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Wartime Violence and Post-Conflict Development Policy: The Case of Agricultural Concessions in Mozambique

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Abstract

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JEL Classification: D74, N47, N57, O13, O25, Q15, Q16, Q18

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Stark violence is still the sire of all the world's values.
- Robinson Jeffers, "The Bloody Sire" (1940) (Jeffers, 2002, p. 563)

1. Introduction

Post-conflict development policy is increasingly seen as a chance to correct societal problems, to dismantle structural causes of violence, and redress socioeconomic and political inequalities that the conflict may have produced or exacerbated (Brauer & Caruso, forthcoming, Caruso, 2010, Collier & Hoeffler, 2002, Duthie, 2008, Mac Ginty & Williams, 2009, esp. Ch. 4, Ohiorhenuan & Stewart, 2008, Selim & Murithi, 2011). In short, post-conflict development is supposed to represent a clean break with a past in which economic welfare and societal development were influenced by violence. But is it a real opportunity for change? To what extent may the dynamics of violence during a war replicate themselves in the execution of post-conflict development schemes, due to the persistent inability of the war's victimized to stand up for themselves? Or, on the other hand, does violent conflict actually engender social cohesion and political mobilization? It is a question of community resilience: if conflict-affected communities are unable to mobilize politically in the aftermath of war, then there may be a case for their protection by a paternal state. If, on the other hand, such communities are capable of political mobilization, they might be relied upon to play a lead role in structuring and carrying-out post-conflict development agendas.

In this paper, we examine the case of Mozambique, where vast agricultural tracts have been transferred to corporate investors in recent years, giving rise to resistance efforts at the local level. In particular, we study the case of biofuel

concessions and examine whether the degree of community mobilization is related to previous wartime violence. In particular, local mobilization is proxied by the capacity of communities to resist corporate concessions on contested land and successfully lobby for their own communal land grants to secure lands against concessions. Taking the absence of concessions, the presence of community land grant allotments, and overlapping "contested" areas between the two as proxies for successful local community mobilization, we find evidence of both creative and destructive forces at work. Across the board, recent violence is associated with signs of elevated local political mobilization, while violence intensity plays a more complicated role, associated, as it is, with higher levels of both corporate concessions (locally undesirable) and community land grants (local desirable). We conclude by suggesting that war may have different effects on different forms of social capital, strengthening local self-reliance, while weakening ties to national authorities.

In addition, these results speak to a wider phenomenon in the developing world (and sub-Saharan Africa in particular), where agricultural productivity is well below its potential, and where local and international demand for land has been steeply on the rise. Mozambique is not alone in transferring large tracts of land to investors in recent years (Alden-Wily, 2011): Ethiopia and Sudan are prime examples of other countries where trend has been in full swing (Deininger, et al., 2011, p. xiv) – and which, like Mozambique, have experienced internal conflict in the past quarter century. Some scholars have even questioned the legality of such land transfers in the first place (Alden-Wily, 2010).

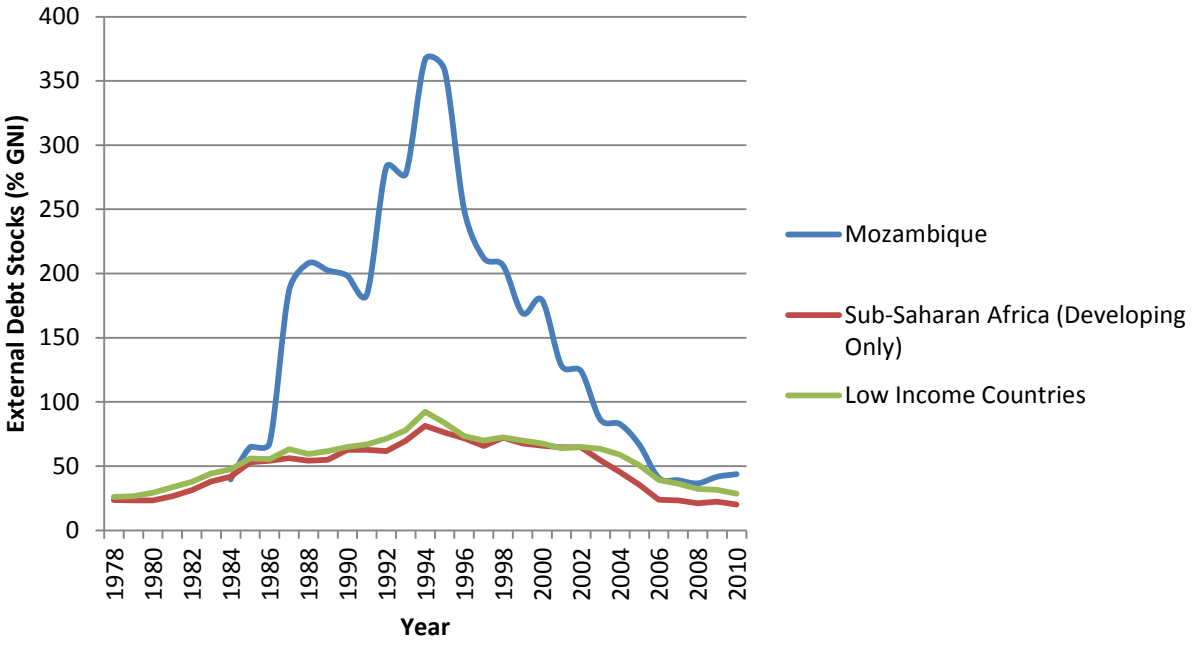
The remainder of the paper is structured as follows. Section 2 serves as a background discussion on three separate topics: Mozambique's post-conflict development trajectory, the biofuels debate, and the mechanisms that motivate our hypothesis formation. Section 3 describes our methods. Section 4 presents the results. Section 5 summarizes and interprets the results and the implications for post-conflict development policy.

