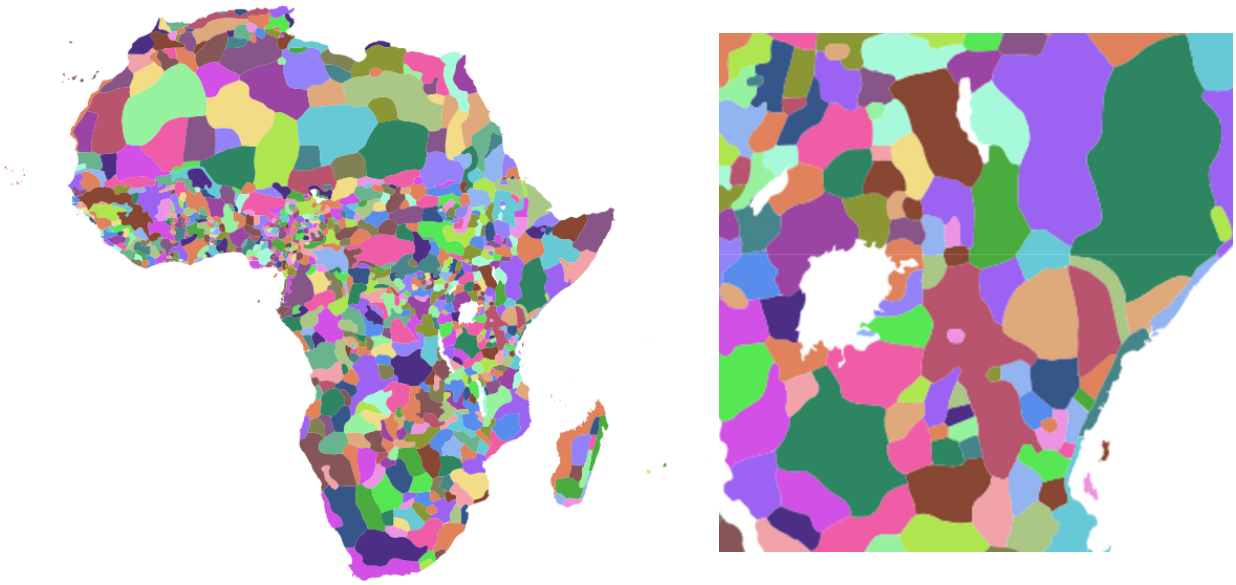
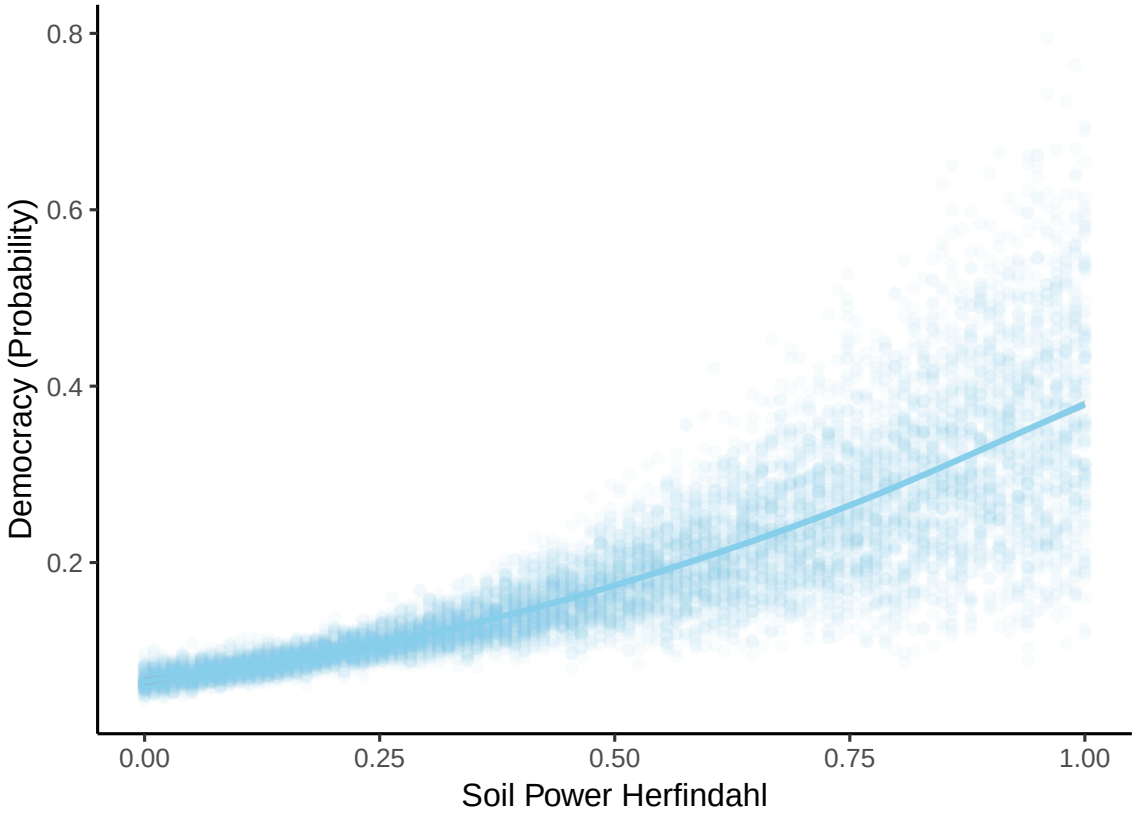


