The Localized Geography of Foreign Aid: A New Dataset and Application to Violent Armed Conflict

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Summary. — Existing foreign aid databases – the OECD's CRS data and now AidData – are project-based. And yet nearly all empirical analyses using these data aggregate to the country-year level, thereby losing project-specific information. In this paper, we introduce new data on the geographic location of aid projects that have been committed to many African countries between 1989 and 2008. The data enable an examination of project-level information in a wider variety of systematic research contexts. To demonstrate the utility of the new data, we discuss how geographically disaggregated foreign aid and armed conflict data are needed to capture the theoretical mechanisms in the aid-conflict literature. We then map the disaggregated aid and conflict data in Sierra Leone, Angola, and Mozambique as specific examples of how these data could help disentangle competing causal mechanisms linking aid to conflict onset and dynamics. The research provides an important new perspective on the connections between aid and conflict. More generally, it is a crucial first step in geo-referencing and comparing foreign aid projects to various localized development outcomes.
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Key words — geocoding, Mozambique, Angola, Sierra Leone, intrastate armed conflict, foreign aid

1. INTRODUCTION

Existing databases on foreign aid – the OECD's Creditor Reporting System and now AidData (Tierney *et al.*, 2011) – contain information at the project level. And yet nearly all of the hundreds of empirical analyses of aid effectiveness using these data, which typically analyze whether aid increases economic growth, aggregate to the country-year level, thereby losing project specific information (*e.g.*, Burnside & Dollar, 2000). Because so many aid projects are targeted at localized development, the neglect of project and location-specific information in research is potentially a serious deficiency in the current aid literature. This problem is especially acute if the development outcomes of interest are location-specific.

While aid has been linked to many outcomes in the developing world, it potentially has important consequences for the occurrence and severity of violent armed conflict. The literature on conflict has similarly aggregated data to the country level, resulting in many of the same analytical limitations. Despite the aggregation, much of the armed conflict occurring in the world is localized even within countries (Raleigh, Linke, & Hegre, 2009). Thus, because conflict is also typically localized, occurring largely within specific regions of a country, current assessments of the aid and conflict literature that use country-level data for both aid and conflict could be doubly problematic.

In this paper, we introduce new data on the geographic locations of foreign aid projects that allow an examination of the distribution of foreign aid at the province, district, and city level, wherever possible. More precisely, we introduce new data on the geographic location of approximately 65,000 foreign aid projects that have been committed to most African countries between 1989 and 2008. We then explore specific applications of these data in the context of armed conflict.

A review of the recent aid-conflict literature suggests two prominent causal mechanisms linking foreign aid to the onset and dynamics of conflict: (1) aid increases the size of the prize associated with capturing the state and (2) aid capture is business for rebellions, allowing them financing for military operations or material support in the form of food, weapons, or other supplies. The fungibility of aid – its potential to be diverted for purposes other than those intended by its donor – likely exercises a mediating effect on whether aid increases or decreases violence, which we consider below.

We do not intend to provide comprehensive tests of the aid-conflict relationship, but instead, show how the geo-referenced data could be applied to these general possibilities. To do this, we closely examine the cases of Sierra Leone, Angola, and Mozambique for which all foreign aid projects from the

AidData portal have been coded: 6,449 projects during conflict years and 547 in non-conflict years for Angola; 1,158 projects during conflict years and 13,354 during non-conflict years in Mozambique; and 1,121 projects during conflict years and 2,561 projects during non-conflict years in Sierra Leone. To measure violent incidents we use battle events data from the UCDP Geo-referenced Events Dataset (GED), provided by the Uppsala Conflict Data Program.

Using the cases of Sierra Leone, Angola, and Mozambique, we consider how disaggregated data can provide insights into the competing mechanisms identified above. The spatial associations in these countries illustrate that fungible aid and battles appear to cluster together in localized geographic areas. Further, they suggest that aid granted to the capital of a country could be associated with conflict onset in other regions of the country. We emphasize that these observations represent only initial possibilities of the aid-conflict relationship and we are optimistic that the geo-referenced data provide ample opportunity for more sophisticated empirical tests.

Understanding the connections between aid and conflict is crucial, given the enormous humanitarian implications. In explaining the Rwandan genocide, for example, Uvin (1998) contends that "aid financed much of the machinery of exclusion, inequality, and humiliation; provided it with legitimacy and support' and sometimes directly contributed to it". Beyond Rwanda, both humanitarian and general development aid have been used and misused in locations as varied as Somalia, Afghanistan, Tajikistan, Chechnya, and Gaza.

Apart from our specific consideration of the relationship between localized aid and conflict, this paper represents the first attempt to geo-reference aid data on a multi-country scale. While this paper provides only one sectoral example of geo-referencing's increased empirical accuracy, its basic methodology could be utilized in other sectors to address key aid-effectiveness questions, such as poverty (e.g., Burnside & Dollar, 2000), health (Williamson, 2008), or education (Dreher, Nunnenkamp, & Thiele, 2008), which have primarily been studied at the macro-level. The data could be used to evaluate, for instance, whether aid to certain regions of a country reduce poverty in those regions. Or the data could address whether particular health or education projects have only localized effects in remedying or preventing health crises or education failures in the villages or provinces in which they are deployed. In effect, subnational research with these data could allow researchers to more fully utilize project-specific information to examine subnational variation in localized development outcomes.

We begin by describing our efforts to geo-reference foreign aid project data within African conflict countries between 1989 and 2008. Following, we introduce the aid-conflict literature with an eye toward identifying prominent causal mechanisms that could be elucidated with geo-referenced data. We then examine the cases of Sierra Leone, Angola, and Mozambique to provide examples of the utility of the data.

2. SPATIAL DATA ON FOREIGN AID

Prior to our geo-referencing work, very little subnational aid data have been available. Some donors have geo-referenced their projects on a limited scale, including some country offices of the United Nations Development Program (UNDP), which have completed city-level coding in Kenya[1] and district-level coding in Nepal.[2] The *Mapping for Results* partnership between AidData and the World Bank provides the most widespread donor-generated database – active projects have been mapped in more than half of the World Bank partner countries – but even this data set is restricted to active projects.[3] The UCDP/AidData geo-referenced aid dataset introduced in this paper represents the only historic sub-national dataset currently in existence.

(a) Subnational geo-referenced foreign aid data

The geo-referenced aid projects are drawn from the AidData portal, which contains funding commitments since 1945 from most multilateral and bilateral donors.[4] Because of our interest in the aid-conflict relationship, we prioritized geo-referencing aid projects since 1989 that are committed to African countries in which there are ongoing armed conflicts. All country-years that are active, *i.e.* where there have been at least 25 battle related deaths, are included.[5] In order to illustrate how aid can affect conflict onset and resurgence we have also coded inactive years before and after active conflict years in Sierra Leone, Angola, and Mozambique. This also provides a preview of future versions of the dataset that will include non-conflict years for the countries in the current dataset as well as countries that have not experienced armed conflict.

The system of geo-referencing used here is based on the Uppsala Conflict Data Program's Geo-referenced Events Dataset (Sundberg, Lindgren, & Padskocimaite, 2010) and has been adapted to the specific coding decisions that need to be made when geo-referencing aid projects (Strandow, Findley, Nielson, & Powell, 2010).[6] The system distinguishes between pairs of coordinates on four main levels of precision, ranging from point locations, through two administrative divisions, to the country level. In addition to the four main precision categories there are four additional codes to further separate different levels of certainty in the coding. The criteria for the precision codes are as follows:

1–2: Used when a location lies within (1) or near (2) a specific populated place or object.
3: Used for a district or municipality.
4–5: Used for a specific province (4) or a greater region (5).
6: Used when a project is national in scope.
7: Used when no location is given or location is unclear.
8: Used when aid flows directly to a government entity.[7]

Using precision codes makes it possible for users of the dataset to select subsets that contain different levels of precision. Sources vary greatly in how precisely they record geographic information; sometimes the exact location is named, in other instances the general area is reported, while sometimes much of the country is the intended beneficiary (such as for a program to combat AIDS/HIV for much of the population). Foreign aid projects granted to a national government entity, for example, may intend to reach beneficiaries unevenly distributed throughout the country. Because we cannot assume that the entire country receives aid, the precision code of 8 signifies that the money flows through the government entity, but is unclear afterward. Users of the data could keep such projects in their analysis, or remove them if desired.

