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Geography, Rebel Capability, and the Duration of Civil Conflict

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Why do some armed civil conflicts last longer than others? Drawing on a contest success function model, we show that geographic factors (such as location, terrain, and natural resources) interact with rebel fighting capacity and together play a crucial role in determining the duration of conflict. Using precisely dated duration data in event history models and geographic data for the conflict location, we find that conflicts located at considerable distance from the main government stronghold, along remote international borders and in regions with valuable minerals last substantially longer. In addition, we find that rebel military capacity in its own right increases the prospects of a civil conflict ending within a short time period. Our findings imply that the distances an army must travel to project power, rebel fighting capacity, and characteristics of conflict region affect how a civil war is fought and who will prevail.

Keywords: *geography; civil war; disaggregation; duration; resources*

Some armed conflicts last for years, even for decades; others are over in a few months or even days. Among the longest continuous conflicts are those found in the remote hinterlands of Myanmar, characterized by rugged mountains and dense tropical forest along the national border (e.g., Karen, Shan). These conflict regions are rich in natural resources, including rubies, jade, petroleum, and timber, as well as opium poppy. Northeast India provides further examples of remote, durable insurgencies. Located over 1,500 kilometers from New Delhi, this region is almost completely engulfed by neighboring China, Myanmar, and Bangladesh, and is

attached to the rest of India by a narrow corridor. As in Myanmar, the terrain in the areas with armed conflict (e.g., Assam, Nagaland, Tripura) is mountainous or hilly and with considerable forest cover. Substantial oil and gas reserves are found in some of these regions. The liberation war of Eritrea in resource-poor Ethiopia, which lasted almost thirty years, took place some 600 km north of Addis Ababa, the capital. A large part of the former conflict region is characterized by the rugged mountains of the northern Ethiopian Plateau, and to the west, the porous border to Sudan. And the forty-year-old Colombian civil war waged by Fuerzas Armadas Revolucionarias de Colombia; the Revolutionary Armed Forces of Colombia (FARC), and the Sendero Luminoso's (the Shining Path) uprising in Peru (almost thirty years old), are also fought predominantly in rural hinterlands that provide vital rebel protection and ample opportunities for income generation (coca cultivation and processing).

At the other end of the scale, the 1991 armed conflict in Togo lasted only for six days. In Yemen (1994), the southern secessionist movement was suppressed in less than three months, and the civil war in Guinea Bissau in 1999 was active for only a year. Common for all these swift rebellions is the limited geographical opportunities offered by the terrain. We argue that these examples are representative of a more general pattern: civil conflicts in areas favorable to guerrilla warfare last longer.

Relative fighting capability and geography are inherently interrelated. Power decays as it is projected across distance (Boulding 1962). Difficult terrain, porous boundaries, and access to lootable resources also affect the relative strength of a government and rebel group engaged in conflict. Location matters.

Despite the insights provided by earlier theoretical, empirical, and case-study work on both international and intrastate conflict, the dual impact of geography and relative military capability on conflict duration is yet to be studied in a systematic, comparative manner. In this article, we develop a formal model of the military contest between a rebel group and the government, explicitly accounting for the relative capabilities of the belligerents and the geography of civil conflict. Using new georeferenced data, we are able to test five hypotheses derived from our model at a disaggregated level of analysis. To our knowledge, this article constitutes the first systematic study of conflict duration that quantitatively integrates rebel fighting capability and aspects of geography (including the distance an army must travel to

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project military power, access to an international border, rough terrain, and existence of valuable natural resources in the conflict zone).[1]

Our empirical analysis finds rebel fighting capacity and geography to be relevant. We find that rebel military capacity in its own right increases the prospects of a civil conflict ending after a short period, even when controlling for various geographical factors. Different aspects of geography are also significant. Conflicts that occur far away from the state center last substantially longer; the average duration for the 10 percent most distant conflicts is more than twice as long as that of the decile located closest to the capital. Similarly, conflicts where rebels have access to an international border are twice as durable as other conflicts. Indeed, the advantage of having access to foreign territory may actually serve as a substitute for not having a peripheral base and vice versa. In addition, we confirm earlier results that conflicts in regions with rich natural resources tend to last substantially longer (Fearon 2004; Lujala forthcoming); the effects of lootable gemstones, such as alluvial diamonds, and oil and gas reserves prevail even after we control for relative location and rebel strength, though they are sensitive to sample size.

The article proceeds as follows. We begin with a discussion of the prominence of geography in earlier work on civil war. Next we develop a formal model that integrates the relative capabilities of the belligerents with geographical factors (especially regarding location). From this model, we derive a set of testable hypotheses. Then we describe the operationalization of our subnationally disaggregated data and present the results of an empirical analysis of civil conflict duration, 1946 through 2003. The article ends with some concluding remarks on the significance of the findings.

Geography, Rebel Capacity, and Conflict Duration

Knowledge about the impact of geography on conflict is as old as the art of war. Geographers, as well as theorists of international relations, have long claimed climate, topography, and location to be important determinants of state behavior. Difficulties of projecting power over long distances or in regions with rough terrain, territory that can serve as a sanctuary and base for revenue raising, and porous borders that offer access to safe havens in foreign territory and to international markets are all factors that are likely to affect how and for how long period a war is fought (cf. Arreguín-Toft 2005; Salehyan 2007). Geographic considerations, relating to such factors as natural resource wealth, location, and terrain, affect the local balance of power between the rebels and the government (Le Billon 2001). This, in turn, determines the manner in which troops are deployed and engaged in battle, the nature of the warfare, and the prospects for an early settlement to the conflict.

The geographic aspects of territory significantly shape the incentives for going to war. First, defending or conquering some land area may be valuable for strategic

reasons. Rough terrain, for example, may offer good defensive positions, which is particularly important for militarily inferior groups. Controlling a mountain pass or a sea passage may offer similar strategic advantages with regard to communications and logistics. Border areas also may be crucial as they facilitate safe havens and trade. Furthermore, a given territory may hold strategic or valuable resources that can serve as an immediate source of funding (loot) or increase the bargaining leverage with the government. The local population and their settlement characteristics may maintain special significance, because of factors of ethnicity, religion, etc., and can thus serve to legitimize sustained opposition and provide much-needed rebel soldiers (Toft 2003). Territory also may possess certain nontangible qualities, for example, symbolic values tied to group identity and cohesion, which may play a critical role in recruitment and allegiance to an army. All these aspects of territory have been central in the long conflicts in Myanmar, Northeast India, Ethiopia, Peru, and Columbia.

To the extent that geography and conflict are linked in other and more fashionable ways, they have traditionally been subject to one of two approaches. The first deals with micro-level analyses of battlefield effectiveness, typically from a military point of view. In this respect, issues such as weapon and soldier performance in varying topographic and climatic conditions, and how to exploit geographic advantages (ranging from hills and weather to tidal water) are central concerns, sometimes illustrated by certain well-selected historical battles (see Collins 1998). The second approach features system-level discussions of geopolitics and structures of global alliance patterns. Spheres of ideological influence and strategies of nuclear deterrence are central themes (cf. Pepper and Jenkins [1985] for a discussion of Cold War geopolitics). Neither of these approaches is suitable for a cross-national study for the entire post–World War II period; the first is inappropriately detailed, the latter allows little variation between cases.

