State Building and the Geography of Governance: Evidence from Satellites

Florian M. Hollenbach
Department of Political Science
Texas A&M University
2010 Allen Building, 4348 TAMU
College Station, TX, 77843-4348, USA
florian.hollenbach@tamu.edu

Erik Wibbels
Department of Political Science
Duke University
204J Gross Hall, 140 Science Dr, Box 90204
Durham, NC 27708, USA
erik.wibbels@duke.edu*

Michael D. Ward
Department of Political Science
Duke University
294E Gross Hall, 140 Science Dr, Box 90204
Durham, NC 27708, USA
michael.d.ward@duke.edu

September 30, 2016

*Corresponding author: Erik Wibbels.

Abstract

Though weak states are associated with civil war, terrorism and other threats to humanity, we know little about why states vary in their capacity to govern across territory. This article examines this question in post-civil war settings where leaders face stark choices about extending state capacity across territory in the face of resource constraints. We take insight from the distributive politics literature and probe several competing ideas using the DMPS-OLS night lights data in six countries (Burundi, Côte d'Ivoire, Kenya, Liberia, Sierra Leone and Uganda). Contrary to several well-established schools of thought, we do not find evidence that state builders reward core supporters or target swing districts. Rather, they focus distributional benefits in areas that have a history of violence and close to capital cities.

INTRODUCTION

From Somalia and Sudan to Afghanistan and the Philippines, weak states that fail to control their territory are faced with a host of domestic and international problems. These areas are important breeding grounds for civil conflict, staging grounds for terrorist activity, and islands of extreme poverty. Whether weak and failed states facilitate the short-sighted destruction of natural resources or serve as bases for the transmission of border-jumping insurgents, they represent both a local and global threat to peace and well-being. In such countries, one primary challenges for governments is to develop capacities and institutions robust enough to monopolize the use of force and provide some minimal set of public goods to unify the country into a functioning political unit. This challenge is one that even the most capable of states had to address at some point in their histories and may continue to address today. Indeed, extending the capacity to govern across geography is a fundamental feature of state building. In this article we explore a fundamental question about state building: How and why do state leaders expand their capacity to provide governance across the territory of a country? We use post-conflict countries as a setting in which to explore how state leaders facing resource constraints build capacity as they do.

Three decades after political scientists brought the state back in to the study of politics (Evans, Rueschemeyer and Scocpol, 1985; Levi, 1988) and centuries after the earliest efforts to understand how governments consolidate control over territory (Finer, 1997), there is limited insight into the geographic emergence of state capacity. Drawing largely on European state-building centuries ago, research has focused on the importance of revenue collection (Levi, 1988), military threats (Tilly, 1990), or endowments (Landes, 1998) as the primal ingredients of states. It has paid less attention to the uneven geographic contours of the state and has largely ignored the process by which state authority expands (or not) across territory in an uneven way to create a checkerboard of governance capacity. In most accounts, states are monolithic and are assumed to provide homogenous governance over the entire territory of

a country. An important body of literature on the state in Africa and beyond, of course, recognizes the weakness of many states, but even in this work, states are often portrayed as equally weak across their territory.

Work on economic and political geography belies such a characterization. Whether one observes the weak influence of the state in rural Wyoming or eastern Congo, the machinery of government touches unevenly across many countries' territories. Thus does Boone (2003), for instance, emphasize a set of factors that condition asymmetric incentives for state leaders to extend governance across the territory, and Herbst (2000) shows that it can be rational for leaders not to extend the coercive and regulatory power of the state across territory. Indeed, research across a broad swath of the social sciences in recent decades has clarified the geographic unevenness of countries–national economies are highly differentiated by region (Krugman, 1991), individual preferences are geographically concentrated (Rodden, 2010), and geography and location condition collective action (Trejo, 2009). The basic insight of these works is that the underlying societies over which states govern are highly differentiated across their geographies, and states' capacity to govern across these heterogeneous political and social spaces is uneven. What explains this unevenness?

We conceptualize the process of state building as a distributive conflict that takes place in geographic space. Resource constrained leaders must make choices about where to build state capacity with an eye toward sustaining themselves in power. The challenge is to identify the factors that condition those choices. We build on several scholarly traditions to develop competing ideas on why state leaders build state capacity where they do. While one branch of the distributive politics literature suggests that leaders should focus their efforts on areas saturated with supporters (Cox and McCubbins, 1986; Murillo and Calvo, 2004), another suggests that they should target their efforts on areas with many swing supporters who might be brought into the governing coalition (Lindbeck and Weibull, 1987; Stokes, 2005). Another idea emphasizes the role of cities in providing a venue for collective mobilization against authorities and predicts an "urban bias" in the efforts of state leaders (Myrdal,

1956; Bates, 1981). Yet another emphasizes the importance of targeting state capacity at areas where opposition is strongest as a means to both purchase citizen compliance and dissuade future rebellion. Each of these threads of thought rely on the geographic location of supporters or opponents to generate different ideas, yet come to quite different predictions: state leaders should build capacity either where they have many strong supporters, many marginal supporters, or where opponents are strongest.

Building on work by Min (2009, 2015), we use time-series satellite imagery of light intensity at night (electricity provision) as a geographically disaggregated indicator of state effort. The use of satellite data has been growing in the social science, and the so-called night-lights data is, by now, in widespread use (see for example: Small, Pozzi and Elvidge, 2005; Gleditsch and Weidmann, 2012; Min et al., 2013; Pinkovskiy and Sala-i Martin, 2009; Weidmann and Schutte, 2016; Mveyange, 2015; Zhuo et al., 2009; Cederman, Weidmann and Bormann, 2015; Ahrens, 2015; Elvidge et al., 2009; Levin and Duke, 2012). We use the satellite data to test the competing ideas in four post-conflict settings and two additional weak states where new leaders face stark geographic choices about the establishment of governance across territory in the face of serious resource constraints. Contrary to several well-established ideas, our findings suggest that state builders do not reward core supporters or target capacity building in swing districts. They focus benefits on parts of the country that have a history of violence and in areas close to capital cities. This latter finding does not seem to reflect a generic urban bias as state leaders do not build capacity in other urban settings.

THE GEOGRAPHY OF THE STATE

The state is the permanent machinery of governance. At least since Weber, it is defined by a monopoly over the use of force in a territory, and that coercive capacity is reflected in the capacity to tax, legislate, administer and police. Within a given territory, the authority of state leaders is absolute, which is to say that they are sovereign. In Europe, a process defined by the gradual extension of the geographic scale of the coercive powers of authorities resulted

in states supplanting earlier, alternative means of organizing societies, including everything from feudal estates to empires. As Cederman and Girardin summarize:

> Internally, sovereign rulers rid themselves of internal competition within their territories. At the same time, they expanded their territories in the face of external competition. Together, these two processes generated increasingly thin and clearly defined borders. (2010:29)

Those countries exported the organizing principle behind states to the rest of the world through international competition and colonialism. Though the rule of the state is territorially defined, most research on the state has taken the territory of countries and "stateness" as co-terminous. Perhaps because the lion's share of research has focused on Europe where war-making, state formation and state consolidation produced a geographic map of countries that closely approximates the capacity of those states, the focus has been on why states emerge rather than on any heterogeneity in their reach within their borders. In the most influential accounts, the imperatives of revenue-raising (Levi, 1988) and war-making combine to fuel the emergence of states (Tilly, 1990). Technological changes in war elicited the need for larger revenues, which encouraged rulers to expand the scope of their revenue collection, which raised military capabilities, which in turn expanded their monopoly on force and their non-military capabilities. Along with taxes and conscription came the creation of national education, rational-legal bureaucratic standards, broader markets, and public order. This virtuous cycle produced a situation in which state capacity and political maps overlap to such an extent that many scholars traditionally have assigned sovereignty to unitary states and moved on to consider how they interact (Waltz, 1979). In most such work, the reach of the French state and the borders of France are the same thing. Yet even in France, turning "peasants into Frenchmen" was a process that took centuries, and as late as mid-19th century, outside of Paris "laws . . . were widely ignored and direct contact with the central power was extremely limited. The state was perceived as a dangerous nuisance . . ." (Robb, 2008:23).[1]

[1] The term "peasants into Frenchmen" is courtesy of Weber (1976).

Similar historical dynamics characterize many of today's most capable states, and the uneven reach of the state is a common theme in more recent work on state development in the developing world, particularly on Africa. As Herbst notes of post-independence African states:

> States had to control their political cores but often had highly differentiated control over outlying areas. However, the African states did create hard boundaries that were extraordinarily effective in preserving the integrity of their states. As a result, a divergence could result in how power was mapped and how states were mapped. African politics was no longer in particular harmony with the political geography. (2000:134)

In some settings, this is a political equilibrium, but at the extreme, the failure to project state authority is associated with the collapse of public order, famine, mass emigration, and associated ills. Yet in much work on these issues, the uneven geographic capacity of the state is reflected in debates about "state capacity" or its inverse "state failure." In the civil war literature, weak states that poorly manage their territory are understood to underpin civil wars (Fearon and Laitin, 2003), and one large monitoring project of the US government has focused on "failed" states, a project now known as the Political Instability Task Force (Esty et al., 1998; Goldstone et al., 2010).

Likewise, a growing body of work aims to explain individual-level and cross-national variation in the willingness of citizens to "quasi-voluntarily" comply with the state in a manner consistent with the rule of law (Levi and Braithwaite, 2003; Widner, 2001). None of this work, however, speaks directly to the geographic reach of the state or the geography of citizen compliance with the state. As typically conceptualized, state capacity, failure or compliance is a national characteristic and has no geographic content–they do not explain why the state is capable where it is. Most empirical models of state capacity or state failure, for instance, settle on one variable, GDP per capita that does most of the heavy lifting (Collier

and Hoeffler, 2004; Fearon and Laitin, 2003).[2] But GDP per capita is a national indicator that provides scant insight into the geographic heterogeneity of state capacity.[3] The lack of harmony between state authority and country territory is typically associated with post-colonial settings where artificial borders, externally-regulated sovereignty, and international norms against the violent expansion of state capacity or borders work against the process of state consolidation that western Europe experienced. But these are characteristics of a huge number of countries around the world. Extant work, therefore, fails to explain large variation in either the geographic coverage of the state across countries or why states govern where they do within countries.