Whereas all projects, regardless of precision code, are included in our dataset, we exclude the most unclear (7) cases in the maps reported below. Currently, all projects are represented as point locations, though, for future use of geo-referenced foreign aid data, alternative formats could be used. All data could, for instance, be represented as polygons rather than points. Using polygons over points means losing some precision, for instance when city coordinates are aggregated to province level. But the advantage is that it makes the
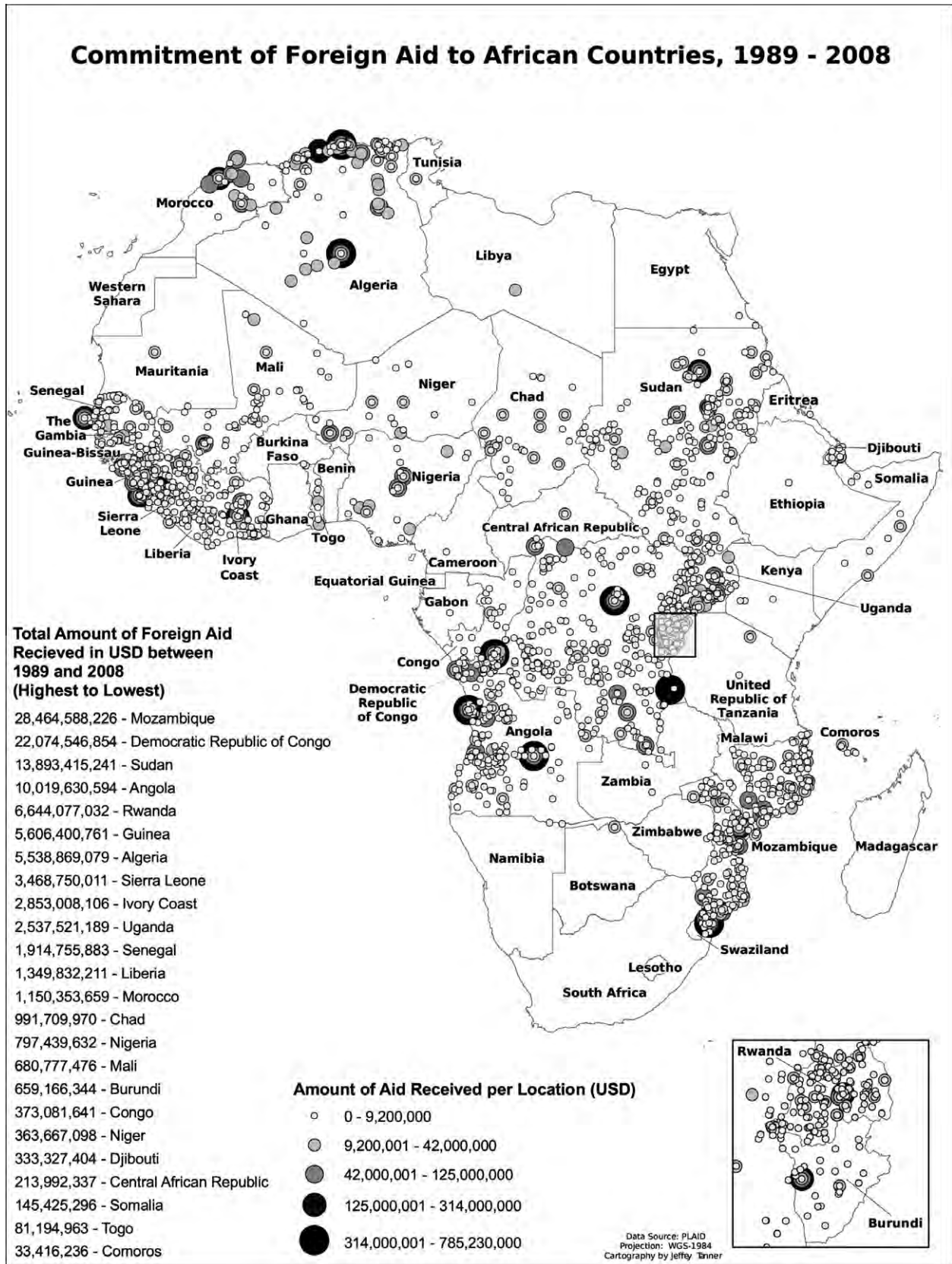
Commitment of Foreign Aid to African Countries, 1989 - 2008

Total Amount of Foreign Aid Recieved in USD between 1989 and 2008 (Highest to Lowest)

28,464,588,226 - Mozambique
22,074,546,854 - Democratic Republic of Congo
13,893,415,241 - Sudan
10,019,630,594 - Angola
6,644,077,032 - Rwanda
5,606,400,761 - Guinea
5,538,869,079 - Algeria
3,468,750,011 - Sierra Leone
2,853,008,106 - Ivory Coast
2,537,521,189 - Uganda
1,914,755,883 - Senegal
1,349,832,211 - Liberia
1,150,353,659 - Morocco
991,709,970 - Chad
797,439,632 - Nigeria
680,777,476 - Mali
659,166,344 - Burundi
373,081,641 - Congo
363,667,098 - Niger
333,327,404 - Djibouti
213,992,337 - Central African Republic
145,425,296 - Somalia
81,194,963 - Togo
33,416,236 - Comoros

Amount of Aid Received per Location (USD)

0 - 9,200,000
9,200,001 - 42,000,000
42,000,001 - 125,000,000
125,000,001 - 314,000,000
314,000,001 - 785,230,000

Data Source: PLAID
Projection: WGS-1984
Cartography by Jeffry Tanner

Figure 1. *This map contains all aid projects that we have geo-referenced (assigned geographic coordinates) based on project descriptions thus far. Each dot on the map represents a discrete aid project and is scaled by the amount of aid it represents as depicted in the legend.*

dataset easier to use in conjunction with other datasets that are aggregated to province levels. One could also use gridded representations of the dataset in order to work with cells as the unit of analysis. Whereas the size of a polygon, like a province, varies greatly over and within countries, cell sizes remain comparable and, thus, easier to use in time-series cross-section analyses. Incorporating these data into a cell structure, such as the ones developed by Tollefsen (2010) or SEDAC (2010), would allow standard multiple regression techniques to be applied at a local level to evaluate the impact of aid on localized development outcomes. [8]

Figure 1 shows the geographic coordinates we have coded for all the countries with conflict throughout Africa using all precision codes except 7, the unclear cases. The accompanying replication dataset contains all projects with any of the precision codes (including 7) for active conflict years, and all projects (conflict or non-conflict related) for the three case examples provided in the paper.

3. FOREIGN AID AND VIOLENT ARMED CONFLICT

We now turn to a consideration of how geographic foreign aid data may be useful in analyzing violent armed conflict. Following a discussion of key approaches and expectations in the aid-conflict literature, we consider empirically the geo-referenced aid data in conjunction with geo-referenced battle data to provide examples of how the data could offer insights into aid-conflict relationships.

The current literature on aid and conflict is largely negative in tone. Most studies argue theoretically or find empirically a positive correlation between aid levels and increased incidence of conflict. There are, however, at least a couple of posited mechanisms linking foreign aid to conflict in less-developed countries: (1) aid can increase the prize for capturing the capital, which motivates the onset of rebellion or affects ongoing conflict dynamics, and (2) aid is similar to other resources that trigger rent seeking behavior to ensure the survival of the rebellion once a war has begun. [9] Each of these mechanisms may be most appropriately considered at a disaggregated level and, which implies the need to use geographically disaggregated data.

(a) Aid and the prize of capturing the state

Many studies assume that aid to governments is a form of rent, which represents income not generated through taxation. By capturing the state, rebels gain access to aid rents that may be used directly, or diverted into private hands to the benefit of the government, thereby increasing the value of holding government power. The potential of accessing rents by holding government power might depend on whether prospective coup or rebel leaders stand to gain greater rents relative to their pre-war access to rents. If gaining access to the government will increase aid rents substantially, then potential rebels may choose to participate in rebellion when the expected payoff of fighting outweighs the costs (Grossman, 1992). This leads to a baseline expectation that reflects what many believe about the incentives that foreign aid creates: civil violence is likely caused, at least partially, by high levels of aid (Arcand & Chauvet, 2001; Grossman, 1992). But, ideally, a finer level of granularity could help us understand this expectation better.

The incentive to fight for control of the state, and the strategy of rebellion, may depend on the type of aid granted. Fungible aid may create incentives distinct from non-fungible aid, for example. Fungible foreign aid consists of money originally intended for development purposes but that can be easily diverted to other activities. In particular, aid destined for agriculture, energy, or education projects can be redirected by recipient governments, whereas aid to the transport and communications sectors may not be so easily diverted (Feyzioglu, Swaroop, & Zhu, 1998).

Existing studies using aid data aggregated to the country level have not been able to consider the distribution of fungible aid between the capital and other parts of the country. This distinction may be important, however, because fungible foreign aid directed to the capital may create different incentives than aid directed to other parts of the country. Aid fungibility may affect conflict in at least two ways: (1) by increasing government military expenditures, and (2) by creating rent-seeking opportunities through the country. Addison and Murshed (2001) have found that aid fungibility can increase the risk of violence through its impact on military expenditures, while Collier (2009) has found that up to 40% of African military expenditures are financed by fungible aid. Recent work has also found that increased military spending may raise risks of civil war by, for example, igniting regional arms races (Collier, 2009; Collier & Hoeffler, 2007). [10] Finally, Blattman and Miguel (2010) assert that some foreign aid flows are analogous to natural resources, and may be easily captured by governments or rebel groups, potentially funding rebellion and fueling civil war. Because fungible aid can create substantial rents, it may provide incentives for rebels to seize control of the central government, or areas within the country that receive significant fungible aid. The dynamic might operate in much the same way that diamond, oil, or other natural resources have been found to fuel conflict (Collier & Hoeffler, 2005; Humphreys, 2005; Le Billon, 2002).

Thus, fungible aid might encourage rebels to seek control of the government and government-diverted aid to the military may also lead to an increased chance of violence. But this leaves open the question of the locus of violence. If aid, particularly fungible aid, creates incentives for the use of rebel violence, but government militaries are much stronger because of the assistance of the foreign aid, then we would expect an onset of violence farther away from the reach of the central government. This is mostly true of conflict onset, because the government has likely concentrated many of its forces close to the capital to maintain control and the rebels will try to avoid a close and direct confrontation with a powerful government.