2. Background

Post-Conflict Development in Mozambique

Mozambique is widely hailed as the paragon of successful post-conflict development policy. Following 16 years of a civil war, the Rome General Peace Accords were signed in October 1992 between the government and the RENAMO rebel group. A UN Peacekeeping force arrived to safeguard a two-year democratic transition, and international observers oversaw elections in 1994. In the following decade, the country embraced liberal market reforms, cut military spending while boosting expenditures in education and public health. According to the data released by the World Bank, GDP per capita increased by almost 150% between 1994 and 2010. Under 5 mortality rates steadily plummeted from 214 per 1,000 in 1991 to 110 in 2010. At the same time, the share of agriculture's contribution to GDP decreased, whilst that of manufacturing grew, and the poverty rate plunged from over 69% in 1996 to under 55% in 2008. (World Bank, 2012) Exports grew, helping to bring the country's external debt down from 370% of GDP as of the 1994 elections to 43% in 2010 (see Figure 1).

Figure 1. External debt stocks as a percentage of GNI in Mozambique, Sub-Saharan Africa and Low Income Countries (1978-2010)



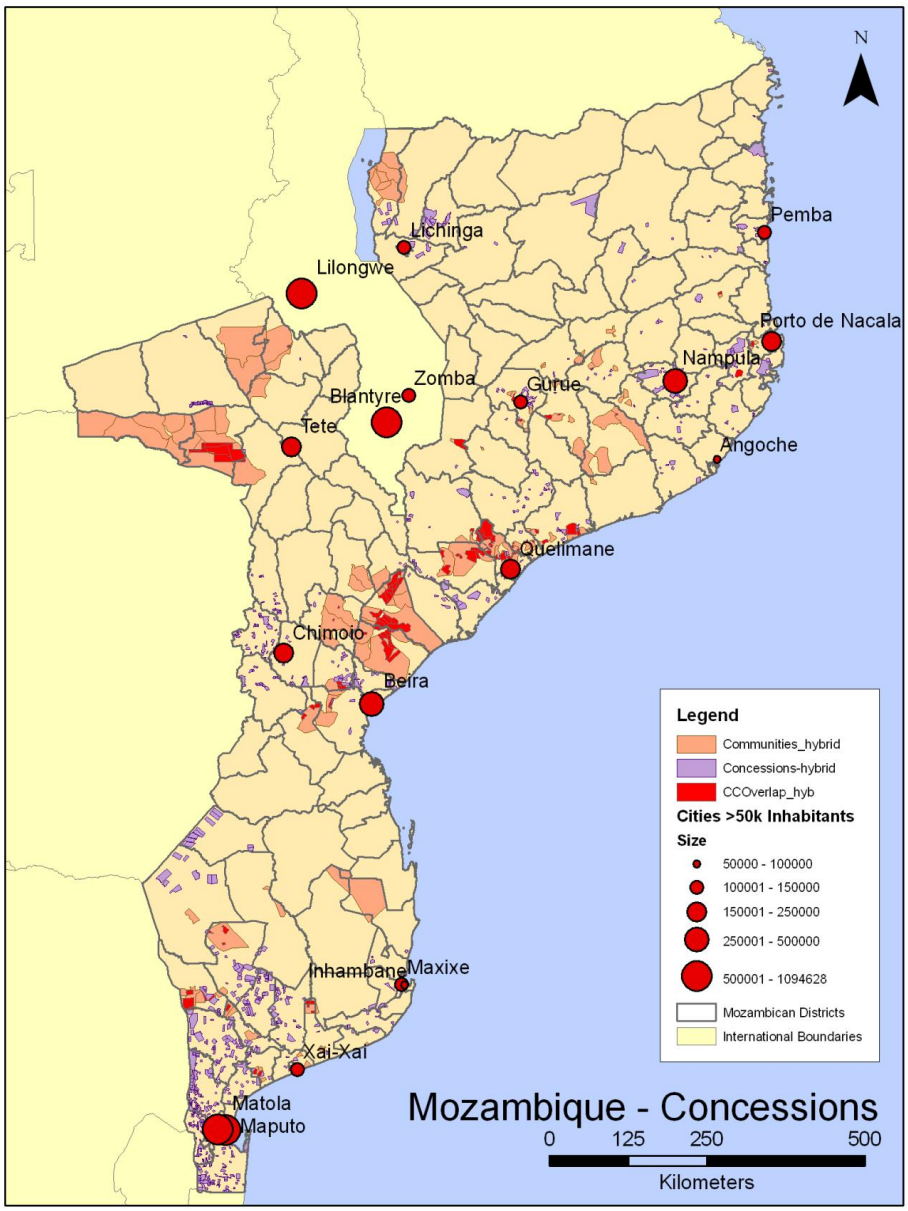
Source: World Bank 2012. Graphics by the authors.

