Places to Hide:
Terrain, Ethnicity, and Civil War

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Abstract

Terrain is central to understanding why some countries have contentious ethnic divisions, while others do not. We argue that access to variable rugged terrain facilitated the development and survival of more distinct ethnic groups, even in the face of government repression. We show that the persistence of greater ethnic diversity in highly variable rugged areas as well as these ethnic groups tendency to be politically excluded also makes civil war more likely in such areas. In other words, ethnicity mediates some of the effect that terrain has on civil war, a point overlooked by most of the literature. Using province-level geo-coded data on civil war, terrain and both the distribution and political status of ethnic groups, we demonstrate that terrain that is variable and rugged directly and indirectly affects the onset and incidence of civil conflict. A substantively important proportion of terrain's indirect effects are transmitted through the distribution and political status of politically relevant ethnic groups. We further explore the historical and contemporary relationships between terrain, ethnicity and conflict with numerous examples and an historical examination of Colombia.

The views expressed in this article are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

Introduction

Terrain ruggedness and geographic variation are central to understanding why some countries have contentious ethnic divisions while others do not. Historically, rugged terrain is associated with ethnic diversity for two key reasons. Rugged terrain facilitates the formation of distinct ethnic identities by restricting interaction between the populations in rugged areas and nearby territories. While many early communities of individuals resided in spatial proximity, their "effective distance" from one another was significant. Northern Chinese peasants, for instance, "were once effectively closer to Mongolian pastoralists nearly eight hundred miles to the north than to Chinese cities scarcely a tenth of that distance to the south: pasture-fed camels could transport grain across the Mongolian steppes more cheaply than stall-fed oxen could haul it to the city" (Canfield, 1973, p. 1519). This remains true in the 20th century. For instance, James Scott's critique of the 9/11 Commission's conclusion that the terrorist threat emanates from "sanctuaries in the least governed, most lawless, most remote, vast un-policed regions, in very difficult terrain" correctly points out that the Commission had "failed to note... that much of the existing population in such areas of sanctuary were there precisely because these areas had historically been an area of refuge from state power" (Scott, 2014, p. 127).

Second, rugged terrain also facilitates the persistence of ethnic groups by complicating state repression. States like Argentina in the 19th century produced conditions of relative ethnic homogeneity through the effective assimilation of immigrants from a diverse set of European countries and the deliberate elimination of the indigenous population. In contrast, ethnic groups like the Quechua in Peru were resilient despite widespread repression and attempts to assimilate them during state-building periods. While Argentinian efforts to repress and eliminate indigenous populations in Patagonia were quite "successful" during General Julio Argentino Roca's nineteenth century "conquest of the desert," Spanish and later Peruvian efforts to subjugate indigenous groups in Peru enjoyed limited success as the Quechua (and others) retreated into rugged areas that the central government struggled to reach (Hasbrouck, 1935; Dodds, 1993). Consequently, although indigenous populations in both countries are coded as either "discriminated against" or "powerless" by Wimmer, Cederman and Min (2009), the largest population in Peru remains the "indigenous high-

lands" population, making up about 44% of the Peruvian population after 1946, while indigenous populations in Argentina make up only around 1% of the population.

We argue and demonstrate that the influence of rugged terrain on ethnic divisions both direct and indirect effects on a state's propensity for civil conflict. Existing literature focuses on rugged terrain's direct effect in limiting state power, e.g., Collier and Hoeffler (1998, 2004) or Fearon and Laitin (2003). A wide range of evidence suggests weak states' inabilities to effectively apply force across the whole of their territories allow rebel groups to escalate conflicts to civil war. Existing work makes clear that this dynamic is compounded for weak states when rugged terrain provides difficult-to-reach safe havens for rebel groups (Fearon and Laitin, 2003; Buhaug and Gates, 2002; Buhaug, Gates and Lujala, 2009). Despite the impressive body of evidence that rough terrain aids rebellion and weakens state forces, a key mechanism underpinning this finding remains unexplored: rugged terrain has historically facilitated ethnic diversity and the maintenance of groups with contentious relations with the state. Rugged terrain's indirect effects on civil war help explain why Peru experienced over 20 years of civil war after 1946 while Argentina had no conflict escalate to civil war.[1] Moreover, to understand the role of terrain in Peru's civil wars, it is important to understand not only how the Shining Path used terrain to survive in its fight with the state for so long but why large numbers of Peruvians live within the country's rugged areas and have long had contentious relations with the state.

We assess our ideas with spatial data on terrain ruggedness, the location of politically relevant ethnic groups and where civil wars have been fought, all measured at the province-level for every country in the world during the post-Cold War era.[2] We demonstrate that terrain ruggedness has both direct and indirect effects on the risk of civil conflict, even during the post-Cold War era, a period long past the initial state-building efforts of many states. Specifically, we show that a significant proportion of the effects of geography are indirectly transmitted through an ethnic mechanism. The rest of the article proceeds as follows. In the next section of this article, we review relevant ideas and findings connecting terrain, ethnicity, and civil conflict. We then theorize about

[1] We use the UCDP/PRIO civil war data for these statistics (Gleditsch et al., 2002; Pettersson and Wallensteen, 2015).

[2] By province, we refer to the every state's first-level administrative unit, which is sometimes called a province and sometimes has a different term, e.g., a "state" in the United States. Our temporal sample starts in 1989.

the complex relationship between these variables. Next, we describe our data and empirical strategy and assess the empirical implications of our argument through a series of statistical tests. We find substantively significant and robust support for our central claims, and leverage the relatively arbitrary location of political boundaries in Africa to conduct a robustness check on our mediation analysis. To probe our argument in greater detail in an important case, we consider terrain's effect in shaping the distribution of ethnic groups in Colombia and trace this development to civil war outbreak following World War II. Finally, we conclude and provide suggestions for future research.

Terrain, Ethnicity, and Civil War

A large and growing literature debates the causes of civil war. Influential work by Collier and Hoeffler (1998; 2004) emphasizes economic conditions associated with civil war onset, while Fearon and Laitin (2003) examine a broad set of political, economic and ethnic explanations. Echoing Buhaug and Gates' (2002) study of the political geography of conflict, Fearon and Laitin identify a large and robust effect of mountainous terrain on conflict onset. Contrary to a large body of qualitative work on intrastate conflict, however, they find little evidence for a link between ethnic fractionalization and civil war onset.[3] The latter finding surprised many scholars in part because history is littered with examples of violence amongst distinct ethnic groups (Dyrstad, Ellingsen and Rød, 2015). In his seminal treatment, Horowitz (1985, p. 3) notes that recent examples alone include "recurrent hostilities in Northern Ireland, Chad, and Lebanon"; secessionist conflict in "Burma, Bangladesh, the Sudan, Nigeria, Iraq, and the Philippines"; "Sikh[,] Basque[,] Corsican[,] [and] Palestinian terrorism"; and "ethnic riots in India, Sri Lanka, Malayasia, Zaire, Guyana, and a score of other countries."

Recent work on ethnicity and civil conflict suggests that null findings are the result of poor conceptualization of when and why ethnicity matters in civil conflict. Cederman, Wimmer and Min (2010) point out that the widely used ethnic fractionalization measure does not indicate whether politically relevant ethnic groups have grievances with the state. Accordingly, more recent work

[3]See Sambanis (2001) for a prominent study that does find a linkage. He shows that ethnic heterogeneity influences ethnic civil war, but not other types of civil war, a finding that Fearon and Laitin (2003) do not replicate. See also Cunningham and Weidmann (2010); Lilja and Hultman (2011).

considers whether relevant ethnic groups are excluded from power, underrepresented, or subject to relative political and economic inequalities and finds that such group-specific measures are important to civil war (Cederman, Wimmer and Min, 2010; Cederman, Gleditsch and Buhaug, 2013). Cederman, Gleditsch and Buhaug (2013) also argue that using the country as the unit of analysis is particularly problematic, as aggregation issues (amongst others) obscure theoretically key relationships between ethnic groups and the state. We propose a relatively unexplored mechanism by which ethnicity influences civil conflict by specifying how terrain features historically shaped the distribution of both ethnic diversity and more specifically the distribution of ethnic groups that have contentious relations with the state.[4]

Why More Difficult Terrain is Not Always Better

The importance of terrain to civil conflict is widely recognized. Difficult terrain provides protection for less powerful guerilla forces. Weak and outmatched, insurgents can base themselves in rugged terrain, where incursions by state forces are often limited by poorly serviced infrastructure. A number of studies show that rebel groups strategically select where to fight, preferring locations distant from the centers of state power, often exploiting natural terrain characteristics. In their seminal treatment of this topic, Fearon and Laitin (2003) focus on how mountainous terrain impedes the application of state power, providing conditions conducive to relatively weak insurgents. Consistent with the importance of terrain, Buhaug and Gates (2002) find that rebels fight in areas with the greatest absolute distance from government strongholds.[5] Buhaug, Gates and Lujala (2009) clarify that rebels also use rough terrain and inaccessible regions to stave off attacks from stronger state opponents.