If aid increases the incentives for taking control of the state, but simultaneously empowers the government, we might expect to observe that violence will be more likely, but located away from the capital, as the military is likely to be strongest near the capital. This expectation appears most likely when foreign aid to the government is fungible and likely motivates potential rebels in the initiation of conflict, though the dynamic could affect ongoing conflicts as rebels fight further away from the capital until they gain sufficient strength to bring the violence closer to the institutions of the state.

(b) Rebellion as business

We have thus far considered fungible aid that flows through a country's capital. But what about aid flowing to localized regions? And what if that aid is fungible? Rents could provide more incentive for rebels to gain income or other forms of material support, such as aid supplies, than to control the government (Collier, 2000, p. 843). From a micro-perspective it is clear that rebels do not have to gain government power to benefit from fungible, or misappropriated, aid. In other words, rebels could be motivated by rents, but primarily to access

valuable resources in areas of the country closer to where they typically live and operate.

Micro-level studies have shown that rebels can capture a variety of foreign aid resources, such as food, transportation, and supplies, which has occurred in conflicts such as Chechnya, Tajikistan, and Somalia, among others (Anderson, 1999). From a micro-perspective, the rent seeking nature of warring parties could result in greater conflict risks as aid can be used to fuel warfare especially if it falls into the hands of rebels. Humanitarian or development assistance can free up resources for warfare that local rulers had originally allocated for civilian use (Anderson, 1999, p. 39).

Combatants can also appropriate aid directly through corruption, theft, looting, or via improved, but unfair, business opportunities (Anderson, 1999, p. 39; Maren, 1997, p. 94, 169). Embezzled aid can then be used to recruit more soldiers and provide the material resources they need to fight, which serves to fuel existing conflicts (Anderson, 1999, p. 38; Blouin & Pallage, 2008; Maren, 1997, p. 103–104, 260). Webersik (2006) finds that foreign aid largely enriches the prosperous business class, which has an interest in perpetuating the seemingly endless cycle of violence within Somalia. And Vaux and Goodhand (2001) similarly found that aid was used to cement the privileged position of Kyrgizstan's elite class, ultimately contributing to the conflict in that country.

We would, therefore, expect that rent-seeking rebels would strive to access aid on a local level. In contrast to the perspective that rebels might want to capture the state, the rebellion as business logic implies that violence should be located close to the foreign aid, especially if the aid is fungible. And rebels are especially likely to loot the aid rents after the onset of conflict so that they can fund the conflict.

The expectations of these two approaches may not necessarily be competing. It is possible that prior to conflict, fungible aid flows to the capital encourage the onset of violence elsewhere, but once a conflict is underway fungible aid flows to the capital might encourage a shift in violence toward the capital. Regardless, the disaggregated approach we employ may help distinguish mechanisms at one or both stages.

There is no consensus on how aid influences conflicts at a disaggregated level. Based on the research reviewed here, the preponderance of evidence suggests that differences in access to aid contribute to conflict at the local level, either by motivating rebellion or providing access to funding that fuels continued rebellion. Our analysis does not resolve the debate, but we contend that using disaggregated geo-referenced data takes a step in the direction of being able to separate out different theoretical mechanisms. In what follows, we use the geo-referenced aid and conflict data to shed light on the two theoretical streams from the literature, identified above.

4. APPLICATION OF THE GEO-REFERENCED DATA

We now turn to a closer examination of three individual countries to illustrate patterns of aid and violence by mapping separate foreign aid projects and battle locations in Sierra Leone, Angola, and Mozambique.[11] The cases were selected for two reasons. First, theoretically they are difficult cases for illustrating the influence of aid. Sierra Leone and Angola are conflicts generally thought to be driven by problems related to factors other than international aid, such as natural resources (*e.g.*, diamonds). Mozambique and Angola have generally been considered cases where conflicting ideologies motivated the conflicts, fueled by international military support from great and regional powers. Foreign economic aid should, from those perspectives, be less important for the dynamics of these conflicts (Angola; Mozambique; UCDP Database, Sierra Leone).

Second, during the time-periods for which we have geo-referenced aid data, these conflicts allow us to consider onset, dynamics, and recurrence of conflict. Because we can obtain subnational variation in violence during war, we opted to consider only conflict-prone countries. This disallows a systematic test of whether aid leads to conflict onset, but still gives us variation within conflict to consider the differential effects of aid regionally. Naturally, there may be other appropriate cases to illustrate the importance of geo-referenced aid data, but for this data-presentation we have been able to secure accurate and complete data on battles for Sierra Leone, Angola, and Mozambique. Since we do not aim to generalize our findings to all cases of aid during conflicts, these three cases provide ample illustrative characteristics.

Figures 2–7 illustrate the geo-referenced aid data across these three countries using all precision categories except #7.[12] We use the subnational analyses to illustrate dynamics from the theoretical streams developed above on capturing the state and capturing the aid itself. Following the logic developed above, we pay close attention to whether aid is fungible[13] and also consider whether population density[14] may be an underlying cause of both aid receipts and violence. We present some graphical results based on specific years and, to help sort out the proposed conflict mechanisms, aid is lagged one and two years. The full results for all years are included in the web appendix.

5. SIERRA LEONE: LACK OF AID TO THE PERIPHERY AND CONFLICT ONSET

The Sierra Leone conflict started in 1991 when the Revolutionary United Front (RUF) invaded Sierra Leone from Liberia with the aim to oust the government, set up a multi-party democracy, and to liberate the peasants. Although the rebel-movement was based on existing grievances, both the government and rebel forces were often guided by rent-seeking behavior (UCDP Database, Sierra Leone conflict).

In the two years preceding the onset of conflict in Sierra Leone, donors report only four large destinations for foreign aid within the country. These locations were primarily in the center of the country, and the capital, Freetown. When conflict broke out in 1991, it occurred largely in the East and South of the country, far removed from any of these major aid locations. In fact, during the first three years of conflict, from 1991 to 1993, virtually all battles within Sierra Leone were located along the Eastern and Southern border with Liberia. The fact that rebels seemed to be in remote areas of the country, far from major aid locations, suggests that aid rents might contribute to rebel motivations to fight a civil war beginning in areas away from the capital. Figure 2 illustrates this possibility.

In 1994, there were four major destinations of fungible foreign aid: Kono, Kailahun, Kenema (all near the border of the Eastern and Northern Provinces) and within the capital of Freetown. Meanwhile, the distribution of battles within Sierra Leone changed remarkably in 1994. Battles continued to occur along the border with Liberia. For the first time, however, conflict began to spread inward. The battles occurred near Kono, Kailahun, and Kenema, as conflict seemed drawn toward the high levels of easily divertible aid receipts, suggesting a motive to capture aid (see Figure 3). In 1995, battles
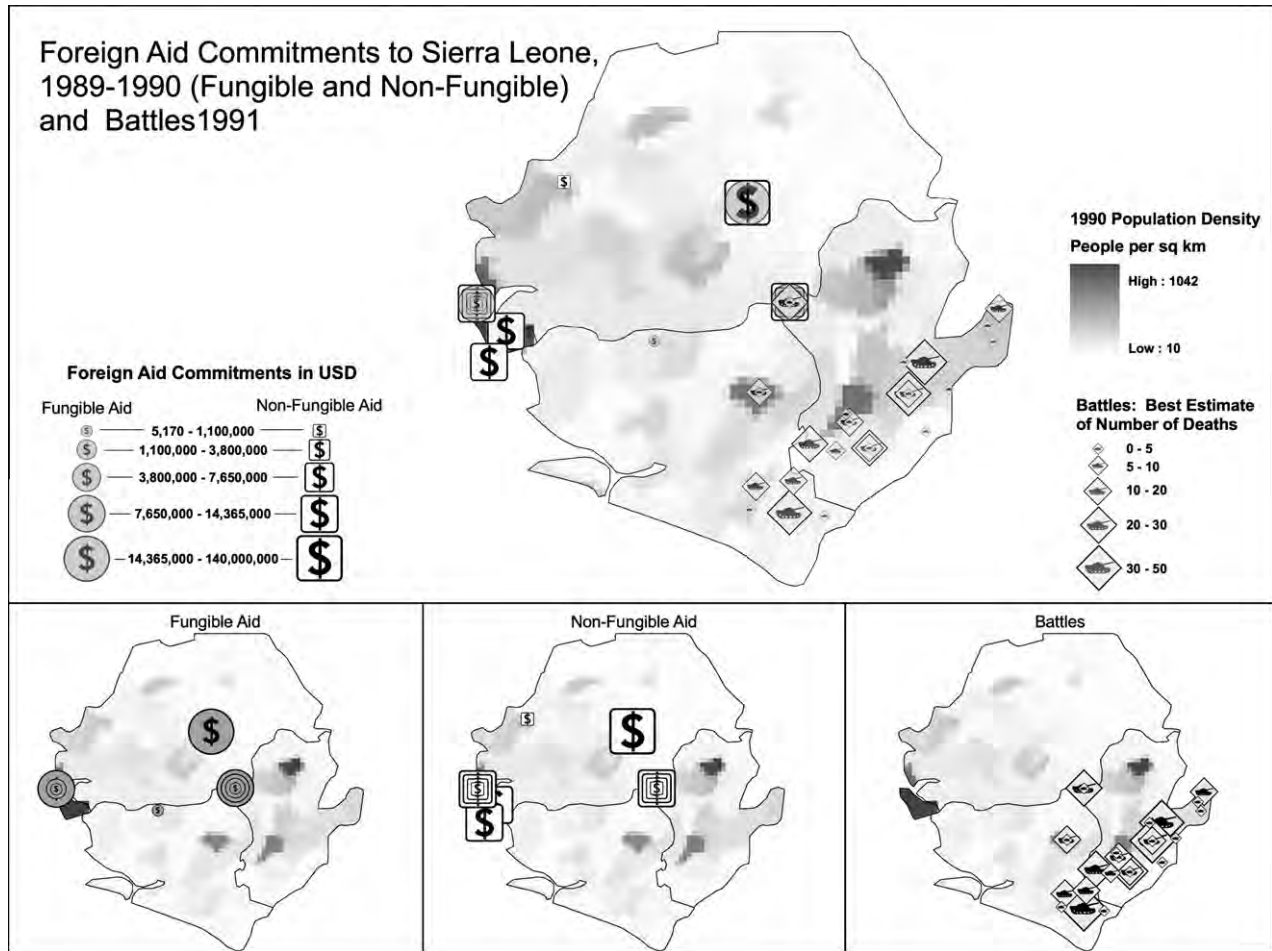
Figure 2. *Shows aid received by Sierra Leone in 1989 and 1990, broken down into fungible and non-fungible, along with battle locations in 1991. The size of the symbols are based on a graduated scale (each size represents a range of values); the size of points representing aid are based on the amount of aid allocated for the project at a specific location, and the size of points representing battles are based on the best estimate of the number of fatalities associated with the battle.*