International aid is attributed with making positive contributions to the country's development (Arndt, Jones, & Tarp, 2006). However, as brilliantly highlighted by Giesbert and Schindler (2012), Mozambican development appears to be significantly asymmetric. In fact, households in rural Mozambique seem to be trapped in a pattern of underdevelopment. This reinforces and enriches the results on inequality presented in Brück and Schindler (2009), which demonstrated that land abundance at the aggregate level in Mozambique does not imply greater degrees of land access at the household level.

Since around 2006, the Government of Mozambique (hereafter, GoM) has increasingly pinned its hopes for continued economic growth on the possibility of becoming a biofuels powerhouse. The Mozambican Council of Ministers approved a national biofuels directive in 2009 outlining a "pilot phase" lasting until 2009, and an operational phase lasting through 2020, at which point, a dramatic expansion is planned. In the meantime, the GoM has granted hundreds of concessions to both foreign and domestic investors in the biofuels industry (including the state-owned oil company, Petroléos de Mocambique, or Petromoc) to grow copra and jatropha for biofuel production, thereby increasing agriculture's relative contribution to the national GDP (Schut, Slingerland, & Locke, 2010).

This land use competes with preexisting local claims on arable land and water resources, and may heighten food insecurity among rural populations (Deininger, et al., 2011, Estabrook, 2011, Oxfam International, 2007). Figure 2 depicts the locations and extents of current agricultural concessions and community land grant claims; overlaps (contested land) are highlighted in red.

Figure 2. Agricultural concessions and community land grants in Mozambique.