There is literature that offers guidance. The uneven presence of the state across territory is echoed, for instance, in Hechter's (2000) distinction between direct and indirect rule and Weingast's (1995) work on the balance between central and decentralized authorities. Also relevant is recent research on the explicitly geographic nature of civil wars (Buhaug and Lujala, 2005; Buhaug and Rød, 2006; Gleditsch, 2007; Braithwaite, 2010; Buhaug et al., 2011; Theisen, 2008). Whether focused on the geographic concentration of factors of production (Dube and Vargas, 2013), unequal access to communication technology (Pierskalla and Hollenbach, 2013; Shapiro and Weidmann, 2015), the spatial diffusion of group mobilization (Busch and Reinhardt, 2000; Weidmann, 2009; Cederman, Weidmann and Gleditsch, 2011), or the mapping of ethnic groups onto nationalist insurgencies (Cederman and Girardin, 2007; Fearon, Kasara and Laitin, 2007; Kalyvas, 2008; Wimmer, Cederman and Min, 2009; Cederman, Rod and Weidmann, 2010; Cederman, Wimmer and Min, 2010) researchers have begun

[2] See Hendrix (2010) and Thies (2010) for recent attempts to measure state capacity; but again, they do not provide information on the geographic scope of the state.

[3] Though, note that subnational disaggregations of GDP per capita are now available (Sutton, Elvidge and Ghosh, 2007).

to grapple with the fact that civil wars are concentrated in particular locations within and across states. These areas of research recognize that the state's reach is uneven. However, they take that unevenness as a given rather than as something to be explained. As a result, they do not explain the process of state formation, an inherently dynamic one that involves the strategic choices of leaders about where to deploy their scarce resources in a context of geographically uneven support from the population.

DISTRIBUTIVE POLITICS IN SPACE: HYPOTHESES

Existing research on civil wars, ethnic conflict, and decentralized governance all support the general sense that state capacity is uneven. We do not, however, know why state capacity emerges as it does across the political geography of countries. Building on work on African states, we begin with an understanding of state building as a distributive game in which leaders must make choices about where to project state authority conditional on the costs and benefits of doing so. Herbst's (2000) explanation for weak, geographically isolated states emphasizes the high cost and low benefit of projecting state power into sparsely populated hinterlands. Kasara (2007) emphasizes the importance of ethnicity for taxation, a key state building activity, and suggests that state leaders tax co-ethnic regions more than other regions. Boone (2003) underscores the role of local production and governance in shaping the contours of center-periphery relations and the incentives for the central state to project authority. We hold that each of these particular accounts builds on the generic logic of distributive politics.

The expansive literature on distributive politics provides a rich set of competing notions as to where and why state leaders extend the arm of the state as they do. Though much of the literature is formally aimed at explaining the geographic targeting of spending that results from democratic political processes, much of it has more general implications for the incentives of politicians to target scarce resources. The starting point is that state leaders must make decisions on the allocation of scarce resources as they develop state capacity.

These allocative choices can be understood as a means to manage the political landscape. In practical terms they are used to reward friends, tempt or threaten foes, and provide governance and security to those thought likely to keep the leader in office. As a result of a stark scarcity in state resources and the strategic choices of leaders, some areas of the country are likely to receive more public effort than others. Different extant models have divergent predictions about which areas those will be.

One of the longest-standing claims in the broad literature on distributive politics and development is that politics suffers from an urban bias (Myrdal, 1956; Bates, 1981). Many governments distort food prices, manipulate trade policy, and extract agricultural surplus to benefit urban dwellers at the expense of rural areas. There are many potential mechanisms that might produce urban bias, including the increased capacity for collective action in cities, attempts by national leaders to protect themselves from unrest, and the economies of scale in urban public goods provision. All of these logics could apply to state builders who make decisions about where to attempt to provide public goods and extend the reach of the state. Thus, the urban bias literature provides a straightforward notion of how this occurs; namely, state builders have systematic incentives to provide governance and expand state capacity in cities first. A particularly strong version of this line of thinking suggests that capital cities will be the focal point of state building since control of the capital is often a precursor to further expansion of state capacity.

Other branches of the distributive politics literature provide alternative expectations. Cox and McCubbins (1986) suggest that politicians have incentives to focus efforts on core supporters. Focused on the importance of mobilizing voters in democratic elections, this notion has received considerable empirical support in diverse settings (Murillo and Calvo, 2004; Bickers and Stein, 2004). The underlying logic of the argument extends comfortably to political leaders attempting to extend the state's capacity. Because the strength of core supporters is likely to be central to leaders' future survival, leaders will have incentives to cultivate them. The history of state building makes clear that the process of geographically

extending the power of the state is conflictual. That the case, leaders might be tempted to devote resources to consolidate support in parts of the country rich in supporters. Thus, the "core supporter" model provides the expectation that state leaders will focus their state building efforts in areas with the most core supporters. The logic of political survival casts this in terms of rewarding the large or small set of supporters in a society (Bueno de Mesquita et al., 2005). Insofar as we can tell this logic has been almost exclusively tied to the nation-state, but should apply across geography within societies as well. It is hard to conceive of a situation in which stake-holders for regime survival will be randomly distributed across geography.

Yet another version of distributive politics suggests leaders will target efforts at areas with many soft or swing supporters (Lindbeck and Weibull, 1987; Stokes, 2005). One can think of swing supporters as those citizens who have limited ideological or ethnic attachment to any particular group or party in society. Given their indifference to the competing parties, such citizens are most likely to be swayed by monetary transfers or public goods. In light of their weak attachments and the responsiveness of their support to government effort, state investments in areas rich in swing supporters are efficient in the sense that the cost of convincing a swing supporter is lower than it is for committed opponents, i.e. the marginal benefit with regard to expanding capacity is the highest in these areas. Thus, state leaders might invest in areas of the country with the highest concentration of weakly-attached, swing supporters.

It is worth noting that all three of these different approaches are premised on the notion of electorally defeating ones opponents in the process of state development–that in culling and extending their base of support, state leaders will succeed in staying in power through the ballot box. But they may equally apply to systems that are less democratically organized since even autocratic leaders have to cultivate support from some portion of society. Thus, the arguments bear on an implicit idea that emerges from the policy literature on civil war and insurgency. That literature often suggests that future conflicts can be avoided to the

extent the state invests in the most conflict-prone regions with an eye toward winning hearts and minds (Nagl, 2002). As Nagle and Burton (2009:93) argue, "Gaining the loyalty of the population requires the difficult process of nation building, which consists of improving the ability of a government to secure its citizens and developing its capacity to provide essential services, including security, to the population". According to this line of thought, such investments serve two purposes. First, by improving the quality of life in conflict-prone regions, the provision of basic public goods reduces the material foundation of grievances against the state. Second, the provision of key infrastructure will facilitate the government's capacity to fight in the region if conflict resumes.

Existing literature provides a rich but contradictory set of expectations. State leaders can be expected either to concentrate scarce resources in cities, among supporters, among swing regions, or among opponents. As is often the case in the social sciences, we have more principled predictions than data to test them. The literature on the emergence of the state is overwhelmingly dominated by work on the emergence of European states in the 16th and 17th centuries. The data for such cases are less than ideal. The literature on state formation in today's developing worlds, in taking its cue from the older literature on European states, has produced precious little systematic data on the uneven capacity of states to project their will across the territory of countries and thus provides limited insight into the geography of state capacity.

RESEARCH DESIGN

Because civil wars destroy infrastructure, post-conflict settings offer the opportunity to examine how and why leaders expand the state where they do, effectively from scratch. For our purpose, post-conflict settings have an important social scientific advantage, namely that they have seen the elimination of much of the state's capacity to govern (Aron, 2003). Roads and electrical grids are destroyed. Systems of taxation are interrupted. Security is unevenly provided. When civil wars come to an end, the leaders of post-conflict states face a strate-

gic challenge: Where exactly should they focus their efforts, given that there is profound scarcity?

We address these crucial issues by examining the expansion of state capacity in four post-civil war countries–Burundi, Côte d'Ivoire, Sierra Leone and Liberia. We supplement these cases with two others – Kenya and Uganda – that also have weak state capacity but have avoided recent civil wars. In all of these cases, a key challenge of governance is the provision of basic public services. The four post-conflict cases are interesting as cases because they vary in the geographic distribution of supporters for post-conflict governments. In Côte d'Ivoire, the rebels were particularly strong in the North, the capital is centrally located, but much of the fighting took place around Abidjan in the South and less so in the West. Unlike the other cases, Côte d'Ivoire did not have an election upon the cessation of hostilities. Liberia has a different profile, with violence during the civil war concentrated in the northern region, around and to the east of the capital of Monrovia. Electoral support for the first post-war elected government was concentrated in the North and very weak in the South. In Burundi, the violence was very concentrated in space – much of the conflict took place in 5 regions, with varying population density, clustered in the northwest part of the country.[4] Finally, in Sierra Leone, the fighting was concentrated in the South, far from the national capital of Freetown in the northwest. The regions that saw the most fighting also provided the highest level of electoral support for the first post-war government. We supplement these post-war cases with two weak states âĂŤ Uganda and Kenya âĂŤ that face chronic challenges in extending state authority, despite quite different political settings. While Uganda is dominated by a long-standing, semi-democratic president (Museveni), Kenya is a geographically fractious democracy. Since they also provide the nuanced subnational data we need, these cases allow

[4] The data on conflict event locations stems from the Uppsala Conflict Data Program (UCDP) Georeferenced Event Dataset (Croicu and Sundberg, N.d.; Sundberg and Melander, 2013).

us to assess if there is something unique to post-war state building.

As described in greater detail below, our empirical approach involves the use of satellite data on the actual distribution of state effort as measured by changes in electrification across territory. The reliance on satellite imagery provides direct, geographically-differentiated evidence on the efforts of state leaders to provide basic public goods. As Min (2009:2) notes, "More than simply a modern convenience, access to electricity is a life-altering transformation that improves quality of life and enables economic development." Extensive research shows that electrification improves educational effort, reduces the time necessary to collect fuel, increases labor supply, reduces poverty, and is an important precursor to improvements in public services (Khandker et al., 2012; World Bank, 2008). There have, of course, been many efforts to develop systematic measures of state capacity, but they suffer from any number of problems. Traditional measures of state capacity–tax revenue as a share of GDP, per capita income, and the like – provide information neither on which citizens benefit from state action nor the geographic distribution of state efforts. As the fundamental precursors to more sophisticated capabilities, electrification provides a direct indicator of where state leaders have chosen to deploy scarce resources. Satellite data has the advantages of providing this geographic information and being an objective indication of state effort that is not subject to cooked accounting (as in governments' self-reported fiscal data).