Diehl (1991) points us in the right direction by emphasizing the importance of distance and territory in war. Although framed within the context of international conflict, these concepts are perfectly applicable to a domestic setting. To formalize our argument on the importance of distance, territory, and rebel fighting capacity and to extend the work presented in this issue by Cunningham, Gleditsch, and Salehyan (2009), we model civil war as a military contest between a rebel group and governmental forces. The model builds on Gates (2002)[2] and follows from a general class of contest success functions (CSF) first developed by Tullock (1980) and applied to conflict by Hirshleifer (1989, 2000), Skaperdas (1996), and others. As applied to military conflict, the contest success function relates to the relative capabilities of two competing sides of a conflict, such that

$$\pi(K_l - K_g) = \frac{f(K_l)}{f(K_l) + f(K_g)}, \tag{1}$$

where $f(K_l)$ and $f(K_g)$ are nonnegative, increasing functions of military capabilities, K_l and K_g, for the rebel group and the government, respectively, and π is the probability of military success of the rebel group.

Military capability, K, depends on some unspecified combination of troop size, military budget, technological sophistication, etc. For all levels of capability, however, power decays as it is projected across distance (Boulding 1962). The military capability of government can thus be represented as $K_g(x_a; \varepsilon_g, x_g)$, which means that the capability of the military is a function of the distance between the center of conflict region, x_a, and the government stronghold, x_g, and the military effort of the army, ε_g. The closer the army is to its own base, the higher its own probability of victory, ceteris paribus.

Formalizing $K_g(\Delta)$, military capability takes the following form:

$$K_{\mathrm{g}}(x_a; \varepsilon_g, x_g) = a + \ln(\varepsilon_g) - (x_a - x_g)^2 + \eta_g, \tag{2}$$

in which η_g is a stochastic element and a is a constant. As such, distance and military effectiveness, as factors shaping the contest success function, are explicitly formalized. In this regard, the functional form of this contest success function is innovative.

By setting the respective capabilities of the two armies against one another, the difference in their capabilities can be compared:[3]

$$\begin{aligned} K_{\mathrm{g}}(x_a; \varepsilon_g, x_g) &= a + \ln(\varepsilon_g) - (x_a - x_g)^2 + \eta_g \\ &= a + \ln(\varepsilon_l) + \eta_l = K_l(\varepsilon_l). \end{aligned} \tag{3}$$

For the rebel group to have an advantage in terms of capability, the following inequality is obtained, $K_l(\varepsilon_l) > K_g(\varepsilon_g, x_g)$. By rearranging the terms, putting the distance and military capability parameters together, the equation can be expressed in terms of the stochastic elements such that $ln(\varepsilon_l) - ln(\varepsilon_g) + (x_a - x_g)_2 > \eta_g - \eta_l$. Using these stochastic parameters, the full equation can be expressed utilizing a subclass of the contest success function, the logit success function (Hirshleifer 1989, 2000; Gates 2002). This functional form allows us to emphasize the differences in capabilities between the two armies. Moreover, it more realistically accounts for the stochastic nature of combat, "where there are sanctuaries and refugees, where information is imperfect, and where the victorious player is subject to fatigue and distraction" (Hirshleifer 2000, 94). Indeed, unlike the ratio form of contest success functions, the logistic class of CSFs does not assume that the defeated side loses everything. Moreover, this functional form has the added advantage of having

peace (at least the termination of conflict) as a possible equilibrium. Peace is not in equilibrium for the more commonly used ratio functional form of the contest success function (see Hirschleifer 2001, 95). In this specification, the cumulative density function of the difference between the two stochastic elements, $F(\eta_g - \eta_l)$, is characterized by a logistic function:

$$F(\eta_g - \eta_l) = \frac{e^{(\eta_g - \eta_l)}}{1 + e^{(\eta_g - \eta_l)}}. \tag{4}$$

The contest success function expressed in this logistic form allows us to directly account for the geographic location of the conflict site, x_a, such that the probability of success, π_1, depends on the proximity of x_a with respect to x_g (the location of the government's stronghold). More specifically,

$$\pi_l = \frac{\varepsilon_l \Big/ \varepsilon_g}{e^{-(x_a - x_g)^2} + \varepsilon_l \Big/ \varepsilon_g}, \tag{5}$$

from which we deduce that the further the conflict region is from the government stronghold, the higher is the probability of rebel victory for a given level of relative military effort, ε, When the distance from the government stronghold to the conflict site increases, the term $e^{-(x_a - x_g)^2}$ decreases, and thus, the probability of rebel victory, π_l, increases.

Contest success function models are particularly useful for explaining why belligerents in an armed civil conflict continue to fight and do not negotiate a bargained settlement (even when a bargain seems to be mutually advantageous). In this regard, they serve as a useful model for understanding why some civil wars last longer than others. The functional forms of our theoretical and empirical models, however, differ. The contest success function provides a model specifying the likelihood of being able to keep on fighting, which in turn affects the duration of conflict.

Our model has two central elements—location and rebel military capacity—that play a crucial role in determining who wins and who loses. In its simplest form, location can be understood as the absolute distance between the government stronghold and the conflict region (Buhaug and Gates 2002). But here we apply location in a wider setting, taking into account not only the distance vis-à-vis the capital but also proximity to international borders, and characteristics of the terrain in the conflict zone, both of which affect an army's ability to effectively target the rebel group. In addition, rebel group's military capability, motivation, and objectives may be influenced by the availability of valuable natural resources in the conflict region. All of these factors constitute aspects of geography.

Hypotheses

Absolute Distance

In an assessment of previous work on geography and international war, Diehl (1991) discusses three theoretical frameworks of particular influence: Sprout and Sprout (1965) with the notion of "environmental possibilism"; Boulding (1962) with the loss-of-strength gradient; and Starr (1978) with the concepts of opportunity and willingness. All three emphasize physical distance as the crucial geographic factor affecting the risk of conflict.

Distance is likely to be a very salient feature in civil conflicts as well. In civil conflict, government forces have a clear disadvantage if they are required to operate over long distances. Remote and sparsely populated regions are more difficult for a government to control, and governments often face significant logistical obstacles when involved in a conflict in distant areas (Herbst 2000). These include physical barriers for transportation of troops and equipment (such as mountains and lack of proper transport network), higher costs associated with longer distance, limited knowledge of the local environment, and, as is often the case, lack of support from the local population. The many self-determination conflicts in Northeast India serve as good examples. The Northeast region is culturally distinct and geographically tenuously connected with the rest of India through a narrow corridor, the "chicken's neck" with Bangladesh to the south and Nepal, China, and Bhutan to the north, "with an approximate width of 33 kilometers on the eastern side and 21 kilometers on the western side" (Sahnie 2009).