Yet, we argue that there are clear limits to the benefits of rough terrain. While rough terrain's benefits are intuitive, it is not obvious that "rougher" or "more rugged" terrain is consistently better for rebels. For instance, there is evidence that rebel groups thrive in areas where they enjoy support among the local populace. Kalyvas (2006) shows that cooperation with rebels among

[4]Cederman (2004) also argues that terrain affects ethnic identity and the state's ability to repress, although his argument differs from ours in several respects and he focuses on a theoretical computational model rather than empirical analysis.

[5]For a related critique of concept measurement, see Buhaug and Lujala (2005).

the population helps groups maintain their organization and avoid state forces. Areas with co-ethnics are important in this regard, as groups often have a comparative advantage in monitoring co-ethnics, and co-ethnics often share similar grievances (Kalyvas and Kocher, 2007; Lyall, 2010). Thus, groups do not simply flee to the most rugged areas to fight the state; rather, they fight from areas where they enjoy networks of support among the local population.

Maximally rugged areas are also not likely to be habitable in the long-term for even modestly sized populations. The most highly and uniformly rugged areas are often not suitable long-term bases for rebel groups. While the degree of protection from state power may increase in the difficulty of the terrain, such areas are also both less well-suited for long-term settlement and as a staging grounds for militant operations. If a rebel group is to base its operations in an area and successfully take on the state, it must be able to the following. First, to successfully carry out attacks on the state, the group needs to be able to reach state forces or strongholds. Maximally rugged areas might be maximally effective at blocking state attacks, but they are also likely to impede the group's ability to target state forces or strongholds. Second, the group must be able to supply itself with weapons, equipment, and basic provisions like food. While states typically have access to reliable revenue sources like taxes, groups have to control areas with supportive population, which often involves co-ethnics.[6] Uniformly rugged areas are difficult to supply and often not hospitable to a large enough populations that can serve as a base of support and source of resources for rebel groups.

Instead, areas with significant variation in terrain ruggedness are more hospitable in the long-term to rebel groups. Regions with high variability in terrain ruggedness offer both refuge from state attack as well as less rugged areas more amenable to long-term settlement. The Cuzco province in Peru, for instance, contains both highly rugged mountainous terrain and the fertile Sacred Valley, which has been the breadbasket of the region for centuries. The terrain of Cuzco allowed the Quechua to produce a food surplus while simultaneously providing sanctuary from Spanish incursions. The areas in Afghanistan where the Taliban has had the most success also illustrate this point. That organization benefits the most from rugged terrain that is proximate to

[6]There is only limited evidence that outside support from states is all that helpful to groups (Asal and Rethemeyer, 2008; Carter, 2012; Phillips, 2014).

population centers, which are typically situated in relatively less rugged areas. In such zones of high terrain variance, the Taliban enjoys both the protection of mountainous terrain and proximity to targets. Were the Taliban to position itself deep within the Hindu Kush for the long-term, it would likely incur significant costs associated with sourcing supplies and traversing vast distances to launch attacks. These arguments suggest that a measure of the variation in rugged terrain in a sub-state area is a better measure of whether it is likely to serve as a long-term home to ethnic groups with historically hostile relations with the state.

The Origins of Ethnic Diversity

While the linkages between ethnic heterogeneity and armed conflict are contested, the origins of ethnic diversity have received much less attention. Yet, a set of qualitative work across disciplines and recent work in development economics suggest that geography is essential to understanding the emergence and persistence of ethnic and ethnolinguistic diversity. This work suggests that terrain ruggedness plays an important role in both the development and survival of ethnic groups. Following this work, we tie the origins of ethnic diversity to ethnic grievances and civil conflict.

Ethnic diversity's association with rugged terrain is noted by historians, anthropologists, and geographers. Many of the world's remaining indigenous populations reside within the rugged periphery of their states. The central Andean highlands, for instance, are highly rugged and have long been home to one of the largest "indigenous" populations in the Western hemisphere. Gelles (2000, p. 1) describes the difficult terrain in this region, noting that its inhabitants

> "live at over 10,000 feet above sea level, in thousands of hamlets, towns, and cities spread over a rugged and vertical terrain. Found in warm fertile valleys, on steep mountainsides, and on frigid high plains, indigenous peasant communities control vast territories in the highlands of Ecuador, Peru, and Bolivia."

Rugged areas host a plurality or majority of many countries' ethnic groups. Vietnam's northern highlands, for instance, comprise only eleven of the country's 58 provinces; yet, "31 of the officially recognized 54 ethnic groups of Vietnam live in [that] area, speaking languages that belong to seven distinct linguistic groups..." (Michaud, Turner and Roche, 2002, p. 306). In Nigeria, a similar

pattern is apparent. The country's central highlands, which has as its apex the Jos plauteau, are home to the most complex cluster of the country's 250 or so ethnic groups. Gandonu (1978) notes that "[t]he nature of the rugged topography combines with the history of interethnic conflicts which deprived the groups of less difficult land areas earlier on, to produce the observed conglomerate of diverse ethnic groups in this region..." (Gandonu, 1978, p. 257).

The blessings of variable and rugged terrain for ethnic diversity operate through two key, non-exclusive, channels. First, rugged terrain has historically fostered ethnic and linguistic diversity by reducing interactions among the communities living in rugged and difficult to traverse areas. In many rugged areas, communities of individuals in close spatial proximity were nonetheless isolated by the effective distance imposed by local terrain. Effective distance can produce greater ethnic diversity than areas of comparable size but without such inhibiting terrain. As Fagan (1999) explains, rough topography reduces communal mobility and contact across groups, which leads to cultural drift. Consistent with this claim, Michalopoulos (2012, 1509) finds that areas of the world with greater heterogeneity in land quality and more difficult terrain tend to have greater ethnolinguistic diversity relative to other areas. The highly rugged terrain of the modern day Mexican state Oaxaca, for instance, kept the Zapotec peoples isolated from one another and is presumed to have "contributed to the development of... [the] remarkable linguistic diversity" of that area (Yannakakis, 2008, p. 21). Moreover, once established, distinct ethnic identities are likely to persist so long as the costs associated with transiting such effective distance remain high. Thus, we expect that *areas with greater variability in terrain ruggedness have a greater number of ethnic groups.*

The second way in which terrain affects ethnic diversity is by providing refuge to groups from hostile powerful actors. Ethnic groups that the state or other powerful actors would otherwise have eliminated with force are simply too difficult to reach. Groups can end up in areas with highly variable rugged terrain because they fled to these areas, or they can have always been housed in rugged areas (Nunn and Puga, 2012).[7] A key implication is that areas with highly variable

[7]In a study of the slave trade in Africa, Nunn and Puga (2012) show that rugged terrain provided protection to many ethnic groups, effectively insulating the most rugged regions of the continent from extensive slave trade activity and contributing to greater ethnic diversity.

rugged terrain will tend not only to contain greater ethnic diversity but to host groups that have contentious relations with the dominant groups that control the state. Writing about the Middle East, Canfield (1973, p. 1511) observes that "dominant sects... are found in the central places, usually lowlands, while diverse 'heretical' groups... occupy marginal territories such as mountains, deserts, and marshes." The idea that highly variable rugged terrain contributes to ethnic diversity by preventing hostile and more powerful groups, often in control of the state, from forceful repression of groups housed in these areas suggests that *areas with greater variability in terrain ruggedness have a greater number of politically excluded ethnic groups.*

These two processes by which rugged variable terrain hosts greater ethnic diversity are not mutually exclusive. Rather, both may work in tandem to produce both greater ethnic diversity and a greater number of politically excluded or targeted ethnic groups. For example, the Liangshan region of southern China, which is described by its "rugged, often vertical topography sandwiched between the high plateaus of Tibet to the west and the gentle hills of fertile plains of central China to the east and northeast," is home to a variety of distinct ethnic groups (Harrell, 1995, p. 97). This area is home to ethnic groups that lived in the region prior to it being under either Tibetan or Chinese influence and power, e.g., Quangic-speaking groups formerly known as Xifan, as well as groups that fled there to take refuge from fighting, e.g., Yi-speaking groups from the neighboring regions of Yunnan and Guizhou (Harrell, 1995).

How Ethnicity Mediates the Effect of Terrain Ruggedness

Areas with highly variable rugged terrain should house both more distinct ethnic groups and a higher number of politically marginalized groups that have contentious relations with the state. If so, the implications for civil conflict are clear. Existing literature focuses on the *direct effect* of terrain on civil conflict – rugged terrain is associated with civil war because it is conducive to relatively weak rebel groups' abilities to fend off and combat the state. Although we take issue with the common conceptualization of what kind of rugged terrain is most conducive to long-term rebel resistance in the face of state power, we agree that terrain directly affects conflict.[8] However,

[8]Recall our argument that highly variable rugged terrain is more conducive to rebel groups than uniformly rugged or mountainous terrain.

existing work largely overlooks an important *indirect effect* of highly variable rugged terrain on civil wars.