Above and beyond its geographic nuance and objectivity, several features of electrification make it a good proxy for central state effort. First, electrification projects tend to be expensive and require central government effort. As Hausman, Neufeld and Schreiber (2010:1) summarize, "The most salient economic characteristic of the electric utility industry has been its extraordinary capital intensity." The expense has precluded subnational authorities in developing countries from playing any serious role in electrification, and despite some enthusiasm in the development community for private financing in the 1980s and 1990s, private investors have not played an important role in deciding which communities receive electrification. Indeed, as it became clear that poor, sparsely populated countries would not attract

extensive foreign investment, the World Bank (2006:2) summarized the subsequent period as one of "disappointment with private sector participation in infrastructure in the developing world." A recent World Bank review indicates with specific reference to sub-Saharan Africa that "funding for electricity expansion is mainly provided through government-sponsored projects to national power companies." (Independent Evaluation Group of the World Bank, 2015:57) Second, while foreign aid donors have played a major role in funding electrification projects in recent decades, the criteria for allocating electricity projects have been developed largely by recipient governments. Indeed, when deciding on investment locations governments have relied on a host of different criteria, including cost-effectiveness, geographic balance, poverty, and the like (World Bank, 2008). While donors have contributed technical assistance and become increasingly attuned to corruption in infrastructure projects, every donor report we uncovered indicates that they view electrification overwhelmingly as a technical challenge rather than a political one. A recent review of hundreds of World Bank electrification projects from 2000-14 emphasizes the broad range of capacity building, technical advice, market restructuring, cost recovery plans, regulatory efforts, etc. that the Bank has engaged in, even while it underscores over and over again that government ownership of projects strongly conditioned success and that governments in Sub-Saharan Africa tend to both plan and fund their own electrical expansion efforts (Independent Evaluation Group of the World Bank, 2015).[5] Third, the last two decades have seen increasing reliance on "off the grid" electrification projects that rely on solar or moderate-sized hydro projects to produce electricity (Hausman, Neufeld and Schreiber, 2010; World Bank, 2008). While still expensive, such projects provide considerable leeway for governments to decide which areas will be electrified. Rather than being constrained by the expansion of the existing, very limited grid, governments can build modest projects wherever suits their strategic needs. Fourth and fi-

[5] It is worth noting that the World Bank is easily the largest player among all the donors working on electrification.

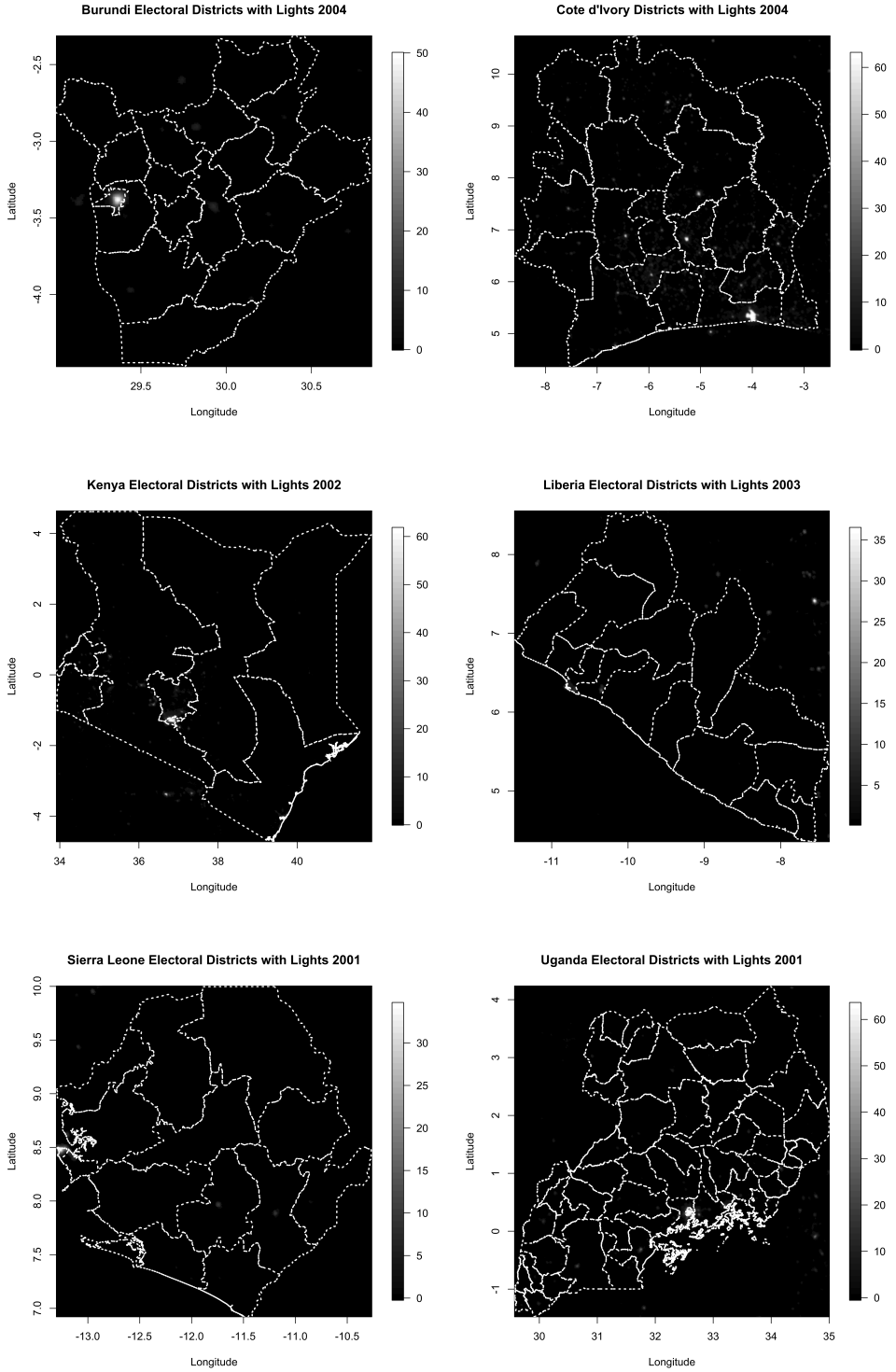
nally, the provision of electricity is electorally salient for authorities (Min, 2009). Perhaps the most visible example of this comes from Liberia, where then-candidate Ellen Johnson-Sirleaf placed electrification at the forefront of her presidential campaign and delivered a promise in her inauguration speech to return electricity to Monrovia within six months (Whitaker, 2009). Four years later, one of the key campaign issues centered around disappointments and controversies associated with Johnson-Sirleaf's electrification efforts across the country. In short, electrification is primarily a responsibility of central governments. Given electricity's scarcity and desirability, central officials have political incentives to allocate it strategically, and these choices are inherently geographic.

As Figure 1 makes clear, the leaders of all four post-conflict countries faced political geographies characterized by stark deprivation. The maps show the night lights in the year that their civil wars came to an end. In all cases, state leaders were largely isolated in capital cities. In Liberia and Burundi, electrification was concentrated almost wholly in the capitals of Monrovia and Bujumbura, respectively. In Sierra Leone, the relatively bright lights of Freetown were only faintly reflected in Kodu in the east and Kenema and Bo toward the south. Côte d'Ivoire, the richest of the four, shows the greatest dispersion of electrification, but even there, the largest city of Abidjan, the second largest city Daloa, the capital of Yamoussoukro, and a small handful of regional capitals are surrounded by a sea of darkness. In a context of profound scarcity, post-conflict state builders in these countries faced a set of stark choices about where to deploy scarce resources in their attempt to consolidate governance.

DATA

Consistent with Min (2009, 2015), we rely on the Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS), which provides detailed images of the earth's surface at night. Annual composite images are available beginning in 1992 until 2013. We make use of the "average visible, stable lights, & cloud free coverages" images, which are

Figure 1: Lights and Electoral Districts in Six African Societies – calibrated digital number (DN) plotted



aggregated to a spatial resolution of 30 arc seconds, which is a grid size of approximately one square kilometer at the equator (Elvidge et al., 2014:100). The digital number (DN) at each of these pixels (between 0 and 63) represents light intensity in the area.

The satellites did not have a recorded in-flight calibration and thus the measurements may not be quite be comparable over time. We therefore follow Elvidge et al. (2014) in the use of their inter-calibration method to adjust the data. In a nutshell, the inter-calibration method assumes that lighting is constant in a reference area (selected by Elvidge et al. (2014)), which can thus be used to adjust the annual brightness values for each year in the rest of the world. In addition, for years where images from multiple satellites are provided we take the average across the multiple images after calculating the newly calibrated DN. The resulting DN again ranges from 0 to 63, though in our sample the values are generally much lower.

We use the growth in light intensity from the end of the violence until the end of the first post-conflict presidential term (or the latest available image if there has not been a second election) as our main dependent variable: a measure of investment by political actors.[6] Our dependent variable is therefore a measure of where the electrical infrastructure was expanded. We aggregate the pixel-level to the lowest electoral level for which we can find data.

We combine the data on growth in light intensity with other geo-coded data that bear on the arguments outlined above. First, we use district level data from the first post-conflict election to assess areas that include many supporters of the winning candidate (the core voter notion) and areas that include many swing-voters.[7] We measure the government's

[6] Light intensity at the end of the first post-conflict government, is measured in the following years for each country: Burundi: 2008; Côte d'Ivoire: 2008; Kenya: 2007; Liberia: 2008; Sierra Leone: 2007; Uganda: 2006.

[7] The level of electoral disaggregation we use depends on the electoral institutions in each country and data availability. In general, we use the results of presidential elections, except for Burundi where the president was elected by the parliament in 2005; there, we use results

support using district-level electoral results – the higher the vote share for the president, the more closely the district approximates an area of core support. We measure "swing" districts using the absolute value of the gap between the president's party and the candidate with the largest vote share other than the president – the smaller that gap, the more competitive the district.Côte d'Ivoire is excluded from any models that include electoral results, since it did not have elections over the time period studied. We provide details on data sources for the electoral results in the Appendix.

Second, we rely on the Georeferenced Event Data (GED) Conflict dataset provided by UCDP for information on the location of violent events in these countries (Sundberg and Melander, 2013; Croicu and Sundberg, N.d.). The UCDP GED dataset includes organized violent events from 1989 to 2014. Event locations are included in the data if the conflict with which the event is associated has had 25 or more total deaths and at least one person was killed at the event itself.[8] To measure the history of violent conflict we use a count of the number of violent events that occurred in a given district over the civil war period.[9]

We operationalize the urban bias proposition three ways. First, we create a variable that measures the distance of each district's centroid to the nation's capital. More coarsely, we also create a dummy variable for districts that include the capital city. Finally, we include

from the parliamentary election. We use the lowest level at which we were able to gather electoral data and align electoral districts with administrative districts. For Burundi the data was aggregated at a higher level to assure a relatively balanced sample.

[8] We utilize the latest version of the data (3.0): `http://www.ucdp.uu.se/ged/data/ucdp-ged-30-codebook.pdf`.

[9] We use data on violent events for each country for the following years: Burundi 1994 – 2004; Côte d'Ivorie 1999 – 2005; Kenya 1991 – 2002; Liberia 1998 – 2003; Sierra Leone 1990 – 2001; Uganda 1990 – 2001.

a variable measuring logged population size, taken from Columbia's "Gridded Population of the World" data (Center for International Earth Science Information Network (CIESIN), 2011). To create the population count for each district we overlay the gridded population data with the district borders and calculate the sum for each administrative unit.