continued to spread throughout the country, reaching the capital for the first time with moderate intensity while still centered on Kono, Kailahun, and Kenema, lending further evidence that conflict tends to gravitate toward areas with high commitments of fungible foreign aid. The dire humanitarian conditions prompted international relief, which in turn resulted in attempts by the RUF to control aid distribution, suggesting a possible feedback loop in the provision of aid and the occurrence of violence. RUF leader Foday Sankoh even threatened to attack all aid convoys to a number of locations, including Kenema, unless the responsible NGO's had managed to secure explicit permission from RUF to conduct transports (Reuters., 1995).

Following government offensives in 1995, which were supported by private military personnel and Kamajors (traditional hunters) militias, the conflict cooled in both 1996 and 1997, occurring mostly where the rebellion began near the Liberian border (UCDP Database, Sierra Leone). However, conflict did remain strong near the only two destinations of fungible aid: Kenema and Freetown. When conflict heated up again in 1998, fewer battle deaths occurred near Kenema, which had received less fungible aid than usual the previous year. Conflict did remain strong near Freetown, however.

In 1999 and 2000, the final two years of the Sierra Leone civil war, conflict had almost completely migrated to the Northern Province and Western Area, closer to the capital.

At this point, Kenema was still receiving high levels of fungible aid, but had seen conflict decrease from a moderate level in 1999 to a very low level in 2000. Instead, battles appear to have migrated to a source of greater fungible foreign aid: the capital, Freetown. It is notable that high levels of fungible aid to the capital were accompanied by continued conflict throughout the country.

Throughout the decade-long civil war, Sierra Leone saw a distinct migration of conflict from the Eastern periphery toward the capital, Freetown. During this time, it seemed that battles tended to be heaviest near areas that received high levels of fungible aid. Thus, while the onset of hostilities appeared to be influenced by donors' neglect of the periphery, the continuance and distribution of violence appeared to have been driven, at least to some extent, by the ability of rebels to seek rents in the form of highly fungible aid both to the capital and throughout the country.

6. CAPTURING THE PRIZE: BATTLING FOR THE CAPITAL IN ANGOLA

In 1989, Angola's civil war had been underway for nearly 15 years. Angola was embroiled in armed conflict for almost the entire period until 2004, with only brief respites in 1996–97 and 2003. Angola concluded its 27-year civil war between
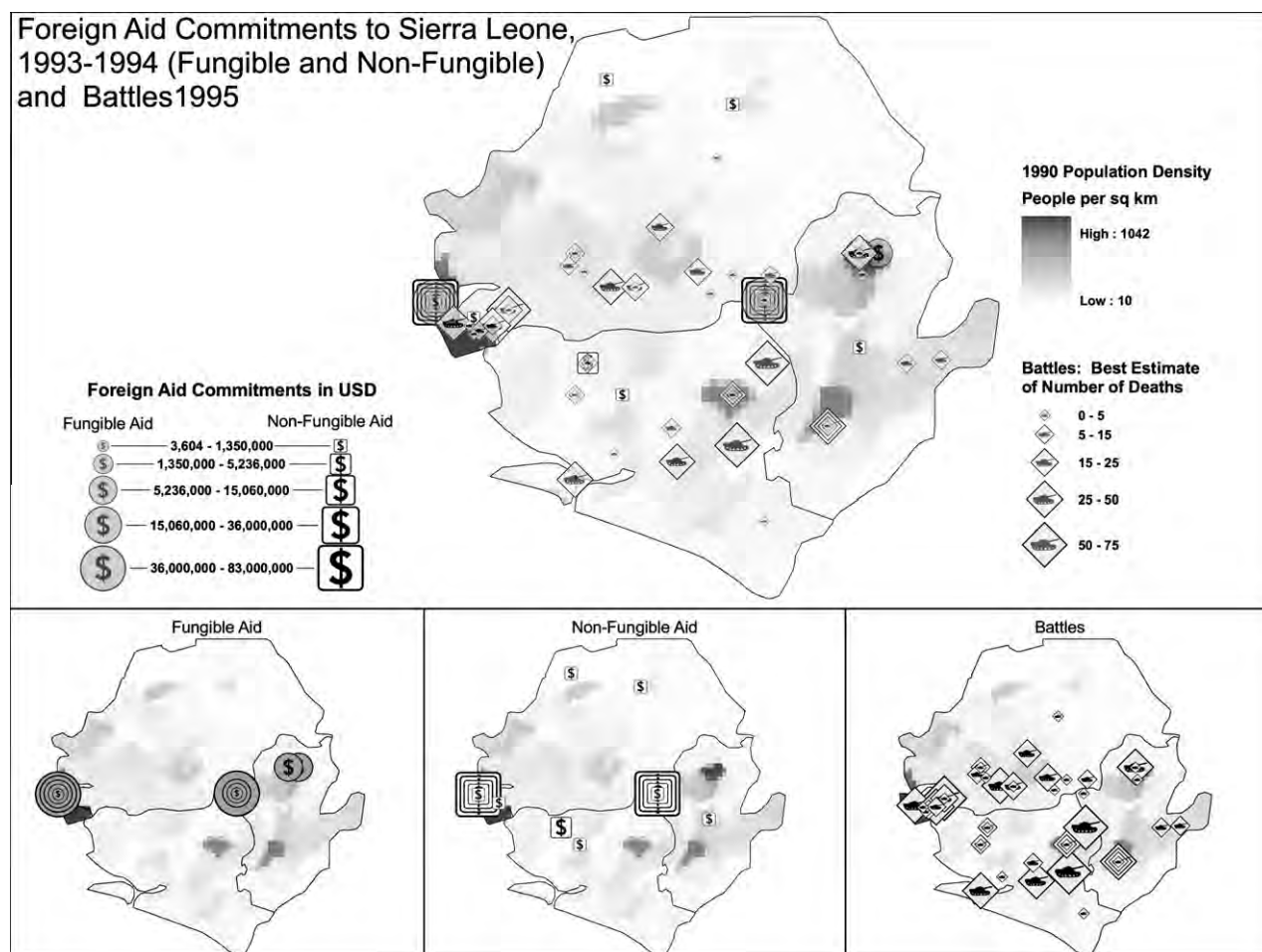
Figure 3. *Shows aid received by Sierra Leone in 1993 and 1994, broken down into fungible and non-fungible, along with battle locations in 1995. The size of the symbols are based on a graduated scale (each size represents a range of values); the size of points representing aid are based on the amount of aid allocated for the project at a specific location, and the size of points representing battles are based on the best estimate of the number of fatalities associated with the battle.*

the Popular Movement for the Liberation of Angola (MPLA) and the National Union for the Total Independence of Angola (UNITA) in 2002 (CIA World Factbook). After the formal end of the war over government power, there was still limited conflict over the northern-most region of Cabinda. In the rest of Angola, donors gave foreign aid and battles occurred throughout much of the country, albeit seemingly more concentrated in the western half during the period from 1989 to 2002.

The data appear to show that higher levels of fungible aid were correlated with the occurrence of battles. Conflict in Angola from 1989 to 1990 was remarkably widespread, with each of the 18 provinces experiencing violence. The data suggest that high levels of fungible foreign aid to the capital motivate conflict in underfunded areas. Further, conflict did seem to gravitate toward destinations of fungible aid in Benguela, Bie, and Luanda, each of which experience violence, some of which was quite severe. From 1989 to 1990, there were high levels of fungible aid to seven locations within five provinces, including to the capital city of Luanda. During the same time period, six of these seven cities also experienced battle events, consistent with expectations that rebellion is motivated by the business stemming from aid capture. See Figure 4 for trends around this time.

From 1991 to 1992, three very noticeable trends emerge. First, there is a substantial increase in destinations of fungible aid. Second, there is a substantial decrease in overall conflict,

but nearly every major battle event in 1992 occurred within or near an area that had received a high concentration of foreign aid. Third, despite the association between battle events and aid, conflict seems to become more focused in certain areas of the country. In particular, Luanda Province experienced both high levels of fungible aid and extremely high levels of armed conflict. The coincidence of these two trends suggests a concerted effort of the rebel forces to capture the central government, perhaps influenced by the availability of easily-divertible funds from foreign donors.