TABLE 2. Soil Power Concentration and Democracy in Sub-Saharan Africa

	Dependent variable:		
	Democracy (Boix, Miller and Rosato 2013)		
	(1)	(2)	(3)
Soil Power Concentration	1.742*	2.205*	2.146*
(Herfindahl, ethnic homelands from Murdock 1959)	(0.965)	(1.203)	(1.202)
Ethno-Linguistic Fractionalization (ELF)	0.401	1.918	2.392
(1 - Population Herfindahl)	(1.561)	(1.844)	(2.026)
Log (Slaves Taken)		0.135	0.124
(Nunn 2008)		(0.108)	(0.103)
Split Ethnic Group Population			1.581
(Michalopoulos and Papaioannou 2016)			(1.294)
Log (Gemstone Exports per sq km)		4.260***	4.191***
(1985-2000 average, from Nunn and Puga 2012)		(1.350)	(1.414)
Log (Proven Oil Reserves)		−0.090	−0.120
		(0.119)	(0.136)
Former British Colony indicator	Yes	Yes	Yes
Former French Colony indicator	Yes	Yes	Yes
Geography Controls ↴	No	Yes	Yes
Tropics FE, terrain ruggedness, Log (Land Area), average distance to coast			
Observations	1,655	1,637	1,637
AIC	1358.471	1121.5	1111.149

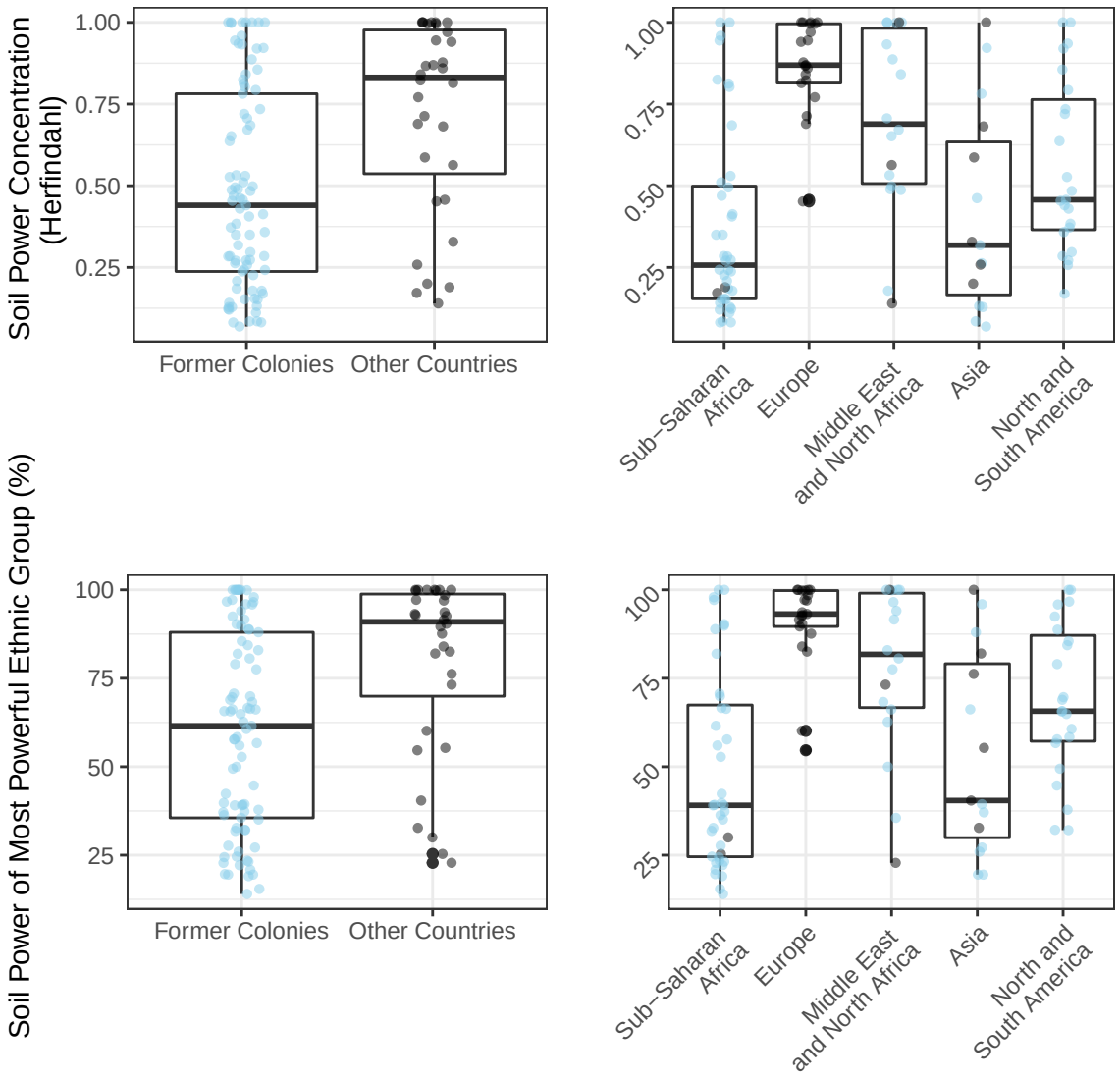
Note: Models are logistic regressions. *p<0.1; **p<0.05; ***p<0.01
(Country-Clustered Standard Errors in Parenthesis)