Our conceptual framework of geography and conflict explicitly incorporates distance (equations 3 and 5). The farther a government stronghold, x_g, is from the conflict region, x_a, the steeper the function of the probability of rebel success. Since in most civil conflicts the rebels are the militarily weaker side, the long distance mitigates the government's a priori advantage, making rebels in remote areas more likely to endure for longer periods. In contrast, the closer the conflict region and government stronghold are located, the lower the probability of rebel victory, and if $x_a = x_g$, implying that the conflict was located at the main army base, equation 5 simplifies to

$$\pi_l = \frac{\varepsilon_l}{(\varepsilon_g + \varepsilon_l)} \tag{6}$$

since the distance term equals zero, making $e^0 = 1$. This is similar to the generalized contest success function, $\pi_l = f(K_l) / [f(K_l) + f(K_g)]$ (see equation 1), but since the distance component has dropped out, the CSF is limited to a ratio of military effort.

The decision of location depends on (but can also be a powerful determinant of) the strategic ambitions of the group. If the group's aim is to secede, the group is

more likely to be in a favorable position vis-à-vis the government (presuming that the seceding province is relatively remote from the capital). If the group aims to capture the apparatus of the state, it will aim at the capital, and in general this will give the government the advantage with regard to distance. Therefore, only the strongest opposition movements, enjoying support from the large masses or key elements of the military, attempt to challenge the center on its home ground—unless the state is unusually weak.[4] In this manner, the distance and relative power considerations modeled in our contest success function exhibit a conceptual similarity to Boulding's (1962) loss-of-strength gradient (LSG) model.

Thus, all else being equal, the military preponderance of government forces decreases as they move away from their main stronghold, the capital city. The result may be durable but low-intensity insurgencies, as found in Northeast India and the Southern Philippines. Indeed, a striking feature of most contemporary insurgencies is their remote location. While earlier research gives some indication of the role of having a peripheral base, this is yet to be explored in an explicit manner. To our knowledge, only two other statistical analyses of civil war duration include a direct indicator of subnational location; both report a very strong, positive effect of the distance from the capital to the conflict zone (Buhaug and Lujala 2005; Rustad et al. 2008). In addition, some have noted the durable character of separatist (Balch-Lindsay and Enterline 2000) and "sons-of-the-soil" conflicts (Fearon 2004), which by definition occur in peripheral areas.[5]

Our first testable hypothesis is:

Hypothesis 1: Conflicts located further from the capital city last longer.

Relative Distance

Aside from operating in the periphery, weaker nonstate actors may avoid open encounters with stronger government forces by taking advantage of rough terrain or enjoying safe havens beyond the national boundaries. As the geography varies from country to country and from region to region, fighting groups face various advantages and challenges imposed by the physical setting surrounding them. Rugged terrain, such as high mountains, dense forests, and other inaccessible landscapes, favors small, irregular bands by making them harder to detect and defeat by government forces. A group that can retreat to areas where it is protected from the enemy can more easily regroup, rearm, and train, and is therefore able to continue fighting for prolonged periods.

Therefore, we interpret our distance measure not only to be limited to the absolute number of kilometers from the government stronghold to conflict region, but also to include difficult terrain and rebel access to safe-havens on foreign soil. In Boulding's (1962) terminology, rough terrain increases the LSG of military power projection, particularly for heavily armed and mechanized regular forces. In the case that rebels seek protection in a neighboring country, an army may find it impossible to operate

beyond the state boundaries which reduces its effectiveness to defeat the rebel group considerable leading in a steep increase in LSG. These problems were experienced by the Indonesian army as they pursued rebels (the Liberation Army of Free Papua) into the jungles of Papua New Guinea in the late 1960s and lost logistical support (Osborne 1985).

In these regards, equations 3 and 5 are again relevant. A rebel group that has knowledge of the terrain and knows how to benefit from it is better equipped to succeed on the battlefield. Nowhere has this been demonstrated with more force than in Afghanistan, where Mujahedeen groups successfully fought off the Soviet invasion, and later, the Taliban insurgents have managed to evade massively superior NATO forces.

Hence, we propose two more hypotheses on geography and duration:

Hypothesis 2: Conflicts located in rough terrain last longer.
Hypothesis 3: Conflicts located near an international border last longer.

Despite the intuitive logic behind the notion of relative distance, country averages of mountainous and forested terrain seem largely unrelated to the duration of civil war (e.g., Collier, Hoeffler, and Söderbom [2004] and DeRouen and Sobek [2004]). To some extent, this lack of empirical support can be explained by overly aggregated data and research designs, although more appropriate conflict-level studies also find only limited support for the rough terrain proposition (Buhaug and Lujala 2005; Rustad et al. 2008). To our knowledge, the role of borders has so far been ignored in quantitative research on civil war duration.

Rebel Capability

Military capacity also plays a prominent role in our contest success function. As the rebel military capacity grows relative to the government's, we expect to see a switch from expected government to rebel victory, such that $K_l(x; \varepsilon_l) > K_g(x_a; \varepsilon_g, x_g)$. In particular, as the ratio $\varepsilon_l/\varepsilon_g$ increases, the odds of rebel victory increase, controlling for the absolute and relative distance. If the fighting occurs in the country's capital, the contest success function is simply the ratio of the fighting capacities (equation 6). As the probability of success shifts to favor the rebels, we would expect to see an end to conflict, and under conditions of balance, we would expect the conflict to continue.

To examine the role of rebel capability, we focus our analysis now to the limiting case where geography plays no role as expressed in equation 6, which is the ratio form of the contest success function. This allows us to focus on capabilities alone. To do this we contextualize military capability with a focus on the rebel group. A group opposed to the government is assumed to distribute organizational resources, R_l, between two activities, military, ε_l, or nonviolent political, α_l, such that

$$R_l = \alpha_l + \varepsilon_l. \tag{7}$$

The resource allocation is exogenously determined, and it serves to constrain military activities and capabilities.

Aggregate income for an entire society is affected by how the government and rebels allocate their resources. Fighting, ε, does not produce income, but nonviolent activities, α, do contribute to aggregate production. National income is thus

$$Y = A(a_l + \alpha_g), \tag{8}$$

which is the sum of the two groups' nonviolent production multiplied by a technological multiplier (designated as a constant, A). The government and the rebel group's income, in turn, are affected by the probability of success, π, from the contest success function (seen in equation 6).

$$Y_l = \pi_l Y \text{ and } Y_g = \pi_g Y \tag{9}$$

Rebel relative capabilities play an important role in determining how much effort is spent fighting. This can be shown by differentiating equation 9 ($Y_l = \pi_l Y$) which leads to,

$$\frac{\partial Y_l}{\partial \alpha_l} = \frac{A\varepsilon_l}{\varepsilon_l + \varepsilon_g} \text{ and} \tag{10}$$

$$\frac{\partial Y_l}{\partial \varepsilon_l} = \frac{A\varepsilon_g (\alpha_l + \alpha_g)}{(\varepsilon_l + \varepsilon_g)^2}. \tag{11}$$

Equation 10 shows that the marginal payoff of nonviolent activity is directly related to violent and nonviolent activities; as fighting effort and productive activity (ε_l and α_l) go to zero, so does the partial derivative, $\frac{\partial Y_l}{\partial \alpha_l}$. Equation 11 shows that the marginal payoff for military capacity, $\frac{\partial Y_l}{\partial \varepsilon_l}$, however, remains positive, even when facing declining resources. Thus, as R_l approaches zero, the weaker side will allocate more and more resources to fighting. This means that conflict is relatively more attractive to the weaker belligerent. Essentially, a weaker group has little left to lose and therefore allocates a disproportionate share of its resources to the conflict.[6]

This "nothing left to lose" result holds also when geography is relevant, but strong asymmetry tends to be less relevant as distance reduces the disparity between the strength of the government's army and the capabilities of the rebel group. It is important to note that there is strong asymmetry relating to how the fighting capacity of army and rebel movement affect the duration of conflict. We especially need to take into account whether the state will realistically exercise full force in battling the opposition.