We also introduce several controls to account for other standard arguments in the literature. In light of the prevalence of ethnic politics in these countries, we control for the ethnic composition of districts. In lieu of data on ethnic composition at lower levels of government, we rely on Wucherpfennig et al's (2011) data on the settlement patterns of ethnic groups and their access to executive governments (Girardin et al., 2015). Specifically, we first identify the ethnic groups present in each district. We then create three indicator variables. The first variable is coded 1 for districts in which at least one of the present ethnic groups either has the monopoly power or is the dominant power in the executive of the country. This variable is called "Ethnicity in Power" in all figures and tables. The second variable is coded as 1 if one of the ethnic groups in the district is sharing power in the executive. This variables is called "Ethnicity Power Sharing" in the tables and figures. Lastly, we create an indicator that is coded 1 for districts in which ethnic groups reside that are excluded from the executive, powerless, or dominated. This variable is named "Ethnicity Excluded".[10]

Co-ethnicity aside, it is possible that governments will want to build capacity in places with marketable economic resources. Boone (2003), for instance, argues that cash crops incentivizes central rulers to project authority in order to capture revenue. For this reason, we introduce several additional variables. First we create a variable that is the share of a given district that is used as cropland or pastures, which we derive from Ramankutty et al. (2010). Specifically, we overlay the gridded data of pastures and croplands with our district

[10] We only take groups into account that are politically relevant. The power status for each group is coded based on the year 2006, a year that includes the government of interest for all countries in our sample.

maps and calculate the share of land that is either pasture or cropland. We then sum those variables to create our "farming" variable. Second, we create an indicator variable for units where diamonds or oil are available for extraction. These data are taken from Gilmore et al. (2005) and Lujala, Rod and Thieme (2007).

Additionally, in some models, we include covariates for roughness of the terrain (forests and mountains), which may make the expansion of state capacity more challenging. Others add a measure for GDP per capita from Nordhaus (2006). The measures of forest cover, mountainous terrain, and GDP per capita are taken from the PRIO grid dataset, version 2.0 (Tollefsen, Strand and Buhaug, 2012). Aside from the electoral data which was collected for the appropriate administrative district, all covariates come in the form of gridded or raster data, which we aggregate to the administrative districts. For time-varying variables we include the value for the year 2000, which slightly precedes the the time period for which we measure change in lighting for all countries in our sample.

Lastly, one possibility is that governments invest in areas that have suffered from destruction during wars, i.e. changes we observe could just be rebuilding previously destroyed infrastructure. We therefore include light intensity prior to the wars in all of the estimated models. This light intensity measures is logged.[11]

VISUAL EVIDENCE

Before turning to the statistical analysis, we present a set of maps for each country that show: a) the growth in electricity coverage between the end of the civil war and second post-conflict election (or the most recent data if a second election hasn't taken place) (Figure 2); b) the level of electoral support for the president in the first post-war election; and c) the location of violent conflict events over the course of the civil war. The latter two types of data

[11] For some districts the mean value of this measure is is zero, we therefore add 0.001 to the original measure prior to the log transformation.

are presented on the same display (Figure 3), with darker blue districts reflecting stronger support for the elected president and dots in red representing conflict event locations. If the core-support idea bears out, one would expect to see an expansion of electricity networks in areas with many supporters; if presidents seek to attract support in swing areas, areas of intermediate support should see an increase in electricity coverage. If, on the other hand, state leaders build capacity in the direction of potential rebels, areas of previous conflict should show evidence of electrification.

Three observations emerge from the maps. First, the overwhelming story is that changes in electrification are modest. These countries remain very dark despite the fact that civil wars have come to an end. If civil wars bequeath geographically isolated states, the process of post-war state building is a slow one. Second, the nature of change in electrification that has taken place varies from cases with a general trend toward greater electrification in most, to those where de-electrification is more prevalent (Liberia and Côte d'Ivoire). Third and finally, there is no obvious correlation between changes in electrification and either electoral outcomes or violence. In Burundi, electrification is focused around the capital city, which has a history of considerable violence and where the government's electoral support was soft. Electrification is also concentrated around the Liberian capital of Monrovia, but the president Ellen Johnson-Sirleaf had stronger electoral support in Monrovia than Ndayizeye had in Bujumbura, Burundi, and thus Monrovia might qualify as a "swing" district. A close look at Côte d'Ivoire does not reveal any clear pattern, as negative and positive light growth occur close to each other. In Sierra Leone, electricity coverage expanded around an electorally contested capital and in key cities where President Kabbah had very strong support, but it also shrank outside some of those cities. In the two cases that have avoided civil wars–Uganda and Kenya–the little change there is, centers on the capitals. In the latter case, the government's support was quite strong; less so in Uganda. In Kenya, around the 2016 elections, there has been considerable violence, and many are concerned that the cycle of violence may lead toward a new civil war.

Figure 2: Growth in Light Intensity in Six African Countries – growth in calibrated digital number (DN) plotted

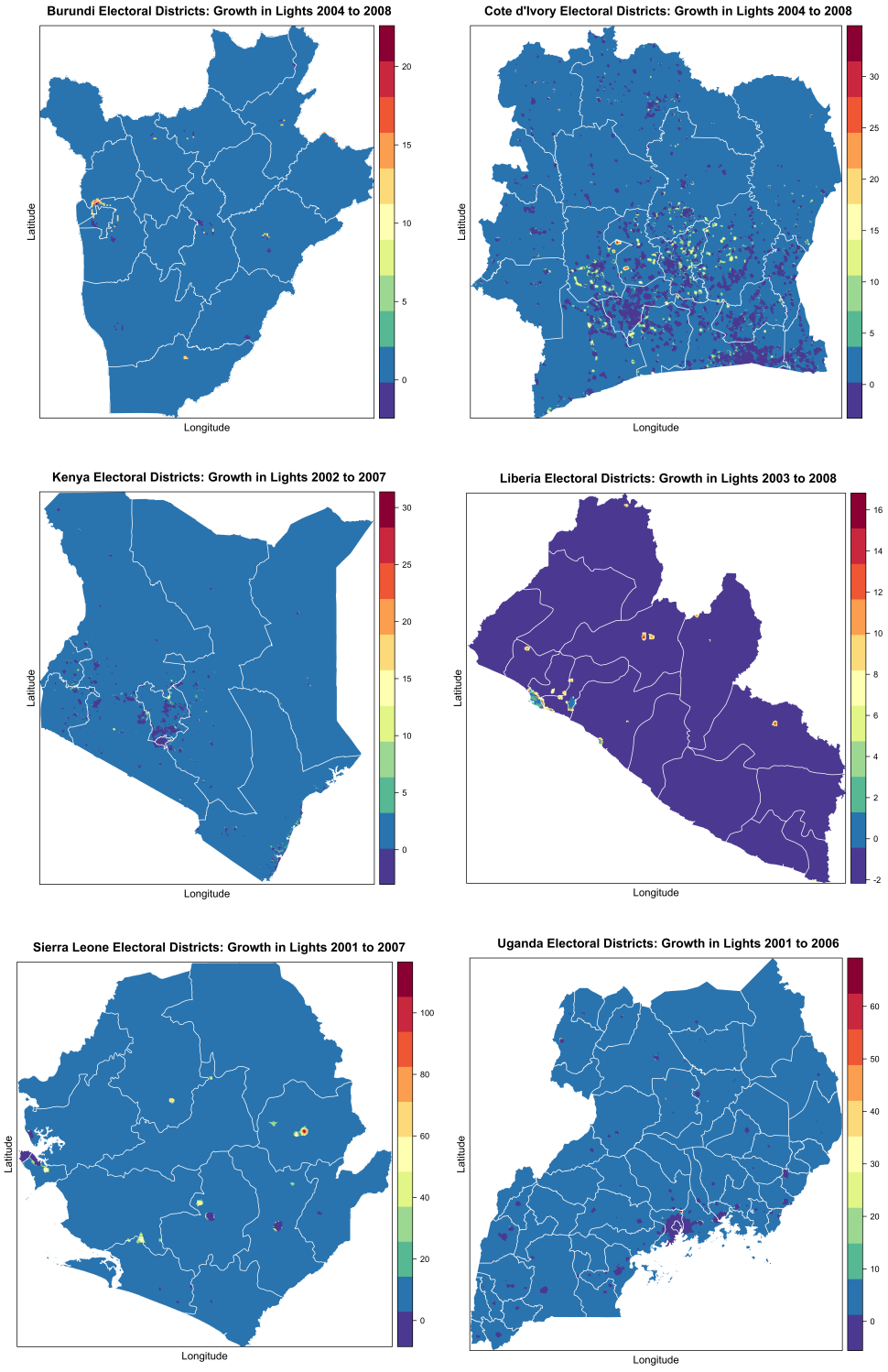
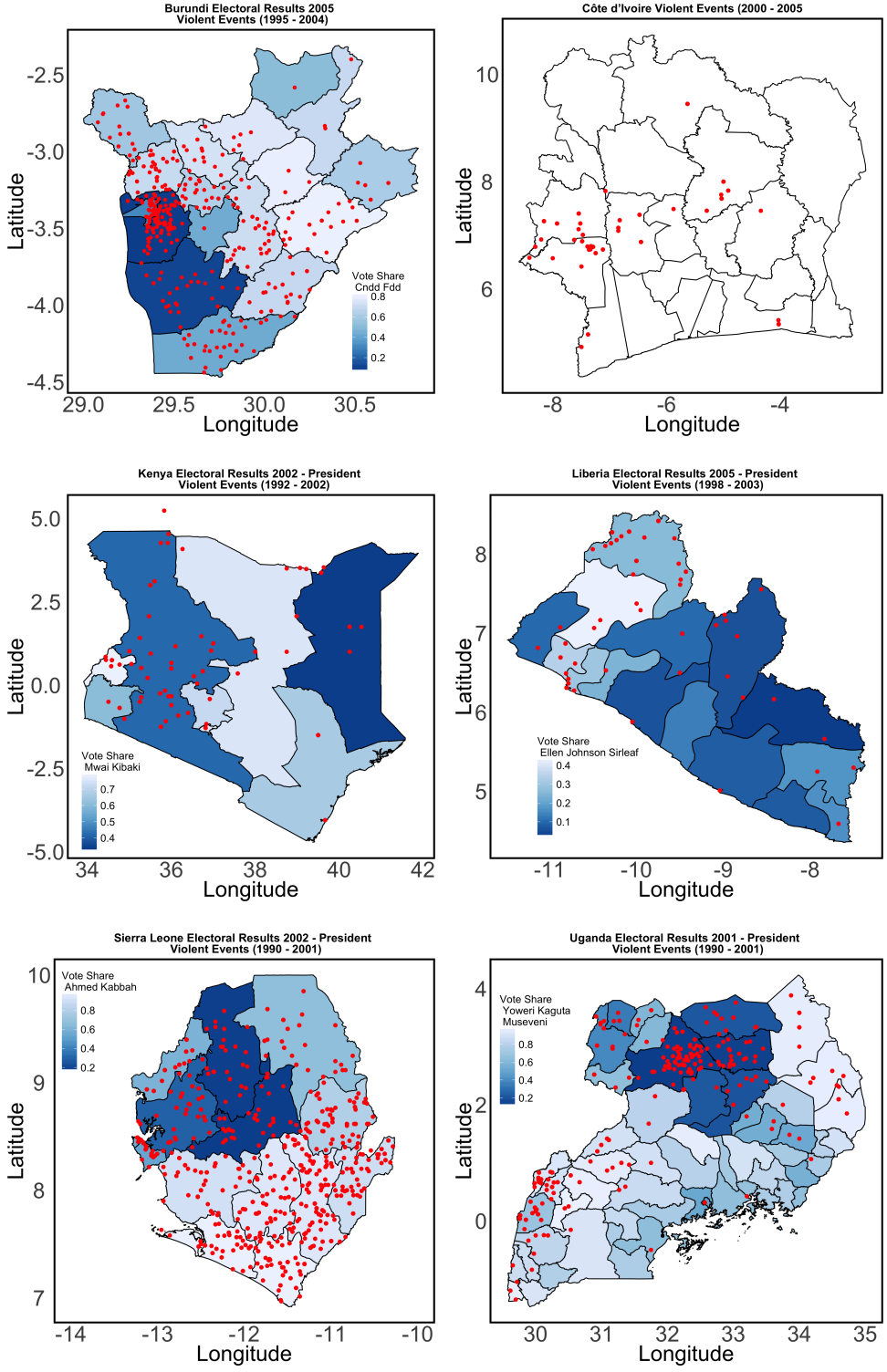