The indirect effect of highly variable rugged terrain on civil war operates through terrain's historical influence on the geographic distribution of ethnic groups. Evidence that areas of highly variable terrain tend to host more politically marginalized ethnic groups suggests that such groups have more historical and contemporary grievances with the state. These grievances increase civil conflict likelihood in their home areas for three main reasons. First, rebel groups are relatively likely to emerge in areas with politically marginalized ethnic groups (Cederman, Gleditsch and Buhaug, 2013). Second and relatedly, rebel groups fighting the state are relatively likely to find a hospitable population in areas where ethnic groups have long been marginalized. Support from the local population is essential, as this provides access to resources and provides important informational advantages relative to the state (Kalyvas, 2006; Kalyvas and Kocher, 2007).

Finally, technological innovations of the last century have increased states' efforts and ability to extend control over their territories while increasing interactions amongst ethnic groups, intensifying frictions in historically difficult-to-rule areas. Ethnic groups in areas of highly variable rugged terrain historically experienced limited interaction amongst themselves and with the state. Although fighting amongst ethnic groups within rugged spaces is a well documented historical phenomenon (Scott, 2014), recent changes brought about by technological innovation – the paving of roads, introduction of vehicles and aircraft, and the spread of information and communication devices, for instance – have increased interactions both amongst groups and between these groups and the state. This dynamic contributes to an increased risk of ethnic group rivalries and more interactions, often conflictual, between these groups and the central government.

All three routes by which areas of highly variable rugged terrain are likely to experience civil conflict derive from the historical processes by which politically marginalized ethnic groups came to inhabit this rugged terrain. Evidence that variation in terrain ruggedness has an indirect effect on civil conflict mediated by greater density of politically excluded ethnic groups implies that *a proportion of the effect of highly variable rugged terrain on conflict is channeled through terrain's early influences on settlement patterns of ethnic groups.*

Data

We use subnational data on ethnic groups, variation in terrain ruggedness, and civil war to assess our ideas. The data is measured at the province level for every country in the world from 1989 to 2008. Province-level measurement of ethnic groups, terrain ruggedness, and civil war eliminates several ambiguities that would arise through the use of country-level data. Specifically, province-level data allows us to more precisely identify spatial connections between the distribution of ethnic groups, highly variable rugged terrain, and civil conflict. It is possible for a country to have a high aggregate level of variation in terrain ruggedness and a large number of distinct ethnic groups but for these groups to not be based in the most variable and rugged areas. Similarly, conflict might erupt far from rugged areas of a country.

We analyze two dependent variables: the first measures the number of distinct ethnic groups and their degree of exclusion; the other measures the incidence and volume of civil conflict in a given province. To measure the former we use the geo-referenced version of the ethnic power relations (EPR) data constructed by Wucherpfennig et al. (2011). We construct several variables using the EPR data, with the baseline measure being the total number of ethnic groups, all measured at the province-level. A key advantage of the EPR data is that it focuses on politically relevant groups (Cederman, Min and Wimmer, 2009).[9] Our theory identifies groups that are both significant enough historically to have clashed with more dominant groups and the central government and our interest is in groups that are important enough to plausibly fight the state. We use this measure of the number of politically relevant ethnic groups to assess our argument that areas with high variance in ruggedness have more ethnic groups.

Our argument that the persistence of ethnic groups is related to their ability to historically avoid state repression implies that the ethnic groups nested in rugged areas will likely have contentious relations to the state. We assess this expectation with three related measures. First, we measure the number of ethnic groups in each province that are excluded from political power in the state in

[9]Groups are considered politically relevant "if at least one significant political actor claims to represent the interests of that group in the national political arena, or if members of an ethnic category are systematically and intentionally discriminated against in the domain of public politics. By significant political actor we mean a political organization (not necessarily a party) that is active in the national political arena" (Cederman, Min and Wimmer, 2009).

a given year. While this measure is straightforward, it is possible that it simply proxies for number of total ethnic groups, excluded or not. That is, the percentage of all politically excluded relevant groups may be relatively constant across provinces. Our second measure aids us in ruling out this possibility by identifying the percentage of all politically relevant ethnic groups that are excluded from power in a given year. Finally, we produce a binary measure of whether an additional group is excluded from political power in year t relative to year $t-1$. Collectively, these measures identify whether provinces with relatively variable rugged terrain are more likely to host politically excluded ethnic groups.

We measure the incidence of civil conflict in a given province using the UCDP/PRIO geo-referenced data. Sub-state violence in a province is measured as having reached the level of civil war if the violence results in at least 25 battlefield deaths in a given year. We consider a province as experiencing civil war in a given year when it falls within a sub-state conflict circle constructed by Hallberg (2012).[10]

We use newly constructed data on terrain ruggedness to measure how rugged and varied terrain is in a given province. The measure of terrain ruggedness is obtained by first dividing the globe into identical one kilometer by one kilometer (1 km x 1 km) grid-squares and then measure absolute elevation change between each grid-square and all contiguous grid-squares. This approach is used to create a terrain ruggedness index, calculated by taking the sum of all squared differences between a given grid-square and all contiguous grid-squares.[11] Given a ruggedness measure for each small grid-square in a province, we then aggregate up to the level of province to generate two variables: mean ruggedness and variance in ruggedness. We expect variance in ruggedness to be associated with more ethnic groups and for those ethnic groups to have contentious relations with the state.

We also include a number of potential confounders in our specification of the distribution of ethnic groups and the incidence of civil war. To account for geographic factors likely important to the persistence of ethnic groups and the potential for civil war, we include average distance

[10]Because these conflict circles are sometimes large enough that they include areas that did not experience sub-state violence, to reduce erroneous classification, we manually correct for all cases in which territories of foreign countries bordering countries in conflict are assigned a positive conflict value when in fact no battles were fought across the border.

[11]The specific calculation is $\left[\sum_{i-1}^{i+1}\sum_{j-1}^{j+1}(X_{ij}-X_{00})^2\right]^{1/2}$.

to nearest contiguous foreign country from a given province as well as distance to the capital city (Tollefsen, Strand and Buhaug, 2012). To account for how large each province is within a given country, we also measure the percentage of the country each province covers (area in square kilometers).

A growing body of work on civil war shows that civil wars have a significant transnational component (Salehyan and Gleditsch, 2006; Gleditsch, 2007; Salehyan, 2009). To account for the possibility of spillover effects, we measure whether a neighboring foreign province is experiencing civil war. Additionally, we include the logged GDP per capita of each province, as well as the population density of each province. Both GDP and population are measured at the province level in 5-year increments from 1989 (Tollefsen, Strand and Buhaug, 2012). We linearly interpolate the years in between the 5 year measurements.[12]

To account for country-level effects, we estimate country-fixed effects versions of every model reported below. Importantly, country-fixed effects ensure that we assess the effect of each regressor measured at the province-level relative to the country-level mean of that variable. In the models without country-fixed effects, we account for the regime type of a state by coding whether it is democracy or not using the Polity IV data. We code a country as a democracy if it has Polity score of greater than 5 and a non-democracy otherwise. To account for the longevity of a country's regime, we also include the regime durability measure from Polity, which indicates how many years since a country experienced a change of three points in the Polity index. We interact this variable with our democracy measure, which makes the interaction the effect of durability in a democracy, and the individual durability measure the effect of durability in a non-democracy. The democracy variable is interpreted as a new democracy, as a durability of zero years indicates a regime change in the prior year. We include both current regime type and durability because a country's history with democracy or autocracy may influence its historical and contemporary repression of minority ethnic groups (Davenport, 2007).

[12]Our key results are not affected if we report the same values for five-year periods.

Results

We assess our hypotheses with several complementary empirical strategies. First, we estimate the effect of terrain ruggedness on the number of distinct ethnic groups that exist in a given province at the start of our sample. Given that the number of ethnic groups does not vary much within province after 1989, we estimate purely cross-sectional regression models with the start year of our sample, 1989.[13] These models establish that terrain ruggedness is strongly related to the spatial distribution of ethnic groups observed globally post-Cold War. Second, we establish that the ethnic groups present in provinces with rough terrain are especially likely to be excluded from political power in a given year. The analysis of whether ethnic groups are excluded or not has both cross-sectional and time-series components, as the political exclusion of ethnic groups varies across time. This assesses our claim that highly variable rugged areas tend to host groups that are at odds with the state. Third, we show that both terrain ruggedness and the distribution of ethnic groups are associated with the incidence of civil war in a given province-year. Finally, we assess the claim that terrain ruggedness has both a direct and indirect effect on the outbreak of civil war violence. We introduce causal mediation analysis to the literature on civil war as it is uniquely suited to analysis of whether the ethnic composition of a province serves as a causal mediator for the effect of terrain ruggedness on civil war. We provide a difficult test of our argument given that our sample starts in 1989, decades after the process of state repression produced the relationship between ruggedness and the distribution of ethnic groups we uncover.

Terrain Ruggedness and the Distribution of Ethnic Groups

Table 1 shows the estimates from different models of the number of ethnic groups at the province level. Given that the number of ethnic groups is almost always constant within-province after 1989, we focus our estimation on cross-sections of the first sample year.[14] We estimate both OLS and negative binomial regressions for each different specification, and also report results with and

[13] Inclusion of all province years artificially deflates our standard errors and neither ruggedness nor the number of ethnic groups varies from 1989–2008. The choice of year does not affect results.