In addition to expecting weaker rebel parties to derive a higher marginal utility for fighting, Cunningham, Gleditsch, and Salehyan (2009) suggest three additional

reasons for why we would expect conflict involving weak rebel groups to last longer. First, it may be a considerable task—militarily and economically—to uproot a rebel group that employs guerrilla tactics and avoids large encounters with state troops. Second, a small, weak rebel group is unlikely to pose a credible threat to the survival of the government, and therefore a state may be reluctant to accommodate the demands of these groups for political and economic reasons. The government may fear that it may be setting a dangerous precedent that may encourage other groups to take up arms to extract concessions from the state (Walter 2006), or that the peaceful settlement may actually be more costly than merely keeping the intensity of violence at an acceptable level. Finally, rebels may be reluctant, even when they know that they are unlikely to attain their objectives, to lay down arms because of fear of reprisals.

All four reasons are exemplified over the course of the conflict between the Lord's Resistance Army (LRA) and the government of Uganda. For twenty years, Joseph Kony's LRA has waged a brutal civil war in northwest Uganda. The LRA has never really threatened the government of Uganda and most certainly poses no direct threat to President Yoweri Museveni's rule. Moreover, Museveni's pattern of negotiations over time has been inconsistent. In December 2003, in an attempt to gain leverage in his negotiations with the LRA, Museveni appealed to the International Criminal Court (ICC). Less than two years later, in July 2005, the International Criminal Court issued indictments for Joseph Kony and four other LRA commanders. But initial optimism regarding what looked to be the end of the conflict soon turned sour, as Kony has been reluctant to conclude the peace deal with the Ugandan government as long as he has an outstanding ICC indictment hanging over his head (Binningsbø, Gates, and Loyle 2009).

In contrast, when the rebels are decisively stronger than the regime, the latter may give in with little resistance or the fighting ends quickly. A strong rebel group, even when not necessarily stronger than the army, may be able to press the government to negotiate and actually succeed in extracting considerable concessions from the government. The civil conflict in the Comoros in 1997 serves as a good example. After the islands of Anjouan and Moheli declared their independence from Grande Comore (where the capital is located), the Comorian government sent troops to Anjouan. After a few months of armed conflict, involving two relatively balanced forces, a peace agreement involving a power-sharing arrangement was signed. Given the poor prospects of either party winning the civil conflict outright, a settlement was reached fairly easily and the conflict lasted only a matter of months.

This leads us to our fourth proposition, which features the military capacity of the rebel group:

Hypothesis 4: Conflicts involving weaker rebels last longer.

Indeed, results by Cunningham, Gleditsch, and Salehyan (2009) strongly support this notion: weak rebels fight longer conflicts, and conflicts in which rebels are stronger are more likely to end in formal agreement or rebel victory.

Natural Resources

A relevant geographic factor for conflict duration, more explored in earlier research than absolute and relative location, is natural resources. Valuable and easily extractable resources,[7] such as alluvial gemstones and narcotics, may increase the rebels' funds available for arms purchase, and the prospect of personal enrichment may also make rebel recruitment easier. This would make the rebel group stronger, resulting in an increase in the $\varepsilon_l/\varepsilon_g$ ratio. Thus, we would expect these conflicts to end more quickly. However, we believe that it is more likely that natural riches influence the duration through other channels. First, a low-intensity conflict itself may be the objective of a rebel group. Small-scale violence may provide the ideal setting for illegal gemstone mining and drug cultivation—opportunities that may be considerably more limited in more peaceful times. Therefore, excessive wartime income may reduce incentives for a peaceful settlement. Second, groups that resort to extensive resource looting may concentrate on revenue extraction and use less time and effort to fight the state army. This would make the rebel movement a smaller and less immediate threat for the government, which may then tolerate the group as long as it is not a direct threat to its existence. Finally, it is possible that natural resources provide opportunities for weak, cash-strapped movements to emerge that do not have potential to grow strong. There is no shortage of long-lived resource-funded insurgencies around: examples include Afghanistan (opium), Colombia (cocaine), Myanmar (timber, opium, gems), and Cambodia (timber and gemstones). The few empirical studies that account for rebel access to contraband are generally consistent with the proposed conflict-prolonging effect of contraband resources (e.g., Fearon [2004] and Lujala [forthcoming]).

The latent value of nonlootable resources may trigger conflicts, for example, by serving as a motivation for groups to capture revenue either by ousting the present government or by secession. In some cases, the prize of future revenue flows may be so huge that the motivational effect on rebel group may encourage these movements to endure longer than otherwise. This would be most likely in the case of very valuable natural resources such as oil and gas, as shown by Lujala (forthcoming).

Thus, our final hypothesis is

Hypothesis 5: Conflicts located in areas with valuable natural resources last longer.

Data and Research Design

The conflict data under study are taken from the UCDP/PRIO Armed Conflicts Dataset v. 3–2005 (Gleditsch et al. 2002) and adapted to survival analysis by Gates and Strand (2004). The dependent variable is the duration of internal conflicts, measured in days. In all, our data contain 228 unique conflicts—coups

excluded—between 1946 and 2003, with an average duration of 2,221, days. Four conflicts lasted for one day only;[8] the most durable uninterrupted conflict is the Israel–Palestine war (20,088 days at the end of 2003).[9] We exclude conflicts that are characterized as coups d'etat. Coups, by definition, constitute a fight between two parts of government and have little to do with geography.[10] As a robustness test, and to make this analysis more comparable to other studies, we also run our models on a subset of the sample limited to major civil wars. Only conflicts that caused one thousand battle deaths or more in at least one calendar year are considered civil wars.[11] This more than halves the number of conflicts in the sample (down from 228 to 104) while the number of conflict years drops by about one-third.

This dataset offers a number of advantages over alternative samples. First, as with all data developed by UCDP, the battle casualty threshold is much lower than comparable datasets—twenty-five as opposed to one thousand per year. Second, the unit of observation is the conflict, not the country. These data thereby differentiate between several contemporaneous conflicts in the same country. This allows us to account for unmeasured heterogeneity. Third, precise dating of outbreak and resolution allows us to account for and differentiate between the large number of conflicts that last less than a year. Unique to the UCDP/PRIO dataset, a conflict is only registered in years where the fighting resulted in at least twenty-five deaths. Many low-intensity insurgencies fail to reach the minimum casualty threshold in every year during the course of conflict. Consequently, we merged units that have identical ID codes, incompatibility, location, and main actors, and are separated by less than twenty-four months of inactivity (these lapses are treated as part of the ongoing conflict).[12]

Another significant novelty of our data is the explicit incorporation of geography. Most intrastate armed conflicts are confined to limited parts of the territory of affected countries, and many proposed explanatory factors for civil war duration (e.g., resources and terrain) also vary across space. Data on the spatial extent of conflicts are derived from the UCDP/PRIO dataset and updated by the authors. Additionally, we make use of several geo-referenced data to capture the local geography of the conflicts. Standard analytical tools are not designed to handle spatial information. Hence, we relied on *ArcGIS,* a desktop geographical information system (GIS), to generate measures of interest and convert the data to a format suitable for event history analysis. Sources and operationalization procedures for these variables are presented in more detail below.