Figure 3: Conflict and the Support for the Incumbent in Post-Conflict Elections



EMPIRICAL ANALYSIS

In addition to the visual evidence we present above, we also undertake multivariate statistical analyses of the patterns in these data. First, Table 1 displays the results from a standard OLS model as well as the results from a weighted least squares estimation with growth in light intensity as our dependent variable.[12] To make comparison of the different coefficients more straightforward we scale all continuous variables by subtracting the sample mean and dividing by the standard deviation. Factor variables are on their original scale.[13]

Figure 4 shows the results of the OLS model in Table 1 in graphical form. As is easily visible, several of the variables have substantive effects on growth in light intensity. First, in this model, both the government's vote share and the swing variable are estimated to have a positive association with growth in light intensity, indicating that leaders may in fact reward voters with investment and swing voters, however, the estimated 90% CIs for both variables include zero. Second, there is significant evidence that areas with farming activity and those hosting ethnicities that are in power have received less investment in electricity, both 95% confidence interval do not include zero. More populous areas are estimated to have seen less growth, but here the 90% CI covers zero. Based on the models presented in Table 1, distance to the capital is positively associated with growth in light intensity indicating investment in far away districts. Similarly, as the positive coefficient for UCDP violence indicates, we find evidence that a large number of conflictual events leads to investment in public goods later on. The coefficient for UCDP event counts is very precisely estimated.

The analyzed data exhibit several issues which complicate the statistical analysis. First, several influential observations exist in the data. We therefore estimate a more robust it-

[12] Tables were created using *stargazer()* in $\mathcal{R}$ (Havlac, 2015).

[13] Table A.1 in the Appendix displays the same models on the unscaled data.

Table 1: Regression Results for Percent Change Light Intensity

	OLS	*WLS*
Vote Share	0.175	0.248
	(−0.033, 0.382)	(0.097, 0.400)
Swing	0.082	0.040
	(−0.124, 0.289)	(−0.110, 0.191)
Population 2000 (Logged)	−0.098	−0.077
	(−0.257, 0.062)	(−0.194, 0.039)
Farming	−0.251	−0.109
	(−0.424, −0.078)	(−0.235, 0.017)
Ethnicity in Power	−0.780	−0.830
	(−1.449, −0.110)	(−1.318, −0.341)
Ethnicity Power Sharing	0.258	0.091
	(−0.143, 0.659)	(−0.202, 0.383)
Ethnicity Excluded	0.398	−0.035
	(−0.136, 0.932)	(−0.425, 0.355)
Natural Resources	0.076	0.389
	(−0.447, 0.599)	(0.008, 0.771)
UCDP Violence	0.318	0.263
	(0.176, 0.461)	(0.159, 0.367)
Distance Capital (Logged)	0.241	0.217
	(0.027, 0.454)	(0.061, 0.373)
Capital	0.628	0.763
	(−0.302, 1.557)	(0.084, 1.442)
Logged Pre-War Lights	−0.452	−0.436
	(−0.636, −0.269)	(−0.570, −0.302)
Intercept	−0.165	−0.127
	(−0.487, 0.156)	(−0.362, 0.108)
Observations	109	109
R^2	0.576	

95% CI in Parentheses

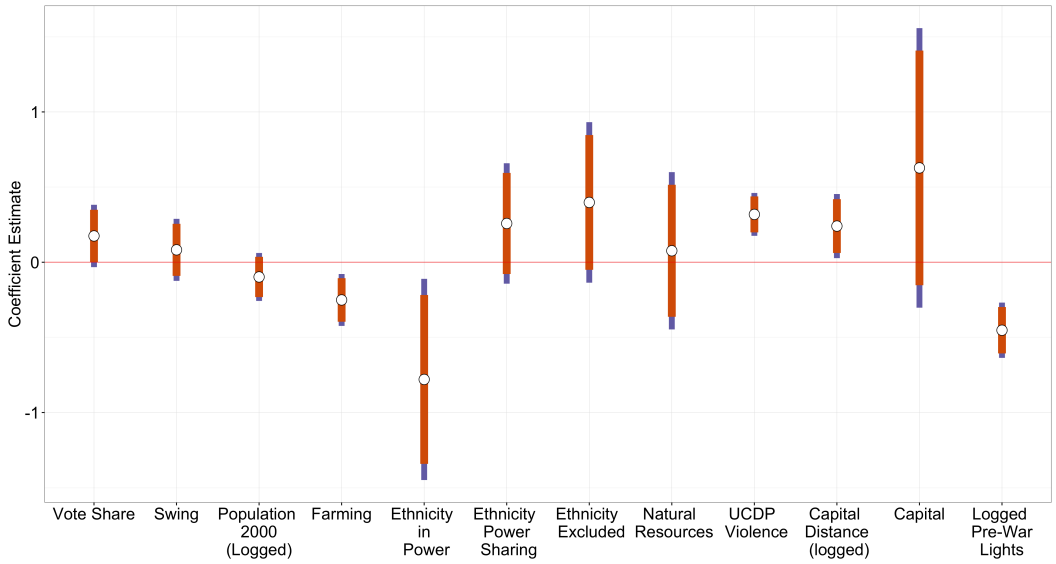


Figure 4: This plot shows the coefficient estimates as well as 90 and 95% confidence interval for model 1 in Table 1. One can see that government vote share is positively associated with growth in light intensity (but the estimated 90% CI includes zero). Surprisingly, districts that host ethnicities in power are associated with less growth in lighting, as are areas that were brighter before the war and those with significant farming. More populated areas have seen less investment (alas, the 90% CI covers zero). Districts with more violent events have seen a strong increase in light intensity, similar to districts that are further from the capital. In addition, districts that host ethnicities that share power or are excluded from power are positively associated with growth in light intensity but the 90% CIs include zero, as is the case for districts with natural resources. For space reasons, the intercept is not shown in the plot.

eratively weighted least squares model, for which the results are displayed in column 2 of Table 1. In this model, the highly influential observations (i.e. those with large residuals) are down-weighted. As one can see, the results are very similar to the initial OLS regression, with three exceptions. According to the WLS regression, districts with natural resource locations have seen substantially more investment. Additionally, the indicator for capital cities and the coefficient for vote share are much more precisely estimated. Again, a history of violence is significantly associated with growth in lighting.

Given the difficulty associated with this data, we undertake a number of additional robustness checks, adding controls and trying different sample specifications, the results of which are displayed in an online Appendix. First, we reestimate the OLS model from above. We then add country intercepts to this particular specification (column 2, Table A.2 in the Appendix). In the third column we restrict the sample to the three civil war cases, Burundi, Liberia, and Sierra Leone. For the fourth model we drop the electoral variables (vote share, swing), which allows us to include observations from Côte d'Ivoire. We then add a number of additional controls to the general OLS model, specifically we control for mountainous terrain, forest area, GDP per capita in 2000, size of the electoral district, and the number of years over which the growth in light intensity is measured (column 5, Table A.2). Lastly, we add country intercepts to the model with all controls (column 6). The signs of coefficient estimates are generally stable across the different specifications, yet the estimate for vote share switches between being negative and positive depending on the model. For the majority of variables the precision with which the coefficients are estimated differs substantially across the different models. The most consistent finding across all OLS models presented in Table A.2 is that previous violent events and distance to the capital are positively associated with growth in light intensity. On the other hand, light intensity before the war is negatively associated with growth after the war.

Several additional issues are of concern. As discussed above several observations are strongly influential, thus Table A.3 again shows all models already presented in Table A.2

estimated as the more robust iterative weighted least squares models. Again, the most consistent finding is that violent events during the war positively affect investment in electricity. In addition, the indicator variable for districts hosting the capital is positively associated and relatively precisely estimated in all but two of the six WLS models.

Lastly, we consider spatial dependence in the data, as it is likely, that even conditional on our covariates light is not distributed randomly across space. We therefore estimate several of our preferred models as spatial autoregressive lag models. The results are shown in Table A.4 in the Appendix. We again find support for the main finding: a higher number of violent events during the war are associated with more growth in light intensity. Moreover, based on the spatial lag models, capitals see significantly more growth in lighting.

Many of the results are quite sensitive to the different model specifications, yet some are very consistent. First, a very specific version of urban bias does seem to be happening, where governments attempt to expand state capacity around capital cities. The coefficient for districts housing the capital is very large and generally significant (especially in the WLS and spatial lag models). Electoral politics seem to have little systematic relationship with electrification. If at all, there seems to be some evidence for a positive effect of swing voters. Similarly, the results regarding the ethnic composition of districts are mixed. Surprisingly, in many of the presented models the coefficients for areas with ethnic groups that dominate the executive power are estimated to be negative or those hosting ethnicities excluded from power are estimated to have benefited. While the results vary somewhat in their precision across the different models, this is generally in line with the findings by Kasara (2007), that governments tax co-ethnics at higher rates than non-co-ethnics.