[14] Note that we are careful to not rely on regressions that include potentially endogenous variables such as GDP per capita. However, the results are robust to inclusion of this variable as well as various measures of population.

without country fixed effects for each specification.[15]

Results across ten models support for the idea that geography, and variance in terrain ruggedness in particular, is associated with the presence of more distinct ethnic groups. Models I–IV include the variance in ruggedness for a given province and show that it is a significant predictor of the number of ethnic groups regardless of whether we estimate OLS or a negative binomial count model or whether we include country fixed effects or not. Models V–VIII show that the mean level of ruggedness in a province is a less robust predictor of the number of ethnic groups. Thus, it is variation in ruggedness rather than high mean levels that are associated with more distinct groups. In models IX and X we include both the mean and variance of ruggedness and find that the variance retains its large positive significant effect, while the significance of the mean level of ruggedness is again inconsistent and the sign is negative. This suggests that the long-term survival of groups is contingent not only on places to hide, but also some variation in terrain.

Other province-level geographic factors also matter. The distance between a province and the capitol city has a consistent positive effect on the number of ethnic groups. This is also consistent with the idea that many of these ethnic groups survived in part because it was difficult for the state to reach them. The finding that smaller distances between a province and the nearest neighboring state is associated with more groups is similarly consistent. This makes sense given that provinces close to an international border are often outlying regions.[16] Finally, provinces that constitute a larger percentage of the total area of the state contain more distinct ethnic groups. This is a useful confounder to control for as it is plausible that more rugged provinces would be less populated and larger, such that ruggedness might proxy for province-size, which is clearly not true here.

In the models without country-fixed effects we also include variables that measure regime type and longevity.[17] Specifically, we include a measure of whether a country is a democracy, how long a given regime has been in place, or regime durability, and an interaction between these two variables. We do not find much support for the significance of any of these variables. We find an inconsistent

[15] We prefer country-fixed effects to random effects, as we are skeptical of the assumption that the country-effects are uncorrelated with omitted variables. Nonetheless, in any of the fixed effects models reported below, the key results also hold if we estimate random effects instead.

[16] The correlation between the distance from the capitol and the distance from the nearest neighboring state is 0.38.

[17] We do not include these regime type variables in the fixed effects regressions as they do not vary across provinces and are thus subsumed by the fixed effects.

and negative effect for democracy in the two negative binomial models with no fixed effects, which suggests that provinces in new democracies have fewer ethnic groups. However, this result is not robust to the OLS specification.

Are Groups in Rugged Provinces Systematically Excluded?

The results in table 1 demonstrate that provinces with rugged and variable terrain are home to more distinct ethnic groups. We now explore whether these groups are more likely to have contentious relations with the state. Table 2 displays the results of four different estimated models of political exclusion. In models I and II, we analyze the number of excluded ethnic groups in a given province using OLS and negative binomial regression, respectively, while model III analyzes the percent of all ethnic groups in a province that are excluded with OLS. The dependent variable in model IV is a binary measure of whether an additional group was excluded from the prior year, $t-1$, to the current year, t. A key difference between the models of exclusion in table 2 and the models of the number of ethnic groups in table 1 is that we include all country-province years in the exclusion models. All three measures of political exclusion vary across time, as groups are excluded and brought back into the regime fold as a function of elections or changes in coalitions. All models include country-fixed effects, which ensure that we identify the variables relative to their within-country mean. Fixed effects also account for any country-level attributes that increase or decrease levels of political exclusion.

All four models provide considerable support for the idea that areas with high variance in rugged terrain have more politically excluded groups. The coefficient for variance in ruggedness is positive and significant across all four models, which constitute three different specifications of the dependent variable. Thus, as a province's variability in ruggedness increases above the level of the average province in the country, it has more excluded groups, a higher percentage of all politically relevant groups that are excluded, and a higher probability of experiencing an increase in exclusion among its ethnic groups each year. This finding is especially notable given that mean ruggedness and all but one of the three other geographic variables perform inconsistently. While mean ruggedness has a modest statistically significant effect on the number of excluded groups, it

has no significant effect on either the percent of excluded groups or whether there is an increase in exclusion from the prior year. Moreover, the substantive effect of variance in ruggedness is always much greater than for mean ruggedness. Provinces that are more distant from the capitol have a higher number of excluded groups, which is also true of provinces closer to the nearest international border. However, neither of these variables has significant effect on either the proportion of total ethnic groups in a province that are excluded or the probability that an additional group will be excluded in a given year. The size of a province in terms of area is a positive and significant predictor across the three different measures of political exclusion. Thus, as provinces constitute a greater proportion of the overall area of the state, they have more excluded groups, a higher proportion of all their groups are excluded, and the probability of an increase in exclusion is significantly higher.

The results for our regime type variables are somewhat mixed. We find that provinces in new democracies host fewer excluded groups and have a lower probability of an additional group being excluded, but find no relation to the percent of excluded groups. Non-democracies that have been in place for longer, i.e., the regime durability variable, have more excluded groups and a higher percentage of groups excluded. However, there is no relation to the probability a new group is excluded in a given year. In contrast, the number of years a country has been a democracy, i.e., Democracy*Durability, is significantly and positively related to the probability an additional group will be excluded in a given year. However, this variable is insignificant in models I–III.

We also include a measure of the logged GDP per capita of a given province in models I–IV. We did not include this variable in the specifications of the number of groups, as we expect development to be endogenous to ethnic diversity (Nunn and Puga, 2012). However, we did include it in our models of exclusion, as the wealth of a province is quite plausibly related to whether its ethnic groups are excluded from power or not. Indeed, we find a consistent positive effect across all four models: higher levels of per capita wealth are associated with higher levels of exclusion. There are still possible endogeneity concerns with GDP per capita, however. We, therefore, also estimate all four models without this variable and find very similar results.

Civil War

Table 3 contains three models of civil war onset and incidence, respectively. The difference among them is that models I and II include a measure of the total number of ethnic groups, models III and IV contain a measure of the number of excluded ethnic groups, while models V and VI include the percentage of all ethnic groups excluded. All measures are again at the province-year level and all models include country fixed effects. All regressors are lagged one year to account for the fact that their effect on civil war likely takes some time, although none of the key results are affected by this choice.

The estimates reveal several important findings. First, the variance in ruggedness is significant and positive predictor of both onset and incidence across all models. Thus, in countries that experience civil war, it is indeed the provinces with relatively rugged but variable terrain that are at higher risk of violence. However, mean ruggedness is generally not an important predictor of civil war. Second, note that the total number of ethnic groups and the total number of excluded groups are consistent predictors of civil war.[18] This finding in tandem with those above suggest that the long-term presence of ethnic groups in rugged provinces is associated not only with political exclusion, but with significant levels of violence. The other variables generally have signs consistent with existing literature, although several are sporadically significant. We do not discuss these variables in the interest of focusing more on our new evidence over how ethnicity mediates the effect of terrain on civil war.

Causal Mediation Analysis

We estimate the direct causal effect and and indirect causal mediation effect of variability in terrain ruggedness using the formal causal mediation analysis methods developed by Imai, Keele and Tingley (2010) and Imai et al. (2011). Causal mediation analysis is a powerful tool that allows us to decompose the total effect of variability in terrain ruggedness into its direct effect on civil war and its indirect effect on civil war via the presence of more ethnic groups and their exclusion. This

[18] Comparison of the coefficient size of the three ethnicity variables is not informative as the regressions are logit and the three variables have quite different magnitudes.

is important as we argue that the connection between civil war and rugged terrain is mediated by the presence of ethnic groups that would likely not exist without access to such terrain.

Mediation analysis uses the potential outcomes framework, which is common in the causal inference literature. We follow Imai et al. (2011) in our treatment here. The idea is straightforward: consider our unit of analysis, a province, our treatment, highly variable rugged terrain, and our outcome of interest, civil war. Given that our treatment is continuous, we must specify a range of values that constitute a province getting the treatment, $T_i = 1$, versus the control, $T_i = 0$. We use values of variability in terrain ruggedness that are above the 95th percentile to indicate the treatment group.[19] Our outcome variable, Y_i is also continuous, as it indicates how many years after 1989 a province experienced civil war.[20] The notation Y_i indicates a potential civil war outcome for each province i, where we can write $Y_i = Y_i(T_i)$ to indicate a province's outcome as a function of its treatment status. Given this exposition, we can define the causal effect of our treatment for province i as $Y_i(T_i = 1) - Y_i(T_i = 0)$, where write the treatment notation as binary to simplify. We focus on the average treatment effect (ATE) over all provinces in our sample.