While conflict does seem to follow fungible aid to the capital, it is less clear whether fungible aid throughout the country attracts conflict in the same way in Angola as in Sierra Leone. During the early 1990s, in the provincial capital cities of Benguela, Malanje, and Kuito, there is a coincidence of fungible aid and conflict, but in the provinces of Huambo, Cuanza Sul, Cuanza Norte, Namibe, Huila, Bengo, and Uige, there does not seem to be a similar clustering of fungible aid and conflict. Similar to Sierra Leone, the presence of fungible aid within the capital city of Luanda appears to be associated with continued conflict throughout the country.

Conflict became heated throughout the country once again from 1993 to 1995 even as fungible aid decreased. But notably every destination of fungible aid was accompanied by armed conflict during this period. In terms of the magnitude of conflict, it does not appear that fungible aid recipients experienced more heated conflict than the rest of the country, however.
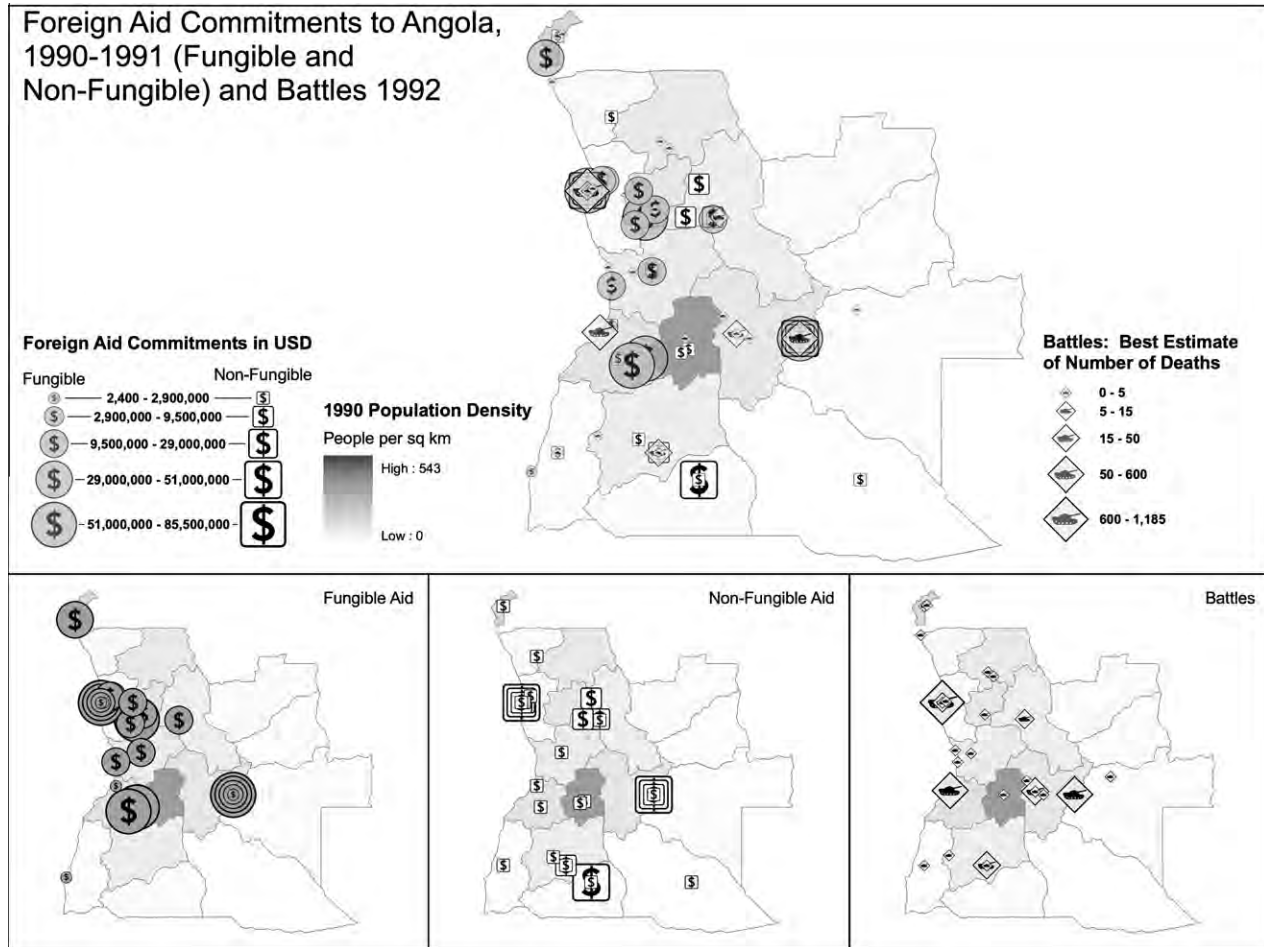
Figure 4. *Shows aid received by Angola in 1990 and 1991, broken down into fungible and non-fungible, along with battle locations in 1992. The size of the symbols are based on a graduated scale (each size represents a range of values); the size of points representing aid are based on the amount of aid allocated for the project at a specific location, and the size of points representing battles are based on the best estimate of the number of fatalities associated with the battle.*

1996, 1997 and 1998 saw an increase in fungible aid that coincided with a decrease in conflict throughout the country. There does not seem to be any distinguishable influence of the fungible or non-fungible aid on battle locations during this time period. Figure 5 displays the substantial decrease in conflict throughout Angola even as fungible aid remains high in regions throughout the country.

The years 1999 and 2000 saw another spike in battle deaths, with conflict occurring throughout most of the country. However, in spite of the widespread distribution of battles, only 4 of 10 destinations of foreign aid experienced similar levels of conflict: the cities of Kuito, Luanda, and within the provinces of Cabinda and Cuanza Sul. The subsequent three years, on the other hand, do begin to show a stronger relationship between fungible aid and conflict.

In the final three years of conflict, 2001–2003, nearly every destination of fungible aid was closely accompanied by a similar level of conflict: in the provinces of Namibe, Benguela (two cities), Huambo, Bie, Cuanza Sul, Malanje, Luanda, and Cabinda (two cities). It is important to note, though, that large sums of fungible aid to the capital city of Luanda accompanied only modest levels of conflict. This may not be entirely unexpected however, as the aid concentrations within Luanda were not high. In sum, Angola provides a mixed picture of the effect of fungible aid on armed conflict, offering moderate support for a general rebellion-as-business logic.

7. REBELLION AS BUSINESS: FIGHTING OVER AID IN MOZAMBIQUE

By 1990, Mozambique had already experienced almost 15 years of Civil War, with the Mozambique Resistance Movement (RENAMO) attempting to remove the Front for Liberation of Mozambique (FRELIMO) from power, beginning in 1977. During the period from 1990 to 1992, the intensity of conflict lessened significantly until the war finally concluded in 1992, when both sides signed the Rome General Peace Accords and UN Peacekeeping troops entered the country (UCDP Database, Mozambique).

Throughout the period from 1989 to 1992, conflict seems to follow the allocation of fungible aid in locations across the country. In 1989 and 1990, there were high levels of fungible aid in several of Mozambique's provinces with nearby conflict activity. Nampula, Maputo, Sofala, Tete, and Zambezia each showed some clustering of fungible aid and battle activity. However, perhaps the heaviest conflict occurred within Gaza Province, which received no fungible aid over the two-year period.