One of the most important stories to emerge from the models is that areas with a worse history of violent conflict are associated with increases in electrification. Consistent across these models, the more violent events a district experienced during the civil war, the greater the post-war growth in light intensity.

Figure 5 displays the marginal effect of the number of violent events in a given district

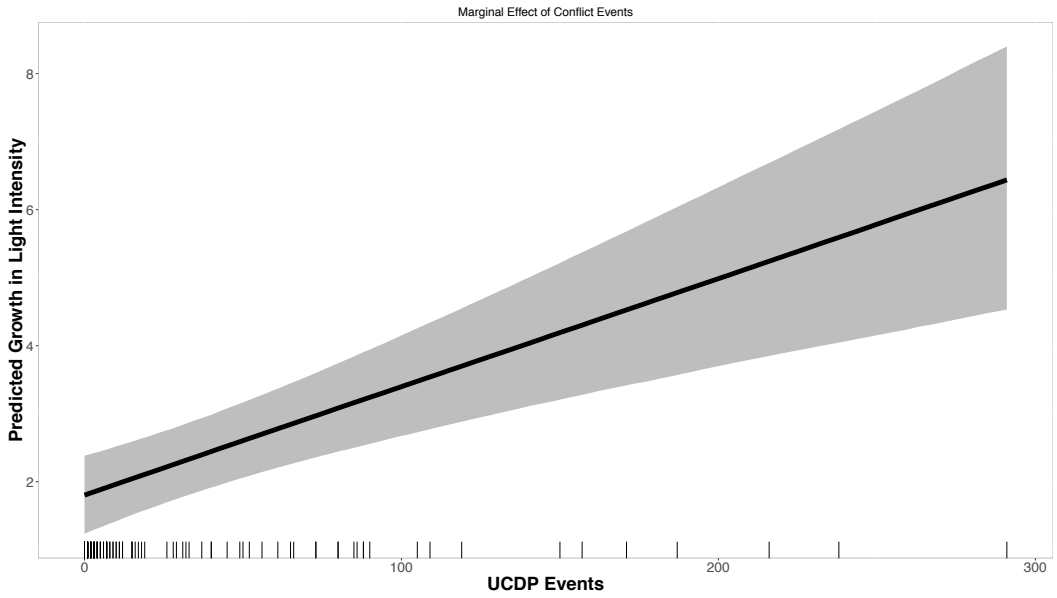


Figure 5: Predicted Growth in Light Intensity, as a function of prior violence.

on the growth in light intensity while all other variables are held at their mean. The figure is based on model 1 presented in Table 1 but estimated on the original, unscaled dataset. [14]

According to model 1, holding all other variables constant at their mean or median, a one standard deviation increase in past violent events from the sample mean leads to an increase in predicted growth in light intensity from 2.25% to 3.07% in a given district. We believe this is a small but still substantively important result, especially since a large variation exists with respect to the number of violent events in a given district and the very low growth rate in light intensity across our sample (the mean growth is only 2.03%, while the third quartile is only 3.43%).

All told, these results indicate that governments invest in state capacity in areas that

[14] The figure and estimations here are produced with the results of Models 1 in Table A.1 in the Appendix. All other variables but the UCDP conflict events are held at their respective means or medians for indicator variables, country dummies are held to zero except for Uganda. The indicator for natural resources and capital is held at 0. We hold the ethnicity variables at zero, except for the most common one, i.e. the example district is one where at least one ethnic group is involved in power sharing.

experienced the largest amount of fighting; they might do this either as a means to purchase hearts and minds or to strengthen its future ability to fight in conflict prone areas. One possibility is that governments would be more likely to invest where previous infrastructure was destroyed. However, recall that we control for pre-war light intensity in all our models.

Gridded Analysis

We provide an additional analysis of the data aggregated at the grid cell level. We use the same variables and time frame as above, however, instead of using electoral districts as our unit of analysis we now use grid cells with 0.5 decimal degrees resolution (these cells are approximately 50 by 50 KM at the equator).

We subset the PRIO-GRID (Tollefsen, Strand and Buhaug, 2012) data frame to our countries of interest and then add each of the variables discussed above (except the voting data, which is not available at this disaggregated level). The first column in Table 2 shows the general OLS model, including controls for GDP per capita and pre-war light levels. Given the smaller units of analysis we can better test the effect of distance to the capital in these models. For the second model we therefore include distance to the capital and distance squared to test for a non-linear effect. The model presented in the third column is estimated on data subsetted to grid cells with meaningful population totals. We do so to make sure that our results are not biased due to changes in areas with little or no population. [15] Lastly, the fourth model in Table 2 shows the results from a maximum likelihood estimation with a spatial lag based on neighboring grid cells.

[15] To subset the data we use the *Global Rural-Urban Mapping Project* data by the Socioeconomic Data and Applications Center (SEDAC) on settlement points (Center for International Earth Science Information Network (CIESIN), 2011; Balk et al., 2006). Specifically we aggregate the settlement point data to the grid cell and then, for model 3, drop the grid cells without any population settlements in the year 2000.

Table 2: Analysis Gridded Data

	OLS	OLS	OLS (Cells w. Population)	Spatial
Population 2000 (Logged)	0.298 (0.196, 0.401)	0.286 (0.187, 0.384)	−0.311 (−0.541, −0.080)	0.119 (0.061, 0.177)
Farming	0.022 (−0.470, 0.513)	−0.076 (−0.546, 0.394)	−0.631 (−1.354, 0.092)	−0.196 (−0.473, 0.081)
Ethnicity in Power	0.856 (−0.029, 1.741)	0.769 (−0.076, 1.614)	1.403 (0.263, 2.543)	0.011
Ethnicity Power Sharing	0.986 (0.676, 1.297)	1.037 (0.740, 1.335)	1.782 (1.206, 2.359)	0.366 (0.241, 0.491)
Ethnicity Excluded	1.833 (1.131, 2.535)	2.006 (1.335, 2.677)	2.510 (1.478, 3.542)	0.678 (0.295, 1.061)
Natural Resources	0.272 (−0.299, 0.843)	0.188 (−0.357, 0.732)	−0.093 (−0.739, 0.552)	0.152 (−0.173, 0.477)
UCDP Violence	0.015 (0.011, 0.019)	0.014 (0.010, 0.018)	0.010 (0.006, 0.014)	0.004 (0.002, 0.007)
Mountaneous	−2.199 (−2.725, −1.674)	−2.302 (−2.804, −1.799)	−2.073 (−2.822, −1.325)	−0.888 (−1.181, −0.595)
Forest	0.015 (0.009, 0.020)	0.016 (0.011, 0.021)	0.013 (0.005, 0.021)	0.006 (0.003, 0.010)
Distance Capital (Logged)	−0.378 (−0.634, −0.122)			
Distance Capital		0.004 (0.001, 0.008)	0.010 (0.005, 0.014)	0.003 (0.001, 0.005)
Distance Capital Squared		−0.00001 (−0.00002, −0.00001)	−0.00002 (−0.00003, −0.00001)	−0.00001 (−0.00001, −0.00000)
Capital	−3.600 (−4.905, −2.294)	−2.149 (−3.326, −0.972)	−0.189 (−1.478, 1.100)	−1.100 (−1.807, −0.392)
GDP per Capita	−0.292 (−0.674, 0.091)	−0.198 (−0.562, 0.166)	−0.179 (−0.692, 0.335)	0.115 (−0.103, 0.333)
Pre-War Lights (Logged)	−0.160 (−0.208, −0.113)	−0.193 (−0.239, −0.146)	−0.330 (−0.405, −0.255)	−0.145 (−0.172, −0.117)
Years	2.364 (2.048, 2.679)	2.337 (2.036, 2.638)	2.335 (1.964, 2.707)	0.268 (0.059, 0.478)
Intercept	−12.780 (−15.262, −10.299)	−14.925 (−16.783, −13.068)	−8.691 (−11.954, −5.429)	−3.463 (−4.781, −2.145)
Observations	448	448	197	448
R^2	0.650	0.683	0.840	
Akaike Inf. Crit.				1,104.857

95% CI in Parentheses

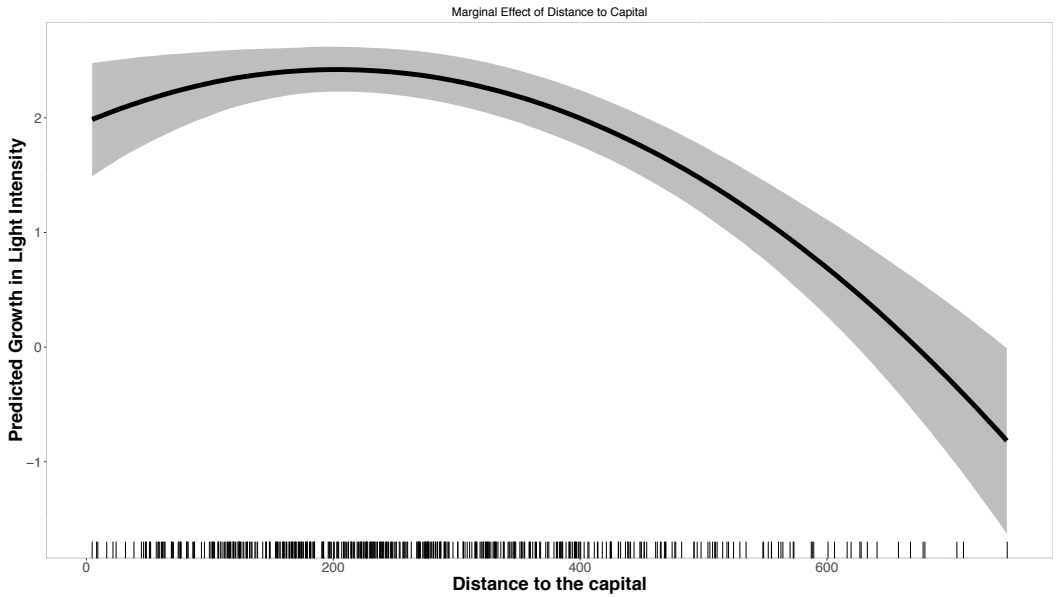


Figure 6: Predicted Growth in Light Intensity, as a function of distance to the capital.

Several insights emerge from these additional models. First, given the lower level of spatial aggregation, grid cells with higher numbers of population (except when excluding zero population grid cells) saw more growth in light intensity. Additionally, those cells with ethnicities excluded from power benefited the most, followed by cells with ethnicities who share power. Not surprisingly, grid cells with mountainous terrain saw less investment (as the terrain makes investment more expensive). Areas with forest cover, on the other hand, saw more growth in light intensity.