We argue that variability in terrain ruggedness, T_i, affects civil war outcomes, $Y_i(T_i)$, directly and indirectly. The indirect effect is transmitted via a causal mechanism, $M_i(T_i)$, which we specify as either the number of ethnic groups in a province or the number of ethnic groups in a province that are excluded at some point. Thus, we can write civil war outcomes as $Y_i(T_i, M_i(T_i))$ to indicate the fact that the treatment and mediator both have an effect. Notice that the number of ethnic groups, $M_i(T_i)$ is also a function of the variability in terrain ruggedness, our treatment T_i. The total effect of rugged terrain (our treatment) for a given province can now be expressed as $\tau_i = Y_i(1, M_i(1)) - (0, M_i(0))$. The causal mediation effects, $\delta_i(t)$ are obtained by holding the treatment, $T_i = t$ constant:

$$\delta_i = Y_i(t, M_i(1)) - (t, M_i(0))$$

In this paper, we identify δ_i by having provinces that have the same treatment status, t, but different numbers of ethnic groups, which is our mediator variable. All other causal mechanisms

[19] The results are not sensitive to using lower thresholds such as the 90th or 75th, or a binary treatment.
[20] See below for a justification of this approach.

by which terrain ruggedness affects civil war are identified through the direct effect:

$$\psi_i = Y_i(1, M_i(t)) - (0, M_i(t)).$$

We identify ψ_i with provinces that have different levels of terrain ruggedness, but share similar numbers of ethnic groups. As is implied by the prior discussion, we focus on average causal mediation effects (ACME) and average direct effects (ADE) across the population of provinces here.

To identify ACME and ADE, we need to specify a set of regressors, X_i, which can be considered "pre-treatment" confounders for each province, and satisfy the assumption of sequential ignorability. There are two assumptions that we need to make to satisfy sequential ignorability. First, we need to assume that the assignment of the treatment is random, or exogenous. Relative to typical observational studies, this assumption seems relatively unproblematic here, as terrain ruggedness is exogenous to outcomes of interest such as civil war and variables of interest such as the distribution of ethnic groups. In other words, it is nonsensical to think that political variables affect ruggedness, or even that omitted variables in a model specification for Y_i or M_i are endogenous to terrain. The second part of the sequential ignorability assumption states that the number of ethnic groups is exogenous given the observed value of terrain ruggedness and pre-treatment covariates. We focus on geographic variables and indicators of region and country as our covariates, as they are more plausible pre-treatment confounders than indicators such as democracy or GDP per capita.[21] This is obviously the harder part of sequential ignorability here, and we address it below with robustness checks.

Does Ethnic Diversity Mediate Terrain Ruggedness?

Tables 4 and 5 contain the results of our causal mediation analysis for all provinces globally. Specifically, table 4 shows the specification of our mediator and outcome equations. To be careful about identification, we focus our analysis cross-sectionally similar to table 1. We measure the number of ethnic groups in a given province in the first year of our sample, 1989. We do this because

[21] That being said, we can include a host of political variables as confounders and the results do not change. However, we doubt the validity of these specifications and thus do not report them here.

variance in terrain ruggedness is fixed across time and because the number of ethnic groups in a province does not really vary across time during our sample. Thus, it makes sense to explore how the number of groups that we observe in 1989 is a function of terrain, and potential confounders. We measure the number of ethnic groups that were excluded after 1989 by counting all groups that were excluded at some point through 2008. In contrast to the mediator and treatment variables, the outcome variable, civil war, does vary across time. Thus, focusing on a single year, such as 1989, for the civil war equation would lead us to lose information about whether each province experienced civil war from 1990–2008. To sidestep this issue, we analyze the number of years in the sample that a given province experienced civil war. Thus, if $Y_i = 5$ for province i, this indicates that this province experienced civil war for 5 years from 1989 to 2008, and did not experience civil war for the other 15 years. It is of course possible to include all province-years; however, doing so would add no statistical information to our mediator equation, artificially lowering our standard errors.

For the global analysis in tables 4 and 5, we report two different specifications for each of our two measures of ethnicity, which results in four mediation models. First, we include only regional fixed effects as pre-treatment confounders, where we measure 26 different geographic regions.[22] This approach seems quite sensible given the assumptions, as all of our country-provinces are in one of these regions, which had numerous effects on its political history. That being said, all of our results survive inclusion of a variety of factors such as regime type and per capita wealth even though these variables are not veru plausibly exogenous to the number of ethnic groups conditional on treatment. In the second specification, we include country-level fixed effects as pre-treatment confounders. While country-fixed effects are more spatially precise, we are less confident that the exact character of many states in the post-Cold War era is exogenous to terrain. For this same reason, we exclude the three state-specific geographic variables included in tables 1–3. However, the key results are not much different in the country fixed effects specification.

The results suggest that the number of ethnic groups does in fact mediate the effect of variability

[22]The regions are: Asiatic Russia, Antarctica, Australia/New Zealand, Caribbean, Central America, Central Asia, Eastern Africa, Eastern Asia, Eastern Europe, European Russia, Melanesia, Micronesia, Middle Africa, Northern Africa, Northern America, Northern Europe, Polynesia, South America, Southeastern Asia, Southern Africa, Southern Asia, Southern Europe, Western Africa, Western Asia, and Western Europe.

in terrain ruggedness. First, note that table 4 shows that variance in terrain ruggedness has a significant and positive effect on the number of ethnic groups in a province, excluded or otherwise, which is unsurprising given the results of table 1. Second, both terrain ruggedness and the number of ethnic groups or the number of excluded groups exert a significant and positive effect on the number of post-Cold War years a province experiences civil war, which is consistent with the results reported in table 3.

Table 5 reports the actual average causal mediation effect and direct effect for each of the models. The model with regional fixed effects shows that nearly 14% of the effect of variable rugged terrain on the incidence of civil war is mediated via the number of ethnic groups. Both the ACME and the ADE are positive and statistically significant, as their lower 95% confidence intervals are easily greater than zero. The same is true of the percentage of terrain's total effect mediated by ethnic groups. The findings are very similar if we allow the effect of the number of excluded groups to be mediated by variation in terrain ruggedness, i.e., model III. The country-fixed effects models produces similar results, although the magnitude of the mediation effects are smaller. In general, the magnitude of the mediated effect we uncover is quite striking given that the state-building processes that we describe in the theory section preceded the post-Cold War period by decades or even longer in many countries. We suspect that if we had similar data for earlier historical periods, we would estimate even larger effects.

Robustness Check: Leveraging Arbitrary States in Africa

Given our endogeneity concerns about state-specific geographic factors in the global population of state-provinces, we examine the African case in more detail here. It is widely noted that African states' boundaries were "abitrarily" constructed, as over 75% of them simply follow lines of longitude or latitude (Herbst, 2000). Thus, it is fair to think of African borders as being exogenous to terrain in a way that European borders are not. Accordingly, a number of scholars have used African borders to identify "as if" natural experiments, e.g., (Posner, 2004). We exploit the fact that African borders were arbitrarily drawn with respect to terrain, ethnic groups, and most other features here as a robustness check on our mediation results. Simply put, sequential ignorability is

even more plausible in the African case.

The results in tables 6 and 7 provide further support for the idea that both the number of ethnic groups and the number of excluded ethnic groups serves as a mediator for terrain ruggedness in driving civil war. The variance in ruggedness is still a significant positive predictor of: the number of ethnic groups, the number of excluded ethnic groups, and the frequency of civil war incidence in the post-Cold War period. Additionally, both the number of ethnic groups and the number of such groups excluded from power exerts a positive and significant effect on the frequency of civil war incidence in Africa. Note that we include two of the state-specific geographic variables in addition to region fixed effects, i.e., model I, and country fixed effects, i.e., model II. The fact that state boundaries can be treated as exogenous makes us comfortable with the inclusion of a province's distance from the capitol and distance from the nearest international border, both of which exert the effects we would expect given the results in tables 1–3.[23]

The results in table 7 show significant causal mediation effects in Africa. Both the ACME and ADE reported in table 7 are positive and significant at the 0.05 level in both the regional fixed effects and country fixed effects models. Furthermore, the percent of terrain's total effect that is causally mediated by either the number of ethnic groups or the number of excluded groups is larger in the African sample relative to what we found globally. In the regional fixed effects model that focuses on the number of groups, we find that over 17% of the total effect of terrain on civil war frequency is mediated by ethnicity, while around 10% of the effect is found to be mediated in the country-fixed effects model. The fact that the ACME is more substantial in the African case is encouraging, as state-building periods relevant to the current system of African states are more recent than regions such as Europe, North America, or even South America, e.g., Argentina's campaign in the Pampas in the 1870s. Accordingly, we expect the mediation effect of terrain via ethnicity to be more pronounced in Africa, which it is. Finally, while we are not comfortable including a battery of additional political "controls", such as regime type or per capita wealth because this likely violate sequential ignorability, doing so again has virtually no effect on the results reported in tables 6 and 7.

[23]We do not include the size of a province as a percentage of the state, as this is plausibly endogenous to terrain. Its inclusion has no effect on the results.

Rough Terrain, Ethnic Diversity, and Conflict in Colombia

Rugged terrain has shaped Colombia's ethnic diversity by limiting colonial and modern attempts to uproot groups. The Andean region's highly variable terrain has also proven advantageous for rebel mobilization. Early settlers of the Andes split into a number of distinct ethnic groups. The arrival of Spanish conquistadors in the early sixteenth century threatened the survival of vulnerable coastal and agrarian tribes. These populations fled to relatively rough areas to avoid incursions by Jimenez de Quesada, Sebastian de Benalcazar, and Nikolaus Federmann (Francis, 2007). Between 1509 and 1541, Spanish forces massacred, forcibly displaced, or enslaved indigenous populations throughout the Chibchan plains, in what is now north-central Colombia (Melo, 1996). Highland populations, shielded by inhospitable terrain, were able to thwart further expansion during the early colonial period. Over the next four hundred years, autonomous self-defense groups, known as peasant leagues, emerged in rural, rugged municipalities. Guerrilla leaders from these leagues that survived the Marquetalia Massacre of 1964 joined ranks as the Revolutionary Armed Forces of Colombia (FARC).