Absolute Distance

Most long-lived civil conflicts are found in the periphery of states. To evaluate the systematic influence of the relative location of the conflict on its duration (Hypothesis 1), we include the natural logarithm of the distance between the conflict

center and the capital.[13] The distances were estimated by means of a geodesic distance calculator, similar to the procedure described in Buhaug and Gates (2002). The average conflict in our data is located about 630 km from the capital city, and the farthest is the separatist conflict in Indonesian West Papua, some 3,360 km away from Jakarta.

Relative Distance

Rugged terrain is generally considered to favor insurgency by reducing the effectiveness of conventional forces, thereby making the militarily inferior rebels better able to sustain opposition. To test whether rough terrain indeed is systematically linked to the durability of the conflict (Hypothesis 2), we used GIS to generate conflict-specific measures of forested and mountainous terrain. The values are expressed as percentage of the two-dimensional conflict area covered by the given type of terrain. The average conflict zone consists of 39 percent mountains and 36 percent forested terrain. Geo-referenced data on mountains were provided by the United Nations Environment Programme (UNEP) while gridded forest data are from the Food and Agriculture Organization of the United Nations (FAO).

We also include a dummy variable to mark off conflict zones that abut the border of a neighboring state (Hypothesis 3). These conflicts were identified by overlaying the conflict polygons with a layer of the outline of states in *ArcGIS*. About one-third of the conflicts extend to or beyond the boundary with a neighboring country, and many more are found on islands. Since rebel groups that operate from distant regions may not need to cross the border to avoid government forces, and groups that have access to safe havens in a neighboring country are less dependent on having peripheral bases in their home country, we also add an interaction term between location and border.

Rebel Strength

In line with the outlined contest success function, we expect conflicts involving more capable rebel groups to be shorter on average (Hypothesis 4). To evaluate this expectation, we use data on rebel fighting capacity from Cunningham, Gleditsch, and Salehyan (2009), which taps into the rebels' ability to "effectively engage the army militarily and win battles." This indicator contains three categories: weak, moderate, and strong. The original data are coded at the level of rebel groups. As our analysis uses conflicts as the base unit, we aggregate the capacity measure by keeping the highest value in the conflict on a year-by-year basis. In the presentation of the results below, we show estimates from a dichotomous variant as this was found to fit the data better than the original operationalization. Roughly one-third of the conflict years involve rebels with moderate to strong fighting capacity, the remaining being considered weak.

Natural Resources

Valuable and easily extractable natural resources are important sources of funding for rebel groups in many contemporary conflicts, thereby enabling the rebels to sustain their armed opposition (Hypothesis 5). In this article, we focus on three types in particular: gemstones, drug cultivation, and oil and gas fields. The gemstones dummy is a joint measure of alluvial diamonds and other gemstones such ruby, sapphires, opal, and jade. Drawing on geo-referenced resource data from Diadata (Gilmore et al. 2005) and Gemdata (Flöter, Lujala, and Rød 2007), we identified all conflicts that took place in areas with gemstone mining.[14] The dummy takes the value of 1 in all conflict years with significant gemstones production. To test the effect of a less lootable natural resource, we code a dummy for the presence of oil and gas in the conflict zone, drawn from Petrodata (Lujala, Rød, and Thieme 2007). We also include a variable denoting whether the conflict zone overlapped with drug cultivation (opium poppy, coca bush, cannabis) at the time of conflict outbreak, using data from Lujala (2002). In both cases, we followed the same operational procedure as described for the gemstones.

Our data suggest that lootable gemstones were available in 26 percent of all intrastate conflicts and 38 percent of all conflict years since 1946. Similarly, 15 percent of the conflicts and 21 percent of all conflict years occurred in areas with significant narcotics cultivation. For petroleum, the figures are 44 and 52 percent, respectively. The fact that a larger share of the observations (conflict years) than the conflicts include these resources tentatively indicates a positive association between local resource wealth and conflict duration.

Control Variables

Previous quantitative work has identified several factors that plausibly affect the duration of civil war. For reasons of parsimony, we decided to limit the selection of controls to just three in the reported estimations, though several more have been tested as part of the sensitivity assessment. First, we include a dummy for the post–Cold War era (1989-). The end to superpower rivalry meant that many "proxy" wars lost vital foreign financial support and thereby the ability to keep fighting. In addition, it also resulted in an international environment that allowed for a more active role for the United Nations and freed the international community in its ability to intervene to end civil wars (Human Security Report 2005). Both developments suggest an increase in the baseline likelihood of conflict termination in this period.

In addition, we include two country-specific measures in the final reported model. As a proxy for regime type we use the Scalar Index of Polities (SIP) from Gates et al. (2006). These data serve as a correction to the inherent endogeneity problem of using Polity data (Gates et al. 2006; Vreeland 2008). One of the more common categories composing the Polity index's measure of political participation

is factionalism. Political systems coded as factional, are characterized by political competition that is "intense, hostile, and frequently violent. Extreme factionalism may be manifested in the establishment of rival governments and in civil war" (Gurr, Jaggers, and Moore 1989, 12). As a result of Polity's coding procedure, any empirical analysis of civil conflict using the Polity data will have civil violence on both sides of the equation. Endogeneity is inherent to the data. The SIP data correct this problem.

We also control for per capita income based on updated data from Gleditsch (2002). However, the GDP data are only available from 1951 (applying a one-year lag) so we lose five years of observations when including this measure. To reduce the problem of reverse causality, both indicators are fixed at the values in the year prior to the outbreak of the conflict.

Estimation Technique

A standard model to capture the duration dependence of civil conflict is the Weibull model. In this model, the "hazard" of war termination is either high immediately after the initiation of conflict and then decreases at a steady rate, or it starts low and increases. Initial inspection of the survival function shows that it corresponds well with the Weibull distribution, though we additionally employed a log-logistic survival model and two variants of the Cox proportional hazards model (clustering and frailty) for robustness checks. The results were essentially similar across estimations, so we limit the presentation of the results to the Weibull regression here.

The data are structured as multiple-record data with multiple events with censoring. A number of wars were still ongoing at the end of 2003 (the last year of our data) and were censored. Given that civil wars frequently occur in the same country at different points in time—and indeed with the UCDP/PRIO data, more than one armed civil conflict can occur in a country contemporaneously—the data were clustered on country code.