In 1991 violence decreased, but the conflict displayed two patterns of particular interest, illustrated in Figure 6. Firstly, much of the conflict activity occurred near the capital, Maputo, which received a high level of fungible aid. Secondly, of the 15 battle locations within Mozambique, 8 occurred directly on or closely nearby destinations of fungible foreign
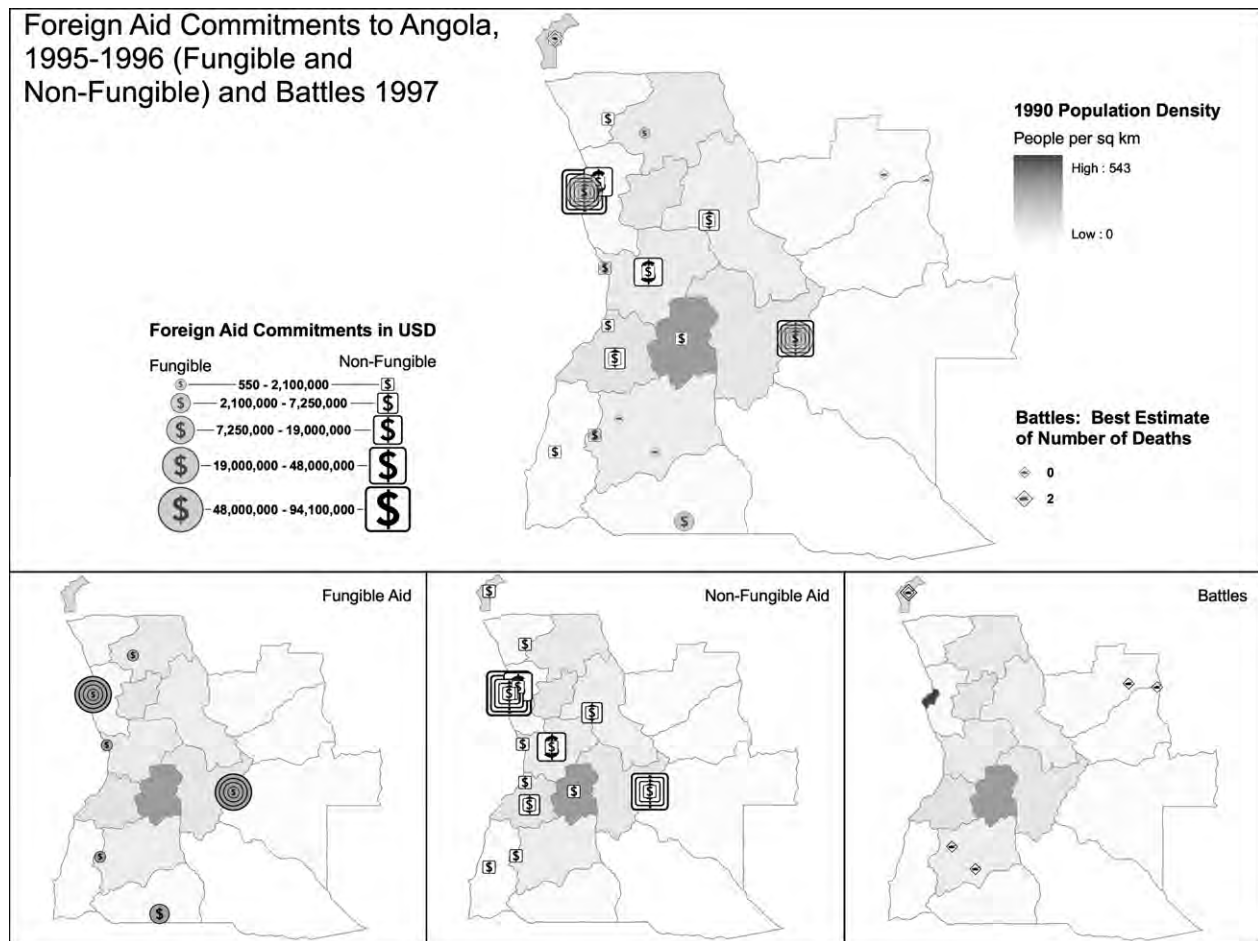
Figure 5. *Shows aid received by Angola in 1995 and 1996, broken down into fungible and non-fungible, along with battle locations in 1997. The size of the symbols are based on a graduated scale (each size represents a range of values); the size of points representing aid are based on the amount of aid allocated for the project at a specific location, and the size of points representing battles are based on the best estimate of the number of fatalities associated with the battle.*

aid. These clusters occurred in Maputo, Gaza, Sofala, and Nampula. In Gaza, which had been one of the heaviest conflict regions in the previous year, the only two battle locations occurred directly near the location of fungible aid. Similarly, 5 of the 10 battle locations in the final year of conflict – 1992 – occurred directly near fungible aid destinations in Sofala, Zambezia, and Nampula, and to a lesser extent, the capital region of Maputo. Figure 6 also shows that, while conflict seems to clearly follow fungible aid, non-fungible aid does not appear to attract conflict in the majority of its locations.

The pattern of attacks near aid locations even went as far as ambushes on aid columns. The data used here do not cover aid to Mozambican interests in other countries, but based on news reports it is clear that aid for Mozambican refugees in Malawi was targeted by rebels as humanitarian aid was transported from Zimbabwe through the Tete corridor on Mozambican territory (Christie, 1991). Attacks on aid columns occurred to such an extent that it halted the distribution of United Nation's food aid and also disrupted the government's own delivery of food to the Tambara district in Manica (Meldrum, 1991; Reuters, 1992).

The final years of Mozambique's civil war seem to lend further credibility to the idea that rebels will seek rents wherever they are available, whether it is the capital or a remote region. Rebels seem to be motivated both by the goal of controlling

the government and its revenues and of controlling locations which receive high levels of easily divertible funds. See Figure 7.

8. CONCLUSIONS

In this paper, we introduced new geo-referenced foreign aid data capturing location information for roughly 65,000 foreign aid projects to many African countries between 1989 and 2008. While the foreign aid data could be applied to variety of localized development outcomes, such as education, health, or poverty, we applied the data to the context of violent armed conflict. We first provided descriptive information about the geo-referenced aid data and then offered a comparison between aid and violent armed conflict.

Many expectations in the aid-conflict literature suggest a disaggregated, low-level testing strategy, but until now testing has only been possible at the country-year level. While we did not attempt an exhaustive test, the case studies illustrate what is possible using the geo-referenced data, particularly examining the possibilities for capturing the government or foreign aid, given aid allocation in countries. We then examined three cases – Sierra Leone, Angola, and Mozambique – to demonstrate the utility of the geo-referenced data.
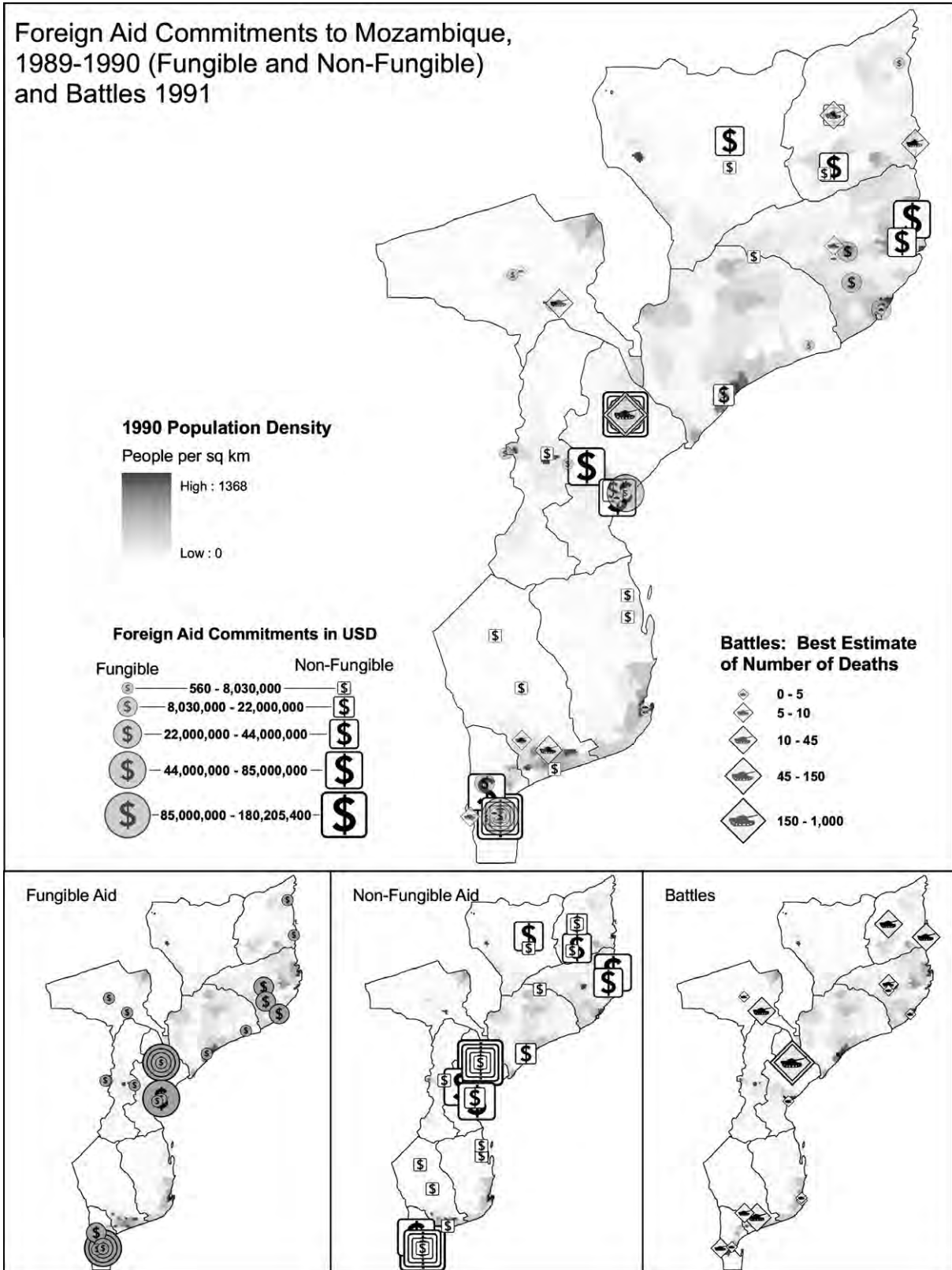
Figure 6. *Shows aid received by Mozambique in 1989 and 1990, broken down into fungible and non-fungible, along with battle locations in 1991. The size of the symbols are based on a graduated scale (each size represents a range of values); the size of points representing aid are based on the amount of aid allocated for the project at a specific location, and the size of points representing battles are based on the best estimate of the number of fatalities associated with the battle.*
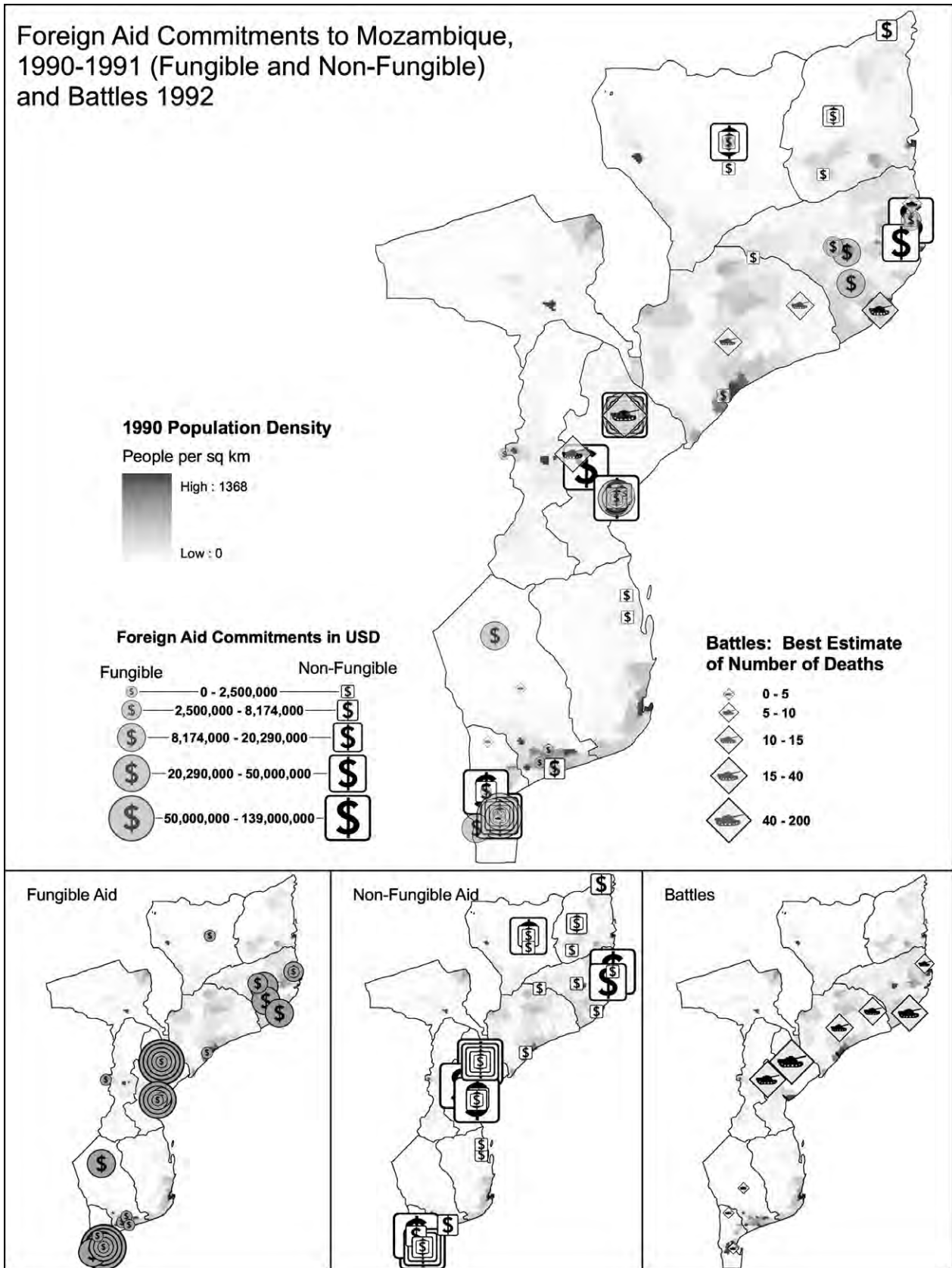
Figure 7. *Shows aid received by Mozambique in 1990 and 1991, broken down into fungible and non-fungible, along with battle locations in 1992. The size of the symbols are based on a graduated scale (each size represents a range of values); the size of points representing aid are based on the amount of aid allocated for the project at a specific location, and the size of points representing battles are based on the best estimate of the number of fatalities associated with the battle.*