Our sketch of these historical events underscores three points. First, we illustrate how geography shaped early settlement patterns. Terrain features influenced how early settlers split into distinct ethnic groups and, over time, how these groups specialized economically. Second, we demonstrate how ruggedness influenced where Spanish forces displaced or eliminated indigenous populations. Those able to survive in rough, mountainous areas were scarred by these colonial atrocities and remained restive and politically excluded for nearly five centuries. Third, we trace how these forces shaped the formation of local self-defense groups in the rural, mountainous countryside that fought a long civil war against the Colombian government. Facing exclusion from a fairly united political establishment and a militarily stronger Colombian military backed by the United States, guerrilla leaders were nonetheless able to form one of the world's most resilient and capable rebel forces, the FARC.

Early Settlement of Colombia

Archaeological evidence reveals that hunter-gathers first occupied the Andean region nearly 12,000 years ago. Bountiful valleys between the region's myriad waterways and steep mountain ranges shaped the migration and demographic patterns of these early settlers. Along the Caribbean and across the Andes Range, two dominant Chibchan kingdoms and a number of smaller ethnic groups emerged, most sharing common linguistic characteristics. The coastal region of the Pacific, known as the Upper Chocó, is characterized by dense land cover and uneven terrain. In this small but rugged band of coastline between Cape Corrientes and Buenaventura, 19 distinct ethnic groups emerged (Williams, 2004). Between 10,000 BCE and 800 AD, the dominant economic orientation of the indigenous Chibchan populations to the land shifted from hunter-gather to simple farming (Langebaek, 1995).

When the first European explorers arrived seven centuries later, the agricultural, social, and political systems of these peoples had advanced significantly (Rivas, 2007). The two dominant kingdoms divided their economy and populations along the ranges and valleys that shaped their emergence. Lowlands groups had adopted innovative farming techniques, tailored to the fertile soil. Precious metal extraction and emerald mining dominated the highland economies. Marketplaces were common in most population centers and local chiefs collected taxes on agricultural exchanges (Rivas, 2007). Although wealthy and not without military capability, these kingdoms were ill equipped for the arrival of European mercenaries in 1509, who brought pestilence and firepower to the Andes.

Conquest and Colonial Repression

The first explorers to arrive in modern-day Colombia explored the Caribbean and Pacific coastlines (Campbell, 1762). These Spanish forces raided and pillaged villages near the coast, but their attempts to advance further inland were hindered by indigenous resistance and geography. First-hand accounts of their struggles reveal widespread frustration with the region's dense forests and substantial rainfall, both of which limited movement.[24]

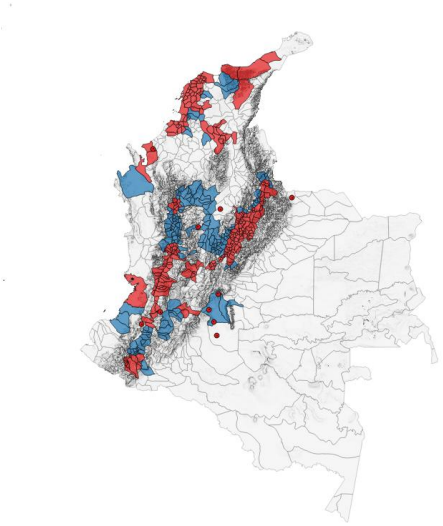
[24]See Williams (2004) for a review of these accounts.

Eventually, these explorers abandoned their goal of conquest and returned to Spain. Between 1509 and 1541, a new wave of colonizers focused their efforts on the northern regions, where the Magdalena River was believed to be the undiscovered passage from the Atlantic to Pacific. The Spanish empire sought a waterway through the continent to ease transport of Peru's newly conquered treasures (Arcinegas, 1942). The interior of New Granada was a mystery, and the most notable effort to find the source of the Magdalena was abandoned when the expedition first encountered the Muiscas Kingdom. The explorers, led by de Quesada and aided by advanced weaponry, raided villages and pillaged tombs for gold and silver (Francis, 2007). After nearly a year, this expedition returned to Santa Marta with the spoils of war. Meanwhile, two more expeditions were launched from newly established settlements along the Caribbean and Venezuelan coasts. Archaeological data and expedition logs from the period suggest that a number of vulnerable ethnic groups were decimated or altogether eliminated by Spanish explorers (Melo, 1996; Williams, 2004). These massacres are mapped in in Figure 1(a). Municipalities where indigenous populations were displaced are in red. Localities where colonial incursions were blocked appear in blue. There is a clear connection between variable rough terrain and resistance to Spanish conquest. Notice that Spanish forces were thwarted in Antioquia, along the Rio Cauca, where geographic relief made invasions difficult and settlement implausible. Ethnic groups in the Upper Chocó also resisted Spanish repression.

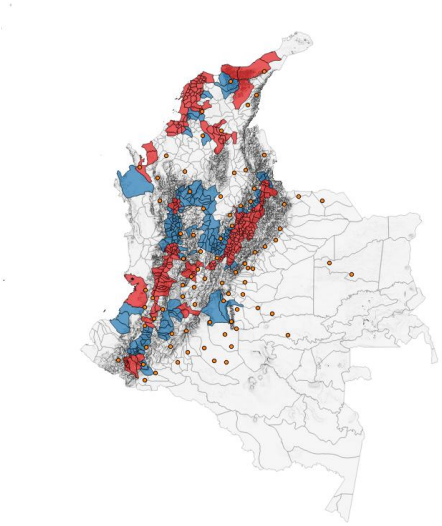
Early massacres were replaced by colonial repression when the Spanish government absorbed the Andean region as the Commonwealth of New Granada, encompassing parts of modern day Colombia and Venezuela. The lowlands populations were commonly displaced or enslaved, as colonial administrators sought to extract the agricultural and mineral wealth of the Chibchan Kingdoms. Indigenous populations survived in rugged areas where Spanish forces found it implausible to establish political or military control.

Peasant Leagues and Guerrilla Defenses

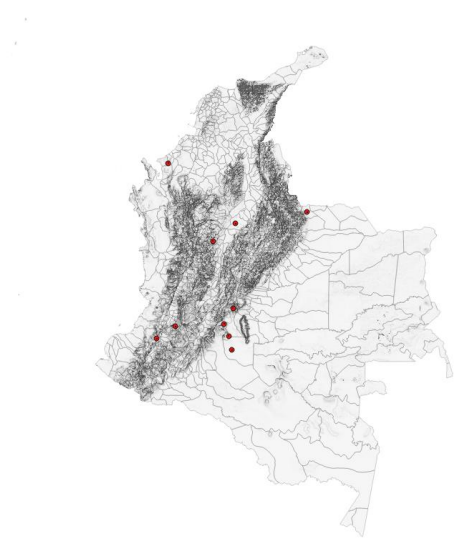
After less than two centuries, the once-attractive bounty of New Granada gave way to economic hardship. Revenue from the colony's agricultural and precious metal exports dwindled and, by



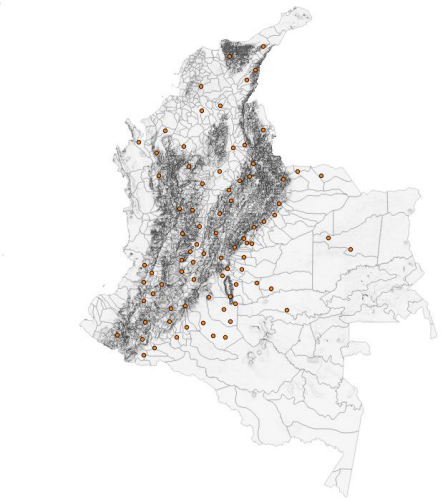
(a) Early massacres and rebel organization, FARC bases in 1964



(b) Path dependence in rebel mobilization, FARC bases in 1995



(c) Terrain features and location of FARC bases, 1964



(d) Terrain features and location of FARC bases, 1995

Figure 1: Early Spanish massacres, terrain ruggedness, and modern insurgency. Areas where indigenous populations were exterminated, displaced, and enslaved are marked in red. Areas of resistance are marked in blue.

the end of the eighteenth century, colonial taxes could no longer cover administrative expenses. Colombia declared national independence in 1810, but the Spanish regained control by force in 1815. The revolutionary forces of Simon Bolivar eventually secured Spanish expulsion and nearly a century passed before the Thousand Days' War defined the modern political landscape of Colombia (Bergquist, 1986).