Results and Discussion

To evaluate the hypothesized relationships, we explore the effect of the explanatory variables across several model specifications. Table 1 presents the results for five models. The models report Weibull accelerated failure-time (AFT) coefficients. The interpretation of the results of the AFT estimates is fairly straightforward: negative coefficients denote shorter duration, and positive values mean longer conflict spells. Robust *Z* statistics are calculated by clustering the observations on countries. The same set of explanatory covariates is applied to all models: two indicators of relative location plus an interaction term. These provide a test for Hypotheses 1 and 3.

Table 1
Event History Analysis of Civil Conflict Duration, 1946-2003

	(1)	(2)	(3)	(4)	(5)
Distance to capital (ln)	0.468	0.500	0.435	0.525	0.493
	(3.60)***	(3.93)***	(3.45)***	(4.28)***	(3.95)***
Conflict at border	0.606	0.626	0.614	0.676	0.708
	(1.90)*	(2.02)**	(2.07)**	(2.28)**	(2.32)**
Border × distance	–0.555	–0.605	–0.597	–0.631	–0.695
	(3.13)***	(3.77)***	(3.71)***	(3.93)***	(3.81)***
Rebel fighting capacity		–0.615	–0.533	–0.660	–0.544
at least moderate		(2.49)**	(2.05)**	(2.60)***	(1.96)**
Gemstones in conflict zone			0.523		
			(2.28)**		
Petroleum in conflict zone			0.530		
			(2.45)**		
Drugs in conflict zone			–0.123		
			(0.44)		
Mountains in conflict zone (%)				–0.006	
				(1.61)	
Forest in conflict zone (%)				–0.002	
				(0.67)	
Democracy score at onset					0.890
					(2.65)***
GDP capita at onset (ln)					–0.174
					(1.42)
Post–Cold War years	–0.923	–0.810	–0.846	–0.764	–0.828
	(2.91)***	(2.58)***	(2.74)***	(2.36)**	(2.92)***
Constant	4.886	4.886	4.883	5.021	5.815
	(6.73)***	(6.98)***	(6.92)***	(7.19)***	(5.46)***
Log pseudolikelihood	–445.7	–406.9	–402.5	–405.2	–353.4
Number of conflicts	230	216	216	216	190
Number of failures	205	192	192	192	167
Observations	1,518	1,477	1,477	1,477	1,375

Note: GDP = gross domestic product. Estimates based on Weibull accelerated failure-time regression. Robust absolute z statistics, clustered on countries, in parentheses. *, **, and *** denote significance at 90 percent, 95 percent, and 99 percent confidence level, respectively.

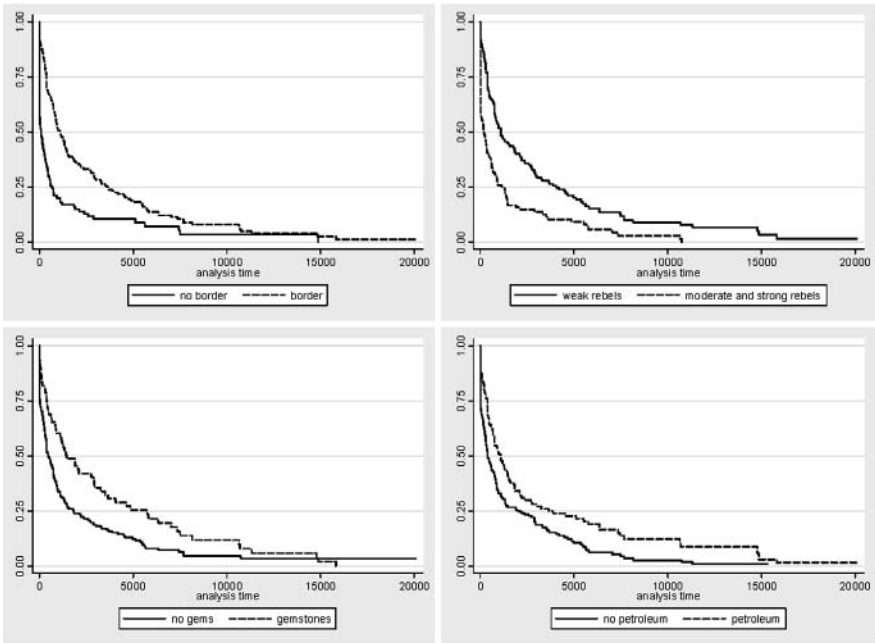
Models 2 through 5 additionally include a measure of rebel fighting capacity to test Hypothesis 4 directly. Three dummies for valuable resources in the conflict zone and two rough terrain measures serve to evaluate Hypotheses 2 and 5. In addition, all models include a dummy for the post–Cold War period, and the final model further controls for democracy and development at onset of conflict. Overall, the various models produce largely similar results, and most postulated expectations are confirmed.

Importantly, all models in Table 1 provide compelling evidence that location matters. We find strong support for Hypothesis 1: conflicts that occur in the periphery are much less likely to be resolved within a short period. In part, this might be because a ruling elite views events in distant parts of the country as less critical to their political survival and thus allocates fever resources than is needed to strangle the unrest quickly. But we believe this finding also reflects the outright inability of many governments to project sufficient force and maintain full authority over peripheral regions, in particular if the rebellion is supported by the local population. Similarly, we find compelling support for Hypothesis 3: proximity to international boundaries exerts a positive impact on estimated conflict duration, and the effect is quite large (Figure 1). This supports the notion of safe havens facilitating sustained opposition (e.g., Arreguín-Toft 2005), though it is also consistent with arguments regarding the role of foreign markets (Le Billon 2001) and supportive ethnic kin (Gleditsch 2007; Saideman 2002; Salehyan 2007). Table 1 further shows that the effect of border is moderated by distance. Accordingly, access to foreign soil can act as a substitute for not having a peripheral base of operation and vice versa. Finally, all models confirm our expectation that the post–Cold War period is associated with a higher baseline probability of conflict resolution.

In model 2, we introduce the proxy for rebel strength and more directly examine the fundamental aspects of contest success functions as models of intrastate conflict. The empirical data provide strong and compelling evidence in favor of our modeled expectation (Hypothesis 4). Conflicts involving capable opposition groups are much more likely to end quickly than are conflicts with weaker rebels, and the finding holds up while controlling for location, resources, terrain, and regime characteristics in subsequent models. Figure 1 effectively visualizes the different survival functions for the rebel strength categories. In substantive terms, it is comparable to the effect of border. After about 1,500 days, only one-quarter of the conflicts involving moderate/strong rebels are still active. In comparison, it takes another three thousand days for conflicts with weak rebel groups to reach that proportion.