Examining the cases of Sierra Leone, Angola, and Mozambique provides some seemingly consistent findings. Across time and in all three countries, conflict appears to be drawn to those locations where fungible aid has been granted. And in the case of Sierra Leone, the high concentration of foreign aid to the capital and other selected cities, and neglect of the periphery seems to have contributed to the instigation of conflict. [15]

This is the first study of which we are aware that explicitly maps large numbers of individual foreign aid projects. It is also the first study that systematically compares geo-referenced aid data alongside specific locations of battles. We expect that the data will be useful in testing the effects of aid on many development outcomes, especially as the data are further refined and expanded.

NOTES

1. See http://www.ke.undp.org/projects for UNDP's active project database in Kenya.

2. See http://www.undp.org.np/index.php for UNDP's active project database in Nepal.

3. See maps.worldbank.org for the World Bank's active project database in Sub-Saharan Africa, Latin America, and selected Asian countries.

4. AidData primarily contains foreign aid commitments (Tierney *et al.*, 2011). When using commitments, the question of whether the committed aid actually arrives in country is always open. Unfortunately, few options exist to remedy this concern. Disbursement data is not extensive, and according to the CRS, it should not be used before 2002, given how inconsistent the data are. According to the OECD: "the analysis on CRS disbursements is not recommended for flows before 2002, because the annual coverage is below 60%...."

5. See the Uppsala Conflict Data Program, http://www.pcr.uu.se/research/ucdp/definitions/, for more information on definitions.

6. Experienced coders considered each project only one time in this iteration of the dataset. In future versions of the data, we will double-code each project and arbitrate to ensure the data are coded reliably.

7. See the appendix for a more detailed summary of the coding procedures.

8. In future versions of the dataset, we hope to release gridded representations of the data.

9. We note that aid receipts may decrease once conflict begins, but it by no means goes away completely. Indeed, in our coding of the data, thousands of projects continue to be committed to countries during wartime. An analysis of what causes aid to decrease or increase at certain times is beyond the scope of this paper as we are primarily motivated to understand how aid, however much allocated, maps to conflict.

10. Empirically, Arcand and Chauvet (2001) find that aid decreases the probability that violent conflict will occur. Arcand and Chauvet do state, however, that "the uncertainty of aid plays a destabilizing role in that it increases the probability of civil war."

11. The data on discrete battle locations in Sierra Leone, Angola, and Mozambique is used with permission of the Uppsala Conflict Data Program, which is currently georeferencing battle events data for the UCDP Georeferenced Events Dataset (GED; Sundberg *et al.*, 2010). The dataset covers the years between 1989 and 2009, in conflicts where there are at least 25 battle related deaths. Only incidents with at least one battle related death are recorded. While these data are excellent, they are currently only available for a small set of countries. This version of the GED records 157 battle related events for Mozambique, 1552 for Angola, and 337 for Sierra Leone.

12. For the three countries we consider in greater detail, the precision categories are distributed as follows. In Angola, 71.3% of the conflict-year projects are clear and 12.2% of the non-conflict-year projects are clear; in Mozambique, 26.1% of the conflict-year projects are clear and 48% of the non-conflict-year projects are clear; and in Sierra Leone 47.7% of the conflict-year projects are clear whereas 15.8% of non-conflict-year projects are clear. Despite using all information available in the AidData database, the most comprehensive source of aid data, there is significant variation across countries in the level of geographic information. A next step, that we are now piloting, is to find many more internal documents that give geographic information. This will provide better data, but will also not be available for some time.

13. We coded projects as fungible based on their sector classification, as indicated by the OECD Creditor Reporting System (CRS) and AidData purpose code system. We reviewed the available literature on fungibility and then operationalized the sectors of aid most likely to be fungible as agriculture, energy supply and generation, education, and general budget support, while transport and communication projects are not as easily diverted (PLAID Codesheet 3.0). These PLAID fungibility classifications were based off of the research of Feyzioglu *et al.* (1998). All other sectors are considered non-fungible. Using these differences, we analyze the difference in conflict patterns comparing the general presence or absence of aid as well as across fungibility classifications.

14. A number of factors could influence both where aid is allocated and where battles are fought. Concentration of resources, such as diamonds, the location of trade routes, natural harbors, and favorable soil may all attract a struggle for control. Moreover, where population is concentrated more densely, and where there are greater opportunities for conflict, there will be needs that foreign aid can meet (Raleigh & Hegre, 2009). Because the purpose of this article is to illustrate how the dataset can be used, we make no attempt to determine definitively any causal relation between aid and conflict. Still, the most obvious possible confounding variable – population density (SEDAC, 2010) – is added to our illustrations to show the possible connections between population and aid as well as population and conflict.

15. We raised the possibility that population density could be an underlying factor motivating both the receipt of foreign aid and the occurrence of violence. Examining the three cases of Sierra Leone, Angola, and Mozambique closely indicates that population may play a role in at least some of the instances. In Sierra Leone, high population density does not appear to be correlated with the occurrence or severity of conflict, whereas most of the battles in Angola occurred in regions with at least moderate population density. The evidence in Mozambique is mixed with some more populous areas experiencing conflict, whereas other less populous regions do not. Greater attention would need to be given to sorting out causality among any of these three factors – aid, conflict, and population – but these initial results suggest that aid does matter for conflict, even if population density is a crucial part of the explanation as well.

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17. "Similar to" means that the area has a similar size as a typical ADM1 or ADM2 in that particular country. If in doubt, always use the less precise option.

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APPENDIX A. GEO-CODING METHODOLOGY

The following has been adapted from an excerpt of the UCDP/AidData geo-referencing codebook [16] to reflect the methodology used in the creation of the geo-referenced aid data set introduced in this paper. The UCDP/AidData codebook has been updated since the creation of this data set to allow for greater information from the use of multiple project documents.