Two political parties, the Liberal and Conservative, dominated Colombia's nascent democracy, and economic and social institutions were highly stratified. The meteoric ascendance and assassination of populist Liberal Jorge Gaitán in late 1940s triggered widespread political violence in the countryside. From 1948 to 1958, the Liberal and Conservative Parties were engaged in a protracted yet diffuse civil war. This period was also characterized by economic violence, with rural municipalities experiencing heightened exposure to banditry and internal displacement. This decade-long turmoil came to be known as *La Violencia*. To protect themselves from these roving partisans and bandits, some villages turned to peasant leagues formed in the 1930s by the Colombian Communist Party (Eduardo Pizarro Leongomez, 1991). These semi-autonomous defense groups mobilized against mainstream party supporters as well as criminals, shielding local populations from state-backed and predatory violence. The leagues were particularly prominent in areas where populist sentiments and a long history of indigenous resistance collided, namely the mountainous regions where colonial incursions were thwarted by rough and variable terrain four centuries prior (Gallego, 2009).

The Rise of FARC

The end of *La Violencia* represented a landmark moment in Colombian history. The Liberal and Conservative Parties agreed to a formal power-sharing government, wherein the president would be elected from amongst each party's candidates on a rotating basis. With the political establishment set, leaders focused on the remaining sources of violent political contestation: the peasant leagues.

With tactical support from the United States, the Colombian military made several early attempts to uproot the remnants of self-defense forces scattered throughout the countryside (Gott, 1971). These attacks were largely unsuccessful and reinforced local support for the leagues. In

1964, nearly 16,000 Colombian troops massacred inhabitants of Marquetalia, where the most vocal guerrilla leaders had gathered. Those who survived the assault fled to the mountains. Of the few who lived, 48 fighters coalesced as the Revolutionary Armed Forces of Colombia (FARC), with the goal of territorial sovereignty under communist political rule. In Figures 1(a) and 1(c), we plot the location of the first FARC fronts on maps that show the localities that experienced Spanish massacres, Figure 1(a), and rough terrain, Figure 1(c). Between 1965, with the First Guerrilla Conference, and the Seventh Guerrilla Conference in 1982, FARC remained a small rural force that concentrated operations in areas with uneven rugged terrain, where government interference was minimal. Beginning in the mid-1980s, FARC adopted urban insurgency tactics, generating revenue from kidnappings and extortion (Sánchez, Solimano and Formisano, 2005). Although their tactics changed, Figures 1(b) and 1(d) reveal that the spread of FARC bases continued to reflect the long-run consequences of settlement and repression, both of which are strongly influenced by the presence of variable rugged terrain.

Conclusion

Although both terrain and ethnicity feature prominently in civil war research, important historical and contemporary connections between these two factors have been overlooked. The robust relationship between terrain and civil conflict consists of two effects. The direct effect of terrain on rebels' abilities to withstand counterinsurgent efforts are widely recognized. We show that terrain also indirectly affects civil conflict through its influence on historical patterns of settlement and state repression. We argue and provide evidence that understanding the historical role of variable rugged terrain on the distribution of ethnic groups within states sheds much light on the political exclusion of ethnic groups. A sizable proportion of the effect of variable rugged terrain on civil war is mediated by the distribution of ethnic groups, which also tend to be politically excluded. These findings suggest that a lack of historical context for how terrain shapes the distribution of ethnic groups and their relationship with the state is one reason why many studies have not found

a relationship between ethnicity and civil war.[25]

This paper makes several key contributions to the civil conflict literature. First, we theorize over why difficult but variable terrain is associated with more ethnic diversity and larger numbers of groups that are politically excluded. We identify two primary reasons why variable rugged terrain hosts more ethnic groups that tend to be excluded: Greater effective distances among groups in rugged areas limited interactions and stunted assimilation. This same factor prevented repression of these distinct groups from the state or colonial powers. Second, we provide an explicit link between this historical process and the contemporary relationships between terrain and civil conflict. Our empirical tests contain two key innovations. First, we focus on areas within states that have highly variable and rugged terrain, a more nuanced measure of "rough" terrain that recognizes that groups must both avoid state repression *and* sustain a population over the long-term. Uniformly rugged and mountainous areas, e.g., the Hindu Kush in Afghanistan, may blunt state attacks but are often poorly suited to sustaining population over the long-term. Second, we introduce mediation analysis to assess the degree to which terrain's effect on conflict is mediated by ethnic variables. The fact that we find important mediation effects despite a focus on the post-Cold War era, a period long after initial state-building periods for many states, suggests that our estimates are quite conservative. The statistics clearly indicate broad trends consistent with our arguments. However, we are careful to supplement all of our key arguments and findings with a number of important examples across different regions and time-periods, and provide an in-depth treatment of how terrain shaped identity and resistance in Colombia in ways that continues to inform civil conflict patterns.

These findings suggest new avenues of research investigating how the complex relationship between ethnic and geographic factors influence the likelihood of civil violence. We have identified a promising route for future work: examination of how ethnicity mediates the established relationship between geography and armed conflict. Although considerable debate still exists over the conditions under which ethnic diversity increases the likelihood of political violence, our analysis suggests that the political legacies that bind geography, ethnic diversity and civil conflict together are at once

[25]See Cederman, Gleditsch and Buhaug (2013) for an excellent treatment that focuses on measurement and the proper unit of analysis.

deeply historical and contemporary. For restive minorities and rebels, difficult geography, while limiting in some ways, is a blessing when it comes to the fundamental objective of survival. For weak or repressive political leaders, difficult geography may be a curse.

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Table 1: Terrain and the Number of Ethnic Groups

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII	Model IX	Model X
Mean Ruggedness					0.87*	0.08*	0.12	-0.003	-1.36	-0.11**
					(0.44)	(0.05)	(0.31)	(0.017)	(0.84)	(0.05)
Variance in Ruggedness	2.00**	0.19**	1.43**	0.07**					3.22**	0.22**
	(0.87)	(0.08)	(0.52)	(0.03)					(1.61)	(0.06)
Distance to Capitol	7.91**	1.02**	4.38**	0.21**	8.23**	1.06**	4.67**	0.22**	4.33*	0.20**
	(3.37)	(0.22)	(0.74)	(0.04)	(3.47)	(0.23)	(0.74)	(0.04)	(2.40)	(0.05)
Distance to Neighbor	-8.75**	-1.22**	-9.08**	-0.92**	-8.57**	-1.22**	-9.33**	-0.92**	-9.05**	-0.94**
	(2.32)	(0.23)	(1.58)	(0.12)	(2.19)	(0.22)	(1.59)	(0.12)	(3.96)	(0.41)
Percentage of Total Area	8.74**	1.72**	24.25**	2.84**	8.89**	1.74**	23.23**	2.77**	23.04**	2.77**
	(4.23)	(0.74)	(4.69)	(0.23)	(4.20)	(0.75)	(4.72)	(0.24)	(7.31)	(0.37)
Democracy	-3.00	-0.56**			-2.82	-0.53**				
	(2.01)	(0.27)			(2.02)	(0.27)				
Regime Durability	-0.24	-0.06			-0.31	-0.06				
	(0.45)	(0.05)			(0.45)	(0.05)				
Democracy*Durability	0.22	0.08			0.24	0.08				
	(0.51)	(0.05)			(0.52)	(0.05)				
Constant	3.77*	1.47**	-3.54**	0.54**	4.62**	1.55**	4.87**	0.61**	3.55**	0.54**
	(1.98)	(0.22)	(0.78)	(0.06)	(1.79)	(0.21)	(0.70)	(0.06)	(1.69)	(0.16)
Log-likelihood		-5658.78		-4300.84		-5667.51		-4303.49		-4294.04
Model	OLS	Negative Binomial	OLS	Negative Binomial	OLS	Negative Binomial	OLS	Negative Binomial	OLS	Negative Binomial
Country Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
N =	2002	2002	2002	1936	2002	2002	2002	1936	2002	1936

Standard errors clustered by country in parentheses
** $p < .05$; * $p < .10$

Table 2: Terrain and the Exclusion of Ethnic Groups

	Model I	Model II	Model III	Model IV
Mean Ruggedness	0.015**	0.07**	0.003	-0.036
	(0.005)	(0.02)	(0.002)	(0.028)
Variance in Ruggedness	0.028**	0.16**	0.009**	0.20**
	(0.008)	(0.03)	(0.003)	(0.04)
Distance to Capitol	0.03**	0.17*	0.006**	0.007
	(0.01)	(0.02)	(0.002)	(0.029)
Distance to Neighbor	-0.09**	-0.014	0.003	0.020
	(0.02)	(0.05)	(0.006)	(0.076)
Percentage of Total Area	0.48**	3.17**	0.08**	1.25**
	(0.05)	(0.17)	(0.02)	(0.27)
Democracy	-0.03**	0.28**	-0.001	-0.12**
	(0.01)	(0.04)	(0.005)	(0.06)
Regime Durability	0.016**	0.17**	0.009**	-0.00
	(0.004)	(0.02)	(0.002)	(0.03)
Democracy*Durability	-0.004	0.02	-0.003	0.74**
	(0.008)	(0.03)	(0.003)	(0.05)
Log GDP per capita	0.016**	-0.09**	0.01**	0.05**
	(0.003)	(0.01)	(0.001)	(0.01)
Constant	0.25**		0.07**	
	(0.02)		(0.007)	
Log-likelihood		-19735.17		-15826.06
Model	OLS	Negative Binomial	OLS	Logit
Country Fixed Effects	Yes	Yes	Yes	Yes
Dependent Variable	Number Excluded	Number Excluded	Percent Excluded	Prob. Increase in Exclusion
N =	33171	30919	33171	32977