Next we assess the role of natural resources. Earlier quantitative research has failed to converge on a systematic and robust connection between resource wealth and conflict, partly because the variation in operationalization of the key independent variable is almost as wide as the sample of analyses. Most of these measures are country-level indicators of the national export structure that at best only indirectly relates to the conflict. In this study, we use data on the production/extraction of three types of valuable resources in the conflict zone at the time of conflict outbreak: secondary diamonds and other gems, petroleum (oil/gas), and drugs (coca, opium, cannabis). While the extent to which these resources were used to fund the conflict—or motivate sustained opposition—will obviously vary between cases, we believe that our data are better suited to measure the effect of rebel access to minerals than alternative sources. In line with Hypothesis 5, we find that intrastate

Figure 1
Kaplan-Meier Survival Estimates



Note: The graphs illustrate the variation in survival rate as a function of (clockwise from top left) access to border, rebel fighting capacity, petroleum, and gemstones in conflict zone.

conflicts in areas with gemstones and petroleum production are significantly more durable than the reference group. Drugs, in contrast, show no systematic relationship to the duration of conflict. It even has the opposite sign of what might be expected. The different ways these variables behave clearly illustrates the need to differentiate between types of resources: some resources are likely to have a larger influence on characteristics of conflict than others, and different resources may further be associated with different forms of domestic conflict (see Le Billon [2001] and Lujala [forthcoming]).

Earlier attempts to analyze the influence of terrain on the onset or duration of conflict typically use overly coarse country-level measures. This might explain the general lack of findings in the literature. However, model 4 shows that even the much-improved GIS-generated terrain measures fail to meet with expectations. In fact, both estimates are negative, suggesting that—if anything—conflicts in mountainous and forested terrain do not last as long as conflicts in the plains. This might imply that the rough terrain argument is not applicable to civil wars in general, but

it could also mean that inaccessible bases are most crucial in the early phase of the conflict, before the rebel group is strong enough to conduct more open warfare (as indeed was the case for Castro's guerrilla war in Cuba, see Pérez-Stable [1999]). Therefore, in the most protracted conflicts, the balance of power between the government and the opposition is close to equal, and rough mountains become less crucial from a military-strategic point of view.[15] In addition, even though our variables give the proportion of mountains and forest in the conflict zone, rather than in the country as a whole, we cannot rule out that the lack of support for the hypotheses might be because of poor data. In this regard, data on the location of rebel headquarters might provide a more precise test of the argument. Until such data become available for systematic scrutiny, however, we conclude that Hypothesis 2 is not supported by the empirical evidence.

The final model explores the extent to which the main findings are robust to the inclusion of two additional, plausible country-level controls. Collier, Hoeffler, and Söderbom (2004) report very strong results for GDP per capita on civil-war duration, signifying that wealthier countries have shorter conflicts. Our model suggests a similar, if weaker, relationship. Moreover, we find higher democracy scores to be associated with longer conflicts. While this may intuitively seem suspect, the lengthy (if generally low-intensity) conflicts in the United Kingdom, India, and Israel demonstrate the general reluctance among democratic regimes to apply massive military force to quell peripheral separatist insurgencies (see Buhaug forthcoming). More importantly in this context, however, we see that relative location and rebel capacity measures maintain their position as important determinants of civil war duration. In this regard the two fundamental elements of the contest success model presented above are empirically verified.

Overall, the empirical analysis offers solid evidence in support of most of our modeled expectations. The location of the rebellion (Hypothesis 1, Hypothesis 3) and the capability of the rebels (Hypothesis 4) proved to be significant determinants of duration, and petroleum and gems (Hypothesis 5), too, exert considerable influence on the likelihood of conflict resolution. Only rough terrain (Hypothesis 2) failed completely to support the outlined proposition. Yet, certain aspects about the data and model specification deserve further consideration. First, one might suspect endogenous relationship between the location of the conflict and its duration. It is not hard to come up with examples to substantiate such a claim. Nonetheless, civil wars are generally remarkably stationary. Laurent-Désiré Kabila's march on Kinshasa (1996-1997) and Fidel Castro's capture of Cuba (1958-1959) represent rare exceptions, but these were also quite short-lived contests. As the conflicts draw on, the battle grounds tend to solidify.[16] Another potential endogeneity problem concerns the fighting capacity of the rebels. Again, however, we find little reason to believe this to be a serious concern as the rebel strength data exerts very little variation over time—in part being a consequence of the admittedly coarse operationalization of the variable.

Second, several of the applied covariates are conceptually overlapping, which might indicate a collinearity problem. For example, one might argue that enjoying a

peripheral base or safe havens across the border directly affects the fighting capacity of the group, and the same goes for control of lootable resources. Certainly, both funding opportunities and being able to evade superior governmental forces are important factors that determine the balance of power between the contenders. But these are complementary aspects of rebel strength; the former taps into arms procurement and recruitment capabilities while the latter is relevant for the ability to resist—as opposed to inflict damages on the regime (see Cunningham, Gleditsch, and Salehyan [2009]).

As with most statistical analyses of complex social phenomena, there is also a potential for omitted variable bias. One seemingly important factor that is left out of our models is conflict type: whether the objective of the rebels is to overthrow the ruling government or seek self-determination. Earlier research has found that different types of conflict indeed exhibit different causal patterns (e.g., Sambanis [2001] and Buhaug [2006]), and history tells us that separatist insurgencies are much more prone to protracted conflict than are popular revolutions and other forms of governmental conflicts. Yet, it would be a mistake to control for conflict type in this case, since the strategic objective of the rebels is in part a function of location and relative strength (see Buhaug forthcoming). Accordingly, conflict type is an intervening factor which should not be controlled for (see Ray 2003). As an alternative, we might code conflicts according to ethnicity (see other contributions in this issue), though we leave that task aside to future work as we have no immediate reason to believe that the role of location and rebel capacity on conflict duration depends on the mobilization structure of the rebellion.

The undertaken study offers a number of advantages over earlier research: explicit consideration of location, GIS-generated measures that tap characteristics of the conflicts (rather than the countries), precise coding of start and end dates, and an inclusive definition of civil conflict that expands the scope beyond earlier research on the duration of civil war. There is a flip side to applying a broad definition of conflict, however. By lowering the severity threshold, the results will necessarily be influenced by a large number of low-intensive conflicts that may exhibit different causal patterns. In fact, rebel fighting capacity and the location of the conflict are likely to be strong determinants of whether the conflict escalates to a civil war. In a final sensitivity test, we evaluate the robustness of geography and rebel capability in predicting the duration of conflict by estimating the same set of models on a sample limited to major civil wars (at least one thousand battle deaths in most violent conflict year). The results are presented in Table 2.

Overall, models 6 through 10 compare well with the corresponding models in Table 1. Importantly, the distance and border indicators (Hypothesis 1, Hypothesis 3), as well as the proxy for capable rebel groups (Hypothesis 4), corroborate the findings reported above. The effect of resource wealth (Hypothesis 5), however, is less robust to sample changes. While this might indicate that valuable resources are more important in affecting the duration of low-intensity conflicts than civil wars,