Surprisingly, at this level of analysis the grid cells that host the capital saw less growth in light intensity. This indicates, that it was not the capital that saw the most investment but areas very close to the capital (recall that the district electoral districts are much larger in size). In addition, the effect of distance to the capital is clearly non-linear. Figure 6 shows the effect of moving away from the grid cell that hosts the capital. As one can see, first investment increases but it then quickly decreases as one moves further away from the capital. Taken together, these findings show that most of the growth occurred in the immediate neighborhood of the capital cities, but not the cities itself (thus the positive effect when the larger districts are the unit of analysis).

Again, as in the models with electoral districts as the unit of analysis presented above, more violent events are significantly associated with higher light intensity. Again, note that these results are based on models that control for pre-war lighting (i.e. destruction), income (GDP per capita), and population. The findings on ethnicity and violence could indicate that governments invest in areas where they fear future violence, either to control or co-opt opponents. Overall, however, given the largely similar results, we believe the grid level analyses add substantial confidence to the conclusions drawn from the models above.

CONCLUSION

States capable of governing their territory are a prerequisite for preventing civil conflict, terrorist activity, and humanitarian crises. The fundamental problem for weak states is that they are unable to project authority. Such states might control the capital city, but they do not provide the fundamentals of governance across all of the territory of the country. Weak state leaders facing sharp constraints must make important choices on where to focus their limited capacity to provide security and basic public goods. Unfortunately, the state of our knowledge on state capacity, particularly how it is distributed across the geography of countries, is weak.[16] As a substantive matter, we have a host of contending notions that might explain the behavior of state leaders intent on developing the state's capacity to govern across territory. In the absence of more appropriate data, arbitrating among these competing claims is impossible. This article brings an original kind of data and systematic analysis to bear on a fundamental question in the social sciences: Where is the state able to govern?

Our findings suggest that authorities in Liberia, Côte d'Ivoire, Burundi, Sierra Leone, Kenya and Uganda target state building in locations that have a history of violence as well as those close to the capital. They do so at the expense of other plausible strategic choices,

[16] But, see recent efforts by Juan Pablo Luna and Hillel David Soifer on measuring state capacity at the subnational level

such as targeting supporters, or swing districts. There are obvious weaknesses in the analysis above that limit our capacity to explain why that is the case. Perhaps most importantly, we have presented electrification as a choice of leaders who have the capacity to provide a limited supply of it across territory. Yet the failure of leaders to electrify some regions could result from a lack of demand for state services or even outright opposition to the state's presence. Put differently, we need to know substantially more about the geography of citizen perceptions and demands for state presence to understand the strategic environment in which state building leaders find themselves.

We would like to know two things. First, what do citizens across the political geography want from the state? Second, how do they perceive the government's efforts at projecting authority? Answers to the first question might help explain why leaders build state capacity where they do. Answers to the second question would provide insight into the implications of state building. If citizens perceive state leaders to be rewarding areas rich in supporters or cities at the expense of rural areas, there might be important implications for peace and stability. Obviously, we can only know the answers to these questions with surveys of samples representative at the district or regional level. Appropriately designed surveys would provide information on the geographic distribution of support and opposition for the government, trust in government, preferences for public goods, and perceived bias in the state's effort.

Second, capable states provide many types of public goods, and electricity is only one of them. Increasingly, geographic data on state projects is becoming available that would allow us to move beyond the specifics of electrification. The Demographic Health Survey project, for instance, has geo-coded the location of health clinics for many countries around the world, and the World Bank is in the process of geo-coding Bank projects. While each of these types of data has limitations, collectively they offer the possibility of mapping state capacity in ways that radically improve upon aggregate national level indicators of wealth or governance.

Ultimately, we would like to know how governments isolated in their capitals can convince

citizens to trust their capacity to govern. We know relatively little about how trust building works in the political contexts (though see Bakke, O'Loughlin and Ward (2010)). It is likely, for example, that noisy signals can be harmful for trust building between governments and citizens. Imagine, for instance, that the lights go out in a medium size town in the Northern section of Sierra Leone owing to electromechanical failure. This random noise is easily interpreted by the inhabitants of the region as delayed retribution or disrespect.[17] If individuals and groups assign credit and blame for the provision of public services, the government's heterogeneous capacity to deliver those services becomes a key ingredient in citizen compliance with the state. Indeed, Elbadawi (2008) notes that long-term peace and growth depends primarily on the government's capacity to organize the provision of public goods. Though an extensive body of work exists on the political context in which conflict and post-conflict negotiations take place (Chauvet and Collier, 2008), it emphasizes exogenous sources of policy, credibility and reputation. In contrast, we seek to understand the sources of governmental credibility and why it varies so substantially across the political geography of societies.

[17] As Min (2009) notes in work on India, such episodes are actually quite frequent.

REFERENCES

Ahrens, Achim. 2015. "Civil Conflicts, Economic Shocks and Night-time Lights." *Peace Economics, Peace Science and Public Policy* 21(4):433–444.

Aron, Janine. 2003. "Building Institutions in Post-Conflict African Economies." *Journal of International Development* 15(4):471 – 485.

Bakke, Kristin M, John V. O'Loughlin and Michael D. Ward. 2010. "Reconciliation in Conflict-Affected Societies: Multilevel Modeling of Individual and Contextual Fac- tors in the North Caucasus of Russia." *Annals of the American Association of Geographers* 99(5):1012–1021.

Balk, D. L., U. Deichmann, G. Yetman, F. Pozzi, S. I. Hay and A. Nelson. 2006. "Determining Global Population Distribution: Methods, Applications and Data." *Advances in Parasitology* 62:119–156.
URL: *http://dx.doi.org/10.1016/S0065-308X(05)62004-0*

Bates, Robert H. 1981. *Markets and States in Tropical Africa*. Berkeley, CA: University of California Press.

Bickers, Kenneth N. and Robert M. Stein. 2004. "Interlocal Cooperation and the Distribution of Federal Grant Awards." *Journal of Politics* 66(3):800 – 822.

Boone, Catherine. 2003. *Political Topographies of the African State. Territorial Authority and Institutional Choice*. Cambridge University Press.

Braithwaite, Alex. 2010. "Resisting Infection: How State Capacity Conditions Conflict Contagion." *Journal of Peace Research* 47(3):311–319.

Bueno de Mesquita, Bruce, Alastair Smith, Randolph M. Siverson and James D. Morrow. 2005. *The Logic of Political Survival*. Cambridge: MIT Press.

Buhaug, Halvard and Jan Ketil Rød. 2006. "Local Determinants of African Civil Wars, 1970-2001." *Political Geography* 25(3):315–335.

Buhaug, Halvard, Kristan Skrede Gleditsch, Helge Holtermann, Gudrund Østby and Andreas Forø Tollefsen. 2011. "It's the Local Economy, Stupid! Geographic Wealth Dispersion and Conflict Outbreak Location." *Journal of Conflict Resolutionn* 55(5):814 – 840.

Buhaug, Halvard and Päivi Lujala. 2005. "Accounting for Scale: Measuring Geography in Quantitative Studies of Civil War." *Political Geography* 24(4):399–418.

Busch, Marc L. and Eric Reinhardt. 2000. "Geography, international trade, and political mobilization in US industries." *American Journal of Political Science* 44(4):703–719.

Cederman, Lars-Erik, Andreas Wimmer and Brian Min. 2010. "Why do ethnic groups rebel? New data and analysis." *World Politics* 62(1):87–119.

Cederman, Lars-Erik, Jan Ketil Rod and Nils B. Weidmann. 2010. "Geo Referencing of Ethnic Groups: a New Dataset." *Journal of Peace Research* 47(4):491–499.

Cederman, Lars-Erik and Luc Girardin. 2007. "Beyond fractionalization: Mapping ethnicity onto nationalist insurgencies." *American Political Science Review* 101(1):173–185.

Cederman, Lars-Erik and Luc Girardin. 2010. "Growing Sovereignty: Modeling the Shift from Indirect to Direct Rule." *International Studies Quarterly* 54(1).

Cederman, Lars-Erik, Nils B Weidmann and Kristian Skrede Gleditsch. 2011. "Horizontal inequalities and ethnonationalist civil war: A global comparison." *American Political Science Review* 105(03):478–495.

Cederman, Lars-Erik, Nils B Weidmann and Nils-Christian Bormann. 2015. "Triangulating horizontal inequality Toward improved conflict analysis." *Journal of Peace Research* 52(6):806–821.

Center for International Earth Science Information Network (CIESIN). 2011. "Global Rural-Urban Mapping Project, Version 1 (GRUMPv1): Settlement Points.".
URL: *http://dx.doi.org/10.7927/H4M906KR*

Chauvet, Lisa and Paul Collier. 2008. "What are the Preconditions for Turnarounds in Failing States?" *Conflict Management and Peace Science* 25(4):332–348.

Collier, Paul and Anke Hoeffler. 2004. "Greed and grievance in civil war." *Oxford Economic Papers* 56:563–595.

Cox, Gary W and Matthew D McCubbins. 1986. "Electoral Politics as a Redistributive Game." *The Journal of Politics* 48(2):370–389.

Croicu, Mihai and Ralph Sundberg. N.d. "UCDP GED Conflict Polygons dataset version 1.1-2011." UCDP, Department of Peace and Conflict Research, Uppsala University.

Dube, Oeindrila and Juan Vargas. 2013. "Commodity price shocks and civil conflict: Evidence from Colombia." *The Review of Economic Studies* .

Elbadawi, Ibrahim. 2008. "Post-conflict transitions: An overview." *World Bank Economic Review* 22:1–7.

Elvidge, Christopher D., Feng-Chi Hsu, Kimberly E. Baugh and Tilottama Ghosh. 2014. National Trends in Satellite-Observed Lighting: 1992 - 2012. In *Global Urban Monitoring and Assessment through Earth Observation*, ed. Qihao Weng. CRC Press chapter 6, pp. 97 – 120.

Elvidge, Christopher D., Paul C. Sutton, Tilottama Ghosh, Benjamin T. Tuttle, Kimberly E. Baugh, Budhendra Bhaduri and Edward Bright. 2009. "A global poverty map derived from satellite data." *Computers & Geosciences* 35(8):1652 – 1660.
URL: *http://www.sciencedirect.com/science/article/pii/S0098300409001253*

Esty, Daniel C., Jack Goldstone, Ted Robert Gurr, Barbara Harf, Marc Levy, Geoffrey D. Dabelko, Pamela T. Surko and Alan N. Unger. 1998. The State Failure Task Force Report: Phase II Findings. Technical report Science Applications International Corporation McLean, VA: .

Evans, Peter B., Dietrich Rueschemeyer and Theda Scocpol. 1985. *Bringing the State back in*. New York, NY: Cambidge University Press.