Standard errors clustered by country in parentheses
** $p < .05$; * $p < .10$

Table 3: Terrain, the Exclusion of Ethnic Groups, and Civil War

	Model I	Model II	Model III	Model IV	Model V	Model VI
Mean Ruggedness	0.05	0.07*	0.04	0.06	0.04	0.065
	(0.06)	(0.04)	(0.06)	(0.04)	(0.06)	(0.041)
Variance in Ruggedness	0.23**	0.30**	0.24**	0.31**	0.24**	0.31**
	(0.09)	(0.07)	(0.10)	(0.07)	(0.10)	(0.07)
Total Number of Groups	0.01**	0.01**				
	(0.00)	(0.00)				
Number of Groups Excluded			0.15**	0.20**		
			(0.07)	(0.05)		
Percent of Ethnic Groups Excluded					0.03	0.23*
					(0.19)	(0.12)
Distance to Capitol	-0.46**	-0.25**	-0.36**	-0.18**	-0.35**	-0.17**
	(0.13)	(0.09)	(0.13)	(0.08)	(0.12)	(0.08)
Distance to Neighbor	-0.54**	-0.96**	-0.33	-0.94**	-0.36	-1.00**
	(0.27)	(0.20)	(0.28)	(0.20)	(0.28)	(0.20)
Percentage of Total Area	1.53**	2.01**	1.55**	2.35**	1.62**	2.46**
	(0.65)	(0.51)	(0.67)	(0.51)	(0.66)	(0.50)
Democracy	-0.39**	-0.55**	-0.78**	-0.79**	-0.77**	-0.79**
	(0.13)	(0.10)	(0.16)	(0.11)	(0.16)	(0.11)
Regime Durability	-0.38**	-0.45**	-0.50**	-0.44**	-0.50**	-0.44**
	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
Democracy*Durability	0.62**	0.33**	0.12	0.30**	0.12	0.30**
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.08)
Log GDP per capita	-0.08**	-0.22**	-0.11**	-0.26**	-0.11**	-0.26**
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Population Density	-0.10**	-0.10**	-0.13**	-0.12**	-0.13**	-0.13**
	(0.04)	(0.03)	(0.05)	(0.03)	(0.06)	(0.03)
War in Neighbor	0.07	0.39**	0.08	0.42**	0.14	0.44**
	(0.18)	(0.14)	(0.19)	(0.14)	(0.19)	(0.14)
Log-likelihood	-3435.65	-5739.97	-3038.29	-5569.58	-3050.93	-5578.36
Model	Logit	Logit	Logit	Logit	Logit	Logit
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Dependent Variable	Civil War Onset	Civil War Incidence	Civil War Onset	Civil War Incidence	Civil War Onset	Civil War Incidence
N =	12965	16206	11399	15429	11417	15441

Standard errors clustered
by country in parentheses
** $p < .05$; * $p < .10$

Table 4: Mediation Analysis: Global

	Mediation Model I		**Mediation Model II**		**Mediation Model III**		**Mediation Model IV**	
	Mediatior Equation	Outcome Equation	Mediatior Equation	Outcome Equation	Mediatior Equation	Outcome Equation	Mediatior Equation	Outcome Equation
Variance in Ruggedness	10.97**	0.898**	1.93**	0.489**	0.75**	0.85**	0.891**	0.476**
	(2.04)	(0.387)	(0.47)	(0.074)	(0.12)	(0.11)	(0.153)	(0.074)
Number of Ethnic Groups		0.013**		0.015**				
		(0.004)		(0.003)				
Number of Excluded Groups						0.137**		0.048**
						(0.017)		(0.011)
Constant	49.71**	-0.663	6.63**	-0.532**	0.498	-1.07	6.20**	-0.729**
	(3.58)	(0.702)	(1.70)	(0.266)	(0.781)	(0.671)	(0.552)	(0.27)
Model	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Region Fixed Effects	Yes	Yes	No	No	Yes	Yes	No	No
Country Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Dependent Variable	Number Ethnic Groups	Subsequent Civil War Years	Number Ethnic Groups	Subsequent Civil War Years	Number Excluded Ethnic Groups	Subsequent Civil War Years	Number Excluded Ethnic Groups	Subsequent Civil War Years
N =	2603	2603	2191	2191	2603	2603	2191	2191

Standard errors
in parentheses
** $p < .05$; * $p < .10$

Table 5: Causal Mediation Analysis: Global

	Mediation Model I			**Mediation Model II**			**Mediation Model III**			**Mediation Model IV**		
	Estimate	95% CI (Lower)	95% CI (Upper)	Estimate	95% CI (Lower)	95% CI (Upper)	Estimate	95% CI (Lower)	95% CI (Upper)	Estimate	95% CI (Lower)	95% CI (Upper)
Avg. Causal Mediation Effect	0.146	0.051	0.249	0.056	0.024	0.103	0.199	0.119	0.287	0.082	0.044	0.137
Avg. Direct Effect	0.903	0.211	1.60	0.938	0.668	1.23	1.63	1.27	2.00	0.911	0.641	1.21
Total Effect	1.05	0.343	1.75	0.993	0.716	1.29	1.83	1.45	2.21	0.993	0.718	1.28
% of Total Effect Mediated	13.78%	8.34%	42.64%	5.58%	4.32%	7.77%	10.87%	9.00%	42.64%	8.21%	6.40%	11.43%
Ethnic Variable	Number of Groups			Number of Groups			Number of Excluded Groups			Number of Excluded Groups		
Region Fixed Effects	Yes			No			Yes			No		
Country Fixed Effects	No			Yes			No			Yes		
	N=2603			N=2191			N=2603			N=2191		

Table 6: Mediation Analysis: Africa

	Mediation Model I		**Mediation Model II**		**Mediation Model III**		**Mediation Model VI**	
	Mediatior Equation	Outcome Equation	Mediatior Equation	Outcome Equation	Mediatior Equation	Outcome Equation	Mediatior Equation	Outcome Equation
Variance in Ruggedness	0.824**	0.705**	1.32**	0.489**	0.856**	0.690**	1.12**	0.496**
	(0.374)	(0.342)	(0.45)	(0.203)	(0.420)	(0.339)	(0.523)	(0.201)
Number of Ethnic Groups		0.175**		0.043**				
		(0.036)		(0.019)				
Number of Excluded Groups						0.186		0.045**
						(0.032)		(0.016)
Distance to Capitol	4.34**	-0.471	3.11**	-1.57**	3.76**	-0.412	3.02**	-1.58**
	(0.637)	(0.601)	(0.631)	(0.288)	(0.715)	(0.588)	(0.732)	(0.285)
Distance to Neighbor	-6.26**	2.28*	-6.47**	0.965	-3.73**	1.88	-1.85	0.769
	(1.49)	(1.37)	(1.82)	(0.821)	(1.67)	(1.35)	(2.11)	(0.811)
Constant	2.75**	1.51**	-3.84	0.830	2.93**	1.44**	-5.52*	0.913
	(0.597)	(0.552)	(2.83)	(1.26)	(0.670)	(0.547)	(3.28)	(1.26)
Model	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Region Fixed Effects	Yes	Yes	No	No	Yes	Yes	No	No
Country Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Dependent Variable	Number Ethnic Groups	Subsequent Civil War Years	Number Ethnic Groups	Subsequent Civil War Years	Number Excluded Ethnic Groups	Subsequent Civil War Years	Number Excluded Ethnic Groups	Subsequent Civil War Years
N =	652	652	613	613	652	652	613	613

Standard errors
in parentheses
** $p < .05$; * $p < .10$

Table 7: Causal Mediation Analysis: Africa

	Mediation Model I			**Mediation Model II**			**Mediation Model III**			**Mediation Model VI**		
	Estimate	95% CI (Lower)	95% CI (Upper)	Estimate	95% CI (Lower)	95% CI (Upper)	Estimate	95% CI (Lower)	95% CI (Upper)	Estimate	95% CI (Lower)	95% CI (Upper)
Avg. Causal Mediation Effect	0.126	0.010	0.269	0.047	0.004	0.107	0.139	0.003	0.298	0.041	0.0001	0.098
Avg. Direct Effect	0.597	0.031	1.16	0.416	0.084	0.747	0.584	0.023	1.14	0.422	0.092	0.751
Total Effect	0.723	0.149	1.31	0.463	0.129	0.791	0.723	0.153	1.32	0.464	0.133	0.794
% of Total Effect Mediated	17.48%	9.51%	77.69%	10.06%	5.69%	36.08%	19.23%	10.49%	86.21%	8.87%	5.22%	31.16%
Ethnic Variable	Number of Groups			Number of Groups			Number of Excluded Groups			Number of Excluded Groups		
Region Fixed Effects	Yes			No			Yes			No		
Country Fixed Effects	No			Yes			No			Yes		
	N=652			N=613			N=652			N=613		