FIGURE 6. Soil Power Concentration and Democracy in Sub-Saharan Africa (Effect Size)



Details: Within Sub-Saharan Africa, borders were largely determined by colonial powers. The plot visualizes the effect of the distribution of soil power established by these borders (specifically, that of the model summarized in Table 2, column 3, simulated 10 000 times). It shows that among Sub-Saharan countries, a higher concentration of soil power is related to a larger probability of democratic rule in the post-independence era. This difference is significant at the $p < 0.07$ level.

FIGURE 7. Distributions of Soil Power at the Country Level — a Legacy of Colonial Borders



Details: The plots show the distribution of soil power at the country level, with each dot representing a country (former colonies in blue). In the first row, countries are compared using a Hirschman-Herfindahl index, while the second row they are compared on the maximum percentage of soil power controlled by any one group in the country. The boxplots show the 1.5 inter-quartile range, the 25th and 75th percentile, and the median. Very small countries (population below 500 000) and states with no land borders (islands) were omitted. All differences except between Asia and Sub-Saharan Africa are significant at the $p < 0.001$ level.

CONCLUSION

We propose a novel measure of ethnic groups' material resources and empirically test a stylized fact common in the ethnic politics literature: that material resources influence the bargaining power ethnic groups have in forming coalitions and winning power.We calculate the cumulative agricultural potential – soil power – of all ethnic homelands and show that soil power predicts whether an ethnic group's has national power and if it avoids discrimination. We demonstrate that between-group differences in resources shape political competition between them, and that considering soil power makes for better models than those estimated using ethnic population shares alone.

We next demonstrate that the distribution of soil power has implications for long-term political development. Specifically, we find that greater fractionalization of soil power is negatively associated with democracy in sub-Saharan Africa, beyond that explained by ethno-linguistic fractionalization. This result is particularly important in light of our next finding: that post-colonial countries are substantially more likely to have highly fractionalized soil power, with Sub-Saharan Africa at the fractionalization extreme. We thus provide the first cross-country evidence in support of another stylized fact: that the Berlin Conference created artificial political units which were harder to govern.

Our study provides new data on ethnic group resources which allow us to empirically test long-standing theoretical wisdom. We hope that in future work, this data can be used to propose and test new theories of ethnic politics.

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ONLINE APPENDIX:

TABLE 3. Determinants of Ethnic Groups' National Power and Discrimination

	Dependent variable:		
	National Power		Discriminated Against
	(1)	(2)	(3)
Soil Power (prop)	1.398*		
	(0.757)		
Population (prop)	6.177***		
	(0.866)		
Most Soil Power		1.79***	−0.84***
		(0.32)	(0.39)
Largest Population		2.30***	−0.43
		(0.35)	(0.40)
Observations	35,310	35,316	35,310
AIC	19832.26	23711.231	26317.466

Note: Models are logistic regressions. *p<0.1; **p<0.05; ***p<0.01
(Country and Group-Clustered Standard Errors in Parenthesis)

Details: Shows the results of logistic regressions wherein the dependent variable is whether the ethnic group is whether the group has national power (columns 1 and 2) or if its being discriminated against (column 3). The models correspond to Figure 3 and 4, with both ethnic group homeland maps and national power/discrimination status from the Ethnic Power Relations Project (GEO-EPR and GrowUP).

TABLE 4. Determinants of Ethnic Groups' National Power and Discrimination: Wald Tests

	Dependent variable:		
Does Inclusion of Soil Power Equivalent Improve Model with Population Data?	National Power		Discriminated Against
	(1)	(2)	(3)
Measure	Share	Top (0,1)	Top (0,1)
F-statistic	3.3161	33.854	4.6709
p-value	0.06861	< 0.00001	0.03068
	Yes*	Yes***	Yes**
Observations	35,310	35,316	35,310
Note:			*p<0.1; **p<0.05; ***p<0.01 (Country and Group-Clustered-tests)

Details: Shows the results of Wald-tests clustered on group and country, in which a model with only population shares is included (either proportion or top group indicator) to one in which both population shares and its soil power equivalent is included. The tests relate to Figure 3 and 4, with ethnic group homeland maps and national power/discrimination status from the Ethnic Power Relations Project.