Fearon, James D. and David D. Laitin. 2003. "Ethnicity, insurgency, and civil war." *American Political Science Review* 97(1):75–90.

Fearon, James D., Kimuli Kasara and David D. Laitin. 2007. "Ethnic minority rule and civil war onset." *American Political Science Review* 101(1):187–193.

Finer, Samuel. 1997. *The History of Government from the Earliest Times: Ancient Monarchies and Empires; The Intermediate Ages; Empires, Monarchies and the Modern State*. Oxford, UK: Clarendon Press.

Gilmore, Elisabeth, Nils Petter Gleditsch, Päivi Lujala and Jan Ketil Rød. 2005. "Conflict diamonds: A new dataset." *Conflict Management and Peace Studies* 22(3):257–272.

Girardin, Luc, Philipp Hunziker, Lars-Erik Cederman, Nils-Christian Bormann and Manuel Vogt. 2015. "GROWup - Geographical Research On War, Unified Platform." ETH Zurich. `http://growup.ch/`.

Gleditsch, Kristian Skrede. 2007. "Transnational dimensions of civil war." *Journal of Peace Research* 44(3):293–309.

Gleditsch, Kristian Skrede and Nils B. Weidmann. 2012. "Richardson in the Information Age: Geographic Information Systems and Spatial Data in International Studies." *Annual Review of Political Science* 15(1):461–481.

Goldstone, Jack A, Robert H Bates, David L Epstein, Ted Robert Gurr, Michael B Lustik, Monty G Marshall, Jay Ulfelder and Mark Woodward. 2010. "A global model for forecasting political instability." *American Journal of Political Science* 54(1):190–208.

Hausman, William, John Neufeld and Till Schreiber. 2010. "Donor Policies, Industry Structure, and the Global Allocation of Electrification Aid, 1970-2001." Working Paper 98, Department of Economics, College of William and Mary.

Havlac, Marek. 2015. "stargzer: Well-Formatted Regression and Summary Statistics Tables." R package version 5.2. `http://CRAN.R-project.org/package=stargazer`.

Hechter, Michael. 2000. *Containing Nationalism*. New York, NY: Oxford University Press.

Hendrix, Cullen S. 2010. "Measuring State Capacity: Theoretical and Empirical Implications for the Study of Civil Conflict." *Journal of Peace Research* 47(3):273–285.

Herbst, Jeffrey. 2000. *States and power in Africa: Comparative lessons in authority and control*. Princeton: Princeton University Press.

Independent Evaluation Group of the World Bank. 2015. "World Bank Group Support to Electricity Access, FY 2000–2014." `https://ieg.worldbankgroup.org/Data/reports/chapters/Electricity_Access_1.pdf` (Accessed March 21, 2016).

Kalyvas, Stathis N. 2008. "Ethnic Defection in Civil War." *Comparative Political Studies* 41(8):1043 – 1068.

Kasara, Kimuli. 2007. "Tax me if you can: Ethnic Geography, Democracy and the Taxation of Agriculture in Africa." *American Politial Science Review* 101(1):159–172.

Khandker, Shahidur R., Hussain A. Samad, Rubaba Ali and Douglas Barnes. 2012. "Who Benefits Most from Rural Electrification: Evidence in India." Paper presented at the Agricultural and Applied Economics Association's 2012 Annual Meeting.

Krugman, Paul. 1991. *Geography and Trade*. Cambridge, Mass: MIT Press.

Landes, David S. 1998. *The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor*. New York, NY: W.W. Norton & Company Inc.

Levi, Margaret. 1988. *Of Rule and Revenue*. Berkeley, CA: University of California Press.

Levi, Margaret and Valerie Braithwaite. 2003. *Trust and Governance*. New York, NY: Russell Sage Foundation.

Levin, Noam and Yishai Duke. 2012. "High spatial resolution night-time light images for demographic and socio-economic studies." *Remote Sensing of Environment* 119:1 – 10. **URL:** *http://www.sciencedirect.com/science/article/pii/S0034425711004421*

Lindbeck, Assar and Jorgen Weibull. 1987. "Balanced Budget Redistribution as the Outcome of Political Competition." *Public Choice* 52(3):273–297.

Lujala, Päivi, Jan Ketil Rod and Nadia Thieme. 2007. "Fighting over Oil: Introducing a New Dataset." *Conflict Management and Peace Science* 24(3):239–256.

Min, Brian. 2009. "Distributive Politics and Power in India: Evidence from Public Service Provision from Satellite." Working Paper. Department of Political Science. University of Michigan.

Min, Brian. 2015. *Power and the Vote: Elections and Electricity in the Developing World*. New York, NY: Cambidge University Press.

Min, Brian, Kwawu Mensan Gaba, Ousmane Fall Sarr and Alassane Agalassou. 2013. "Detection of rural electrification in Africa using DMSP-OLS night lights imagery." *International Journal of Remote Sensing* 34(22):8118–8141.

Murillo, Maria Victoria and Ernesto Calvo. 2004. "Who Delivers? Partisan Clients in the Argentine Electoral Market." *American Journal of Political Science* 48(4):742 – 757.

Mveyange, Anthony. 2015. "Night lights and regional income inequality in Africa." Working Paper. World Bank.

Myrdal, Gunnar. 1956. *Economic Theory and Under-Developed Regions*. London, UK: Gerald Duckworth & Co.

Nagl, J.A. 2002. *Counterinsurgency lessons from Malaya and Vietnam: learning to eat soup with a knife*. Praeger Publishers.

Nagle, John A. and Brian M. Burton. 2009. "Dirty Windows and Burning Houses: Setting the Record Straight on Irregular Warfare." *The Washington Quarterly* 32(2):91–101.

Nordhaus, William D. 2006. "Geography and Macroeconomics: New Data and New Findings." *Proceedings of the National Academy of Sciences of the USA* 103(10):3510–3517.

Pierskalla, Jan H and Florian M Hollenbach. 2013. "Technology and collective action: The effect of cell phone coverage on political violence in Africa." *American Political Science Review* 107(02):207–224.

Pinkovskiy, Maxim and Xavier Sala-i Martin. 2009. "Parametric estimations of the world distribution of income." Working Paper. National Bureau of Economic Research. No. w15433.

Ramankutty, N., A.T. Evan, C. Monfreda and J.A. Foley. 2010. "Global Agricultural Lands: Pastures, 2000." Data distributed by the NASA Socioeconomic Data and Applications Center (SEDAC).`http://sedac.ciesin.columbia.edu/es/aglands.html` (accessed June 25,2011).

Robb, Graham. 2008. *The Discovery of France: A Historical Geography*. New York, NY: W.W. Norton & Company.

Rodden, Jonathan. 2010. "Political Geography in the Shadow of the Industrial Revolution: Cities and the Representation of the Left." Manuscript. Stanford University.

Shapiro, Jacob N. and Nils B. Weidmann. 2015. "Is the Phone Mightier Than the Sword? Cellphones and Insurgent Violence in Iraq." *International Organization* 69(2):247–274.

Small, Christopher, Francesca Pozzi and Christopher D Elvidge. 2005. "Spatial analysis of global urban extent from DMSP-OLS night lights." *Remote Sensing of Environment* 96(3):277–291.

Stokes, Susan C. 2005. "Perverse Accountability: A Formal Model of Machine Politics with Evidence from Argentina." *American Politial Science Review* 99(3):315–325.

Sundberg, Ralph and Erik Melander. 2013. "Introducing the UCDP georeferenced event dataset." *Journal of Peace Research* 50(4):523–532.

Sutton, Paul C., Christopher D. Elvidge and Tilottama Ghosh. 2007. "Estimation of gross domestic product at sub-national scales using nighttime satellite imagery." *International Journal of Ecological Economics & Statistics* 8(S07):5–21.

Theisen, Ole Magnus. 2008. "Blood and Soil? Resource Scarcity and Internal Armed Conflict Revisited." *Journal of Peace Research* 45(6):801–818.

Thies, Cameron G. 2010. "Of rulers, rebels, and revenue: State capacity, civil war onset, and primary commodities." *Journal of Peace Research* 47(3):321–332.

Tilly, Charles. 1990. *Coercion, Capital, and European States, AD 990-1990.* Oxford, UK: Blackwell.

Tollefsen, Andreas Forø, Havard Strand and Halvard Buhaug. 2012. "PRIO-GRID: A Unified Spatial Data Structure." *Journal of Peace Research* 49(2):363–374.

Trejo, Guillermo. 2009. "Religious Competition and Ethnic Mobilization in Latin America: Why the Catholic Church Promotes Indigenous Movements in Mexico." *American Politial Science Review* 103(3):323–342.

Waltz, Kenneth N. 1979. *Theory of International Politics.* Reading: Addison-Wesley.

Weber, Eugen. 1976. *Peasants into Frenchmen: The Modernisation of Rural France, 1870 – 1914.* Palo Alto, CA: Stanford University Press.

Weidmann, Nils. 2009. "Geography as motivation and opportunity: Group concentration and ethnic conflict." *Journal of Conflict Resolution* 53(4):526–543.

Weidmann, Nils B and Sebastian Schutte. 2016. "Using night light emissions for the prediction of local wealth." *Journal of Peace Research* in press.

Weingast, Barry R. 1995. "The Economic Role of Political Institutions: Market-Preserving Federalism and Ecnomic Development." *Journal of Law, Economics, & Organization* 11(1):1–31.

Whitaker, Rick. 2009. "Let there be Light: The Role of Electrification in Liberia's Post-Conflict Stabilization." Washington, DC: United States Agency for International Development.

Widner, Jennifer A. 2001. *Building the Rule of Law.* W.W. Norton.

Wimmer, Andreas, Lars-Erik Cederman and Brian Min. 2009. "Ethnic politics and armed conflict: A configurational analysis of a new global dataset." *American Sociological Review* 74(2):316–337.

World Bank. 2006. "Infrastructure at the Crossroads: Lessons from 20 Years of World Bank Experience." Washington, DC: The World Bank.

World Bank. 2008. "The Welfare Impact of Rural Electrification: A Re- assessment of the Costs and Benefits." Washington, DC: The World Bank.

Wucherpfennig, Julian, Nils B. Weidmann, Luc Girardin, Lars-Erik Cederman and Andreas Wimmer. 2011. "Politically Relevant Ethnic Groups Across Space and Time: In- troducing the GeoEPR Dataset." *Conflict Management and Peace Science* 28(5):423–437.

Zhuo, L., T. Ichinose, J. Zheng, J. Chen, P. J. Shi and X. Li. 2009. "Modelling the population density of China at the pixel level based on DMSP/OLS nonâĂŘradianceâĂŘcalibrated nightâĂŘtime light images." *International Journal of Remote Sensing* 30(4):1003–1018. **URL:** *http://dx.doi.org/10.1080/01431160802430693*