Table 2
Event History Analysis of Major Civil War Duration, 1946-2003

	(6)	(7)	(8)	(9)	(10)
Distance to capital (ln)	0.423	0.434	0.414	0.459	0.402
	(2.12)**	(2.20)**	(2.10)**	(2.41)**	(1.91)*
Conflict at border	0.580	0.768	0.573	0.793	0.836
	(1.32)	(1.92)*	(1.45)	(2.13)**	(2.33)**
Border × distance	–0.570	–0.562	–0.612	–0.598	–0.568
	(2.06)**	(2.40)**	(2.59)***	(2.51)**	(2.06)**
Rebel fighting capacity		–0.839	–0.732	–0.851	–0.656
at least moderate		(2.88)***	(2.49)**	(2.97)***	(1.83)*
Gemstones in conflict zone			0.394		
			(1.54)		
Petroleum in conflict zone			0.286		
			(0.86)		
Drugs in conflict zone			0.464		
			(1.46)		
Mountains in conflict zone (%)				–0.005	
				(0.87)	
Forest in conflict zone (%)				–0.004	
				(0.94)	
Democracy score at onset					0.822
					(1.82)*
GDP capita at onset (ln)					0.033
					(0.16)
Post–Cold War years	–0.906	–0.733	–0.733	–0.678	–0.875
	(2.97)***	(2.64)***	(2.65)***	(2.41)**	(2.52)**
Constant	5.709	5.762	5.644	5.903	5.483
	(5.71)***	(5.81)***	(5.61)***	(6.00)***	(3.40)***
Log pseudo likelihood	−181.3	−172.9	−170.1	−171.8	−145.4
Number of conflicts	104	102	102	102	89
Number of failures	90	89	89	89	76
Observations	1,057	1,037	1,037	1,037	963

Note: GDP = gross domestic product. Estimates based on Weibull accelerated failure-time regression. Robust absolute z statistics, clustered on countries, in parentheses. *, **, and *** denote significance at 90 percent, 95 percent, and 99 percent confidence level, respectively.

the rareness of these commodities is probably an equally important explanation. The remaining covariates differ only marginally between the samples.[17]

Conclusion

We started this article by remarking how geography has dominated the art of war from ancient times. We contribute to this understanding with a systematic study,

formalizing the relationship between military capability and geography. We developed a contest success function to model how relative location and relative strength affect the dynamics of civil war. From this model we derived a set of testable hypotheses, drawing on a disaggregated research design with conflict-level data (distance, terrain, resources) plus actor-level data on capacity. Using precisely dated and geo-referenced conflict data and GIS to capture local and locational characteristics of the conflict zones, we then conducted a systematic empirical event history analysis of the role of geography in civil war. While some results failed to meet expectations, the findings for relative location and rebel capacity were striking. In that regard, this article complements Cunningham, Gleditsch, and Salehyan (2009). Indeed, despite different research designs, the findings regarding rebel capacity and conflict duration are mutually confirming.

Geography significantly affects the duration of civil conflict. The relative location of governmental and rebel forces can enhance as well as reduce the relative military capabilities of the belligerent parties. Relative military capacity and distance play a fundamental role in determining who wins and who loses. Short of victory or surrender, the decision to continue to fight is shaped by the ability to wage war. In this regard geography plays a critical role in determining the dynamics of armed civil conflict.

To ascertain the role of geography, we need to disaggregate. Subnational georeferenced data are critical. Knowing that a country is mountainous, forested, bountiful in drugs production, or rich in diamond deposits is not enough. Indeed, such nationally aggregated data could be misleading (see Buhaug and Lujala 2005). Despite a seeming correlation, terrain or resources may be completely irrelevant to the conflict itself. The diamonds in the Urals, for example, have nothing to do with the conflict in Chechnya. Information pertaining to the specific location of these factors relative to the fighters and the fighting reveals much more relevant information regarding the relationship between geography and conflict. With disaggregated data and research design, the risk of drawing the wrong conclusions about causal relationships from observed correlational patterns is reduced. Temporal disaggregation is also important. Indeed, for event history modeling it is imperative. Given the number of civil conflicts that last less than a year (some last only a day or so), annual aggregations are extremely problematic. In this setting, the country-year unit of analysis is fundamentally misleading and inappropriate. Most importantly, if we are to understand the complex relationship between geography and armed conflict we must disaggregate our theories and strive to identify the conditions and context under which particular geographic features affect the risk and dynamic of conflict. Geography inherently entails disaggregation.

Notes

1. Another contribution to this issue investigates the connection between rebel capacity and conflict duration in detail (Cunningham, Gleditsch, and Salehyan [2009]) but ignores the influence of location, while Cederman, Buhaug, and Rød (2009) include proxies for both relative location and capacity, but that analysis is framed within conflict risk rather than duration.

2. Polo (1995) is the first to incorporate location into a contest success function. In many regards, the model developed here reflects Polo's work.

3. We could model similarly the distance between the rebel headquarters (x_l) and the center of conflict region (x_a), but since we are not able to include this distance in our empirical analysis we simplify our model and set (x_a–x_l) to zero.

4. Not all governmental conflicts break out in central parts of the country. Both Fidel Castro's revolutionaries and Laurent Kabila's rebels emerged in the periphery, but gradually managed to fight off government forces and push for the capital.

5. These conflicts are almost exclusively organized along ethnic lines. However, we believe that the explanation for the seeming correlation between ethnicity and conflict duration is more subtle, and, crucially, that geographic opportunities and relative capabilities are more important than ethnicity per se.

6. This result holds as long as the government's resource base does not exceed that of the rebels.'

7. Natural resources can usefully be classified as lootable or nonlootable. Although a crude dichotomy, the extraction of nonlootable resources generally requires significant investment in technology and skilled workforce or is very labor intensive. These resources tend to have a relatively low value-to-weight ratio and are called nonlootable since the revenues from the resources are usually not available to rebels during conflict. Petroleum, kimberlitic diamonds, and most agricultural goods belong to this category.

8. These four include Guinea in 1970, Saudi Arabia in 1979, Tunisia in 1980, and the Real IRA bombing in Northern Ireland in 1998.

9. The five longest lasting conflicts are: Colombia (FARC/ELN 1965-), Myanmar (Communist insurgents, 1948-1988; Arakan insurgents, 1948-1988; Karen insurgents, 1948-1992), and Israel (Palestine, 1948-).

10. The results change little if we include coups in the sample of conflicts.

11. The results change little if we apply a more somewhat inclusive operationalization of civil war, covering all conflicts that caused at least one thousand battle deaths in total (125 conflicts).

12. Deciding where to place the cut-off point between ongoing and new conflicts is not trivial and may have a substantial impact on the results. Cut-offs less than twenty-four months seem to be more problematic than longer cut-offs. Moreover, the twenty-four-month criterion possesses a certain prima facie validity. See Gates and Strand (2004) for a more detailed discussion of coding civil wars involving intermittent fighting.

13. Since the geographic coordinates in the UCDP/PRIO data are largely time-invariant, one might suspect endogeneity problems in that longer conflicts are more likely to vary in location and extent over time, thereby affecting the estimated conflict-capital distance. While this may be true in some cases, most armed conflicts are remarkably static in spatial terms.

14. We exclude primary diamonds from our measure since they in most cases require substantial investment of technology.

15. Yet, there are several cases to the contrary; long-lasting conflicts occur in jungles and mountainous areas in, for example, Colombia and Myanmar.

16. For more on determinants of civil war location, see, for example, Buhaug and Gates (2002); Buhaug (forthcoming); Hegre, Østby, and Raleigh (2009); and Kocher (2004).

17. In addition, we have conducted a series of sensitivity tests related to estimation techniques, frailty estimation, and outlier analysis that for space reasons are not reported in the article. These show that our main results are extremely robust to model specification and sample modifications. Documentation of these tests will be made available on request.

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