A.1 *About the geo-referencing of locations*

Each aid project may have location information on several levels. The data for this research was generated by examining the short and long project descriptions in AidData (Tierney *et al.*, 2011), as well as the project title itself, which often provides location information. Donor project documents were not used to augment the data, although AidData is currently

numbloc	Loctext	Lat	Long	ADM1	ADM2	Precision
11	Miritini	-4	39.56667	Coast	Mombasa	1
11	Kisumu	-0.1	34.75	Nyanza	Kisumu	1

Figure A1. *Example of clear locations.*

geo-referencing projects using all available project documentation. In geo-referencing the AidData data set, titles and descriptions are also reviewed for relevant geographic information.

In the data set, the first column contains the number of locations that the project reaches (numbloc). The second column specifies the location name. The third and fourth columns in each set of coordinates contain the latitude (lat) and longitude (long) of the location. The fifth column in a set specifies the first-order administrative division (ADM1) and the sixth a second order division (ADM2) as a string variable. If the information of an event only gives information on the administrative division, and not the exact location, then the centroid point of the administrative division is entered into the latitude and longitude columns. Lastly, in each set of coordinates, the precision of the coordinates is specified (Precision), which we discuss in greater depth below. For additional locations, the project information is replicated in the following row, then the next set of coordinates and Geonames is entered.

Figure A1 illustrates how the coding sheet looks for a project in which the recipient locations are clear and straightforward to geo-reference. The example references part of a World Bank transport improvement project with eleven locations, including Miritini and Kisumu, Kenya.

In Figure A1, the coordinates of the first location are recorded in the third and fourth column. The fifth and sixth columns display the province and district in which the points are located. Finally, the precision code of 1 indicates that the points correspond to a specific place, in this case a town.

If there is no direct mention of any location in the sources, and the title and abstract do not indicate that aid is granted to the central government or national in nature, aid is assumed to go to the country in general. The country coordinates are coded with precision 7 which indicates that the location is unknown. This means that it is up to the researchers using the data to decide if unclear aid locations should, by default, be excluded, or be assumed to go to the entire country.

The coordinates are determined through the American National Geospatial Intelligence Service (NGA). The NGA provides an online service, the GEOnet Names Server (GNS), which contains names and coordinates of various administrative divisions, populated places, waterways, and objects. (http://geonames.nga.mil/ggmagaz/geonames4.asp) The latitude and longitude coordinates are recorded with a six decimal precision. The map projection used is the standard World Geodetic System 1984 (WGS 84) (Sundberg *et al.*, 2010). Google Earth is also utilized in order to complement the primary and secondary sources. Note that some cases have no second order administrative divisions connected to the first order administrative divisions in GNS. Geonames contains this information more often, and second order divisions are included whenever they can be located, but for this version of the dataset the focus is on collecting information on the first order administrative divisions for all locations under the country level.

A.2 *About the precision categories*

For the data to be useful for a wide range of applications it is crucial to make it possible to select sub-sets of the data

based on varying criteria of precision. The first six categories detailed by the UCDP's Georeferencing Project Codebook (Sundberg *et al.*, 2010) are used here, with minor modifications. The seventh and eight precision categories are unique for the UCDP/AidData codebook.

1 = The coordinates corresponds to an exact location, such as a populated place or a hill.
- The code is also used for points that join a location which is a line (such as a road or railroad). Lines are not coded only the points and areas that connect lines.

2 = The location is mentioned in the source as being "near", in the "area" of, or up to 25 km away from an exact location. The coordinates refer to that adjacent, exact, location.

3 = The location is, or is analogous to, a second order administrative division (ADM2), such as a district, municipality, or commune.

4 = The location is, or is analogous to, a first order administrative division (ADM1), such as a province, state, or governorate.

5 = The location can only be related to estimated coordinates, such as when a location lies between populated places; along rivers, roads, and borders; more than 25 km away from a specific location; or when sources refer to parts of a country greater than ADM1 such as a National Park which spans across several provinces (*e.g.*, Foret Classee de Gongon in Benin).

6 = The location can only be related to an independent political entity, meaning the pair of coordinates that represent a country.

7 = Unclear. The country coordinates are entered to reflect that sub-country information is unavailable.

8 = The location is estimated to be a seat of an administrative division (local capital) or the national capital.
- If aid goes to Luanda, for example, without further specification on the location, and there is an ADM1 and a capital called Luanda, then code the coordinates of the capital with precision 8.
- If it is not spelled out that aid goes to the capital; but if it is clear that it goes to a government ministry or to government financial institutions; and if those institutions are most likely located in the capital; then the coordinates of the capital are coded with precision 8. (However, if it can be verified that the recipient institution is located in the capital then the coordinates of the capital with precision 1 are used.)

A.3 *Basic rules for geo-referencing*

A.3.1 *NGA GNS*

Enter the location into the NGA GNS using the category "start with" and input search string "without diacritics". If there is no hit in the GNS, search again using the category "fuzzy search" (Sundberg *et al.*, 2010). If there are still no results, search again using Google Earth or Google Maps. Sometimes Google is better in suggesting options for spelling names that are misspelled in the sources. Use the coordinates of the location with the modified spelling, if it appears to be the place intended in the source. Left click on the pair of

coordinates suggested in the gazetteer in order to obtain the location in decimal form rather than degrees, minutes, and seconds. Only code a specific location once per row. For instance if there are funds going to farms somewhere in the location Bengo, as well as aid to hospitals somewhere in the same location, then Bengo is coded only once.

A.3.2 Area locations

Administrative divisions (ADM1 and ADM2) and countries are areas. The latitude and longitude representation of areas are estimated as the coordinates of the centroid point and the Geoname ID provides a boundary file for the administrative divisions relating to the point. The names of first order administrative divisions (ADM1) and second order administrative divisions (ADM2) are saved in the data as text/strings in the "ADM1" and "ADM2" columns. The precision code depends on the level of the area (3, 4, 6/7).

A particular problem when working with longer time series is that there are states that have revised the boundaries of their administrative divisions at some occasion during the years that are being coded. The priority in such instances is to best approximate the area that is intended in the source. Thus, if a province is divided into several new provinces, each of the new provinces within the boundaries of the defunct province is coded. A more difficult case occurs when countries decrease the number of provinces. In this case, the current province which contains the territory of the defunct province is coded and a note is made of the defunct province as the intended recipient.

A.3.3 Point locations

Locations that are discrete points are for instance towns, cities, suburbs, hills, farms, and various installations. Occasionally the source will mention a location within a location, for instance a hospital in a capital. Since that does not happen often, and since the coordinates of the main location are the only ones available in most cases, record only the coordinates of the main location. Suburbs are borderline cases. Suburbs to cities should be considered to be locations in their own right and are coded if the coordinates are available (with precision 1). If the coordinates of a major suburb are not available use the coordinates of the main city and precision 2.

If a location cannot be pinpointed via the search functions in the GNS or Google Earth, for instance a dam, then use the coordinates of the closest populated place rather than for instance estimating a point in the lake through Google Earth. In that case use the appropriate precision code (2 or 5). However, if the dam itself can be visually located via Google Earth, then estimate the coordinates of the center of that exact location.

When coding point and line locations, also record the names of the related administrative divisions, if possible. Sometimes those names are not available from the gazetteer. If that is the case, use alternate sources such as fallingrain.com to determine the relevant administrative division. First order administrative divisions must be coded when a coordinate represents a sub-provincial feature, while second order administrative divisions may be left vacant if a brief search does not return reliable results.

A.3.4 Line locations

If the location is a road, or a power line or similar connection between points, then code the point locations that are mentioned in the source as linking the road. Sometimes the name of the road (for instance Beira-Machipanda) is not the stretch of the road that receives the funding (for instance the Inchope-Machipanda section). If the source specifies the stretch of road which receives the funding, then record all towns that are explicitly mentioned in the source and that connect the road as well as any provinces through which the road passes.

If connecting towns are not indicated, simply record the provinces through which the road passes. For instance, a road running from Nairobi, Kenya to Mombassa, Kenya would necessitate five codes: (1) Nairobi, with Nairobi Area listed as the ADM1 and precision code 1; (2) Mombassa, with Coast Province listed as ADM1 and precision code 1; (3) Nairobi Area Province with precision code 4; (4) Eastern Province (through which the road passes) with precision code 4; and (5) Coast Province with precision code 4. This is done to reflect the fact that funding is allocated across the entire road through each affected province, rather than simply to the point locations of the road ends.

A.3.5 Islands, peninsulas, and parks

When encountering islands, peninsulas, or parks the proper precision code might be unclear. Do not code the island, peninsula or park separately if it is clearly a part of another location. For instance, Manhattan is a part of New York City and would not be counted as an Island or a suburb. For other situations use the available codes:

1 = The island, peninsula, or park is very small, or a particular point on an island is named and can be coded.

2 = If a very small island, peninsula or park, or a point on a big area, is not specified more than near a point.

3 = If the island, peninsula, or park is analogous to, or is, an ADM2.

4 = The island, peninsula or park is, or is similar to, an ADM1. [17]

5 = The island, peninsula, or park is a bigger region that contains more than one ADM1; or if its location is unclear and further than 25 km from a named location; or if the coordinates can only be estimated between two named locations.

6 = The island, peninsula, or park is an independent political entity.