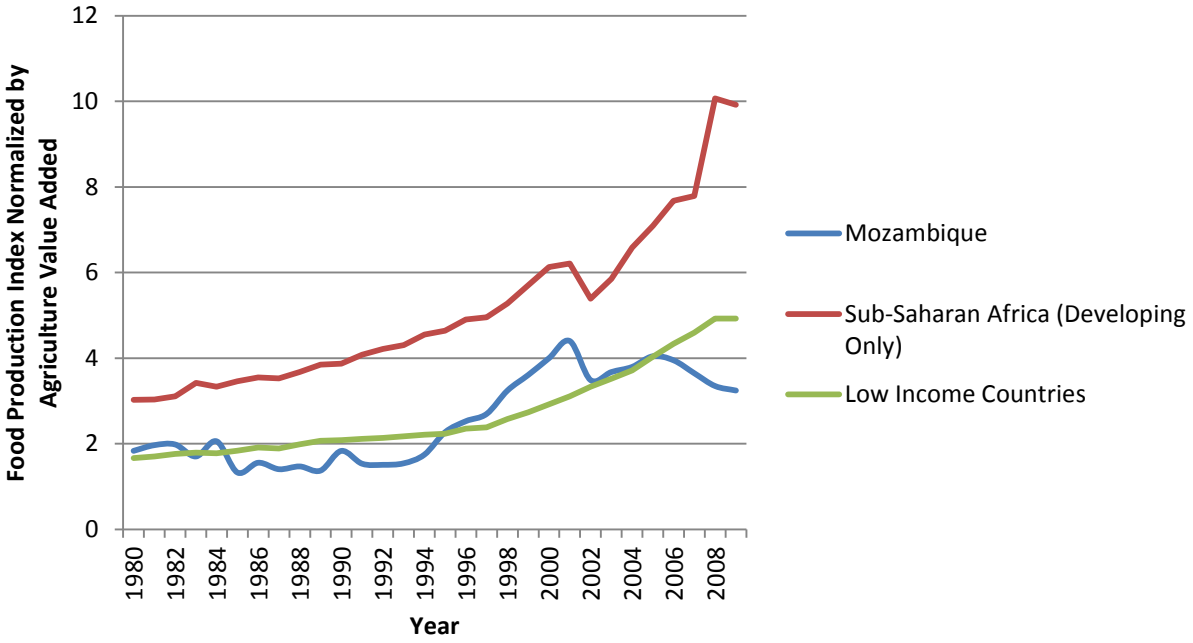


Source:Deininger, et al. (2011), graphics by the authors

It is in this context that, since 2000, the food production index in Mozambique has ceased to realize the steady gains that characterized the early post-war years, and leveled off. In fact, the combined effect of the larger agricultural

output and stagnant food production can be seen in Figure 3: Mozambique bucks the trend in the sub-Saharan Africa and the developing world as a whole in that a declining share of its agricultural output is in food. In response, many local communities have sought (and often received) formal recognition of their land claims, which aids them in warding off unwanted concessions (Deininger, et al., 2011).

Figure 3. Food production indices (2000 = 100) normalized by agricultural value-added as a percentage of GNI in Mozambique, Sub-Saharan Africa and Low Income Countries (1978-2010)



Source: World Bank 2012. Graphics by the authors.

The Biofuels Debate

There is an ongoing debate surrounding the promotion of biofuel production in developing countries. Some argue that it has beneficial impacts on both host countries and investors. On the one hand, the decentralization of fuel production may lead to greater competition on the global marketplace, stabilizing a notoriously volatile market (Hausmann, 2007), and supplementing the fuel supply after "Peak Oil" (Asia Biomass Energy Cooperation Promotion Office, 2009). On the other hand, developing countries are seen to have a comparative advantage in arable land, and biofuel production is viewed as 'pro-poor' since it is labor-intensive and requires broad-based capital investments in transportation infrastructure relative to resource extraction industries (Arndt, Benifica, Tarp, Thurlow, & Uaiene 2009, Benifica, 2006). By contrast, skeptics argue contend that a government-led push for biofuel production significantly diminishes scarce arable land reserves and diverts water resources from food production (Oxfam International, 2007).

The debate is exacerbated by the ongoing dramatic boom in commodity prices on international financial markets since 2002, an increase in the value and volatility of food prices in countries where households may already spend upwards of 50% of their income on food (Economist, 2007). With specific regard to Mozambique, for example, as of 1996, households in the country's Cotton Belt relied upon subsistence farming for 80% of their required caloric consumption, whereas food markets in the so-called "hungry season" represented an unreliable and extremely expensive option for food procurement. However, smallholders were able at that point to grow cash crops (cotton) and still increase their production of edible

foods (maize) in a way that the plantation model of agriculture would not permit (Strasberg, 1996).

However, there is no current empirical evidence available on this point. Employing a CGE analysis, Arndt et al. (2011) show that biofuel production should generally contribute to economic growth and poverty reduction in Mozambique. However, they caution that the type of production model adopted affects the outcome greatly. An 'outgrower' model, in which smallholders produce and sell to processors, is more pro-poor than a capital-intensive 'plantation' model. Similarly, 'outgrower' models are more apt to lead to technology spillovers benefiting the production of other crops.

Mechanisms: Weak Institutions, Reward, and Appeasement

As mentioned, we are examining bio-fuel concessions in the context of post conflict policy. Is Mozambique's post-conflict development policy haunted by the revenant of past wars? Specifically, to what extent can the locational choices of biofuels concessions be explained by the events of the civil war?

First we hypothesize that violent wartime events have the potential to disrupt and destroy local community institutions, weakening their ability to prevent their lands from being expropriated and reassigned by the central government. We test this hypothesis using geographic information system-generated, district-level data on biofuels concessions, recognized community landholdings, overlaps between the two, and civil war event intensity.

We hypothesize that the wartime violence in Mozambique generally weakened local community-level institutions. This weakening limited the ability of communities to effectively oppose government biofuel concessions granted to incoming firms. Hereafter, we refer to this as the "weak institutions" hypothesis (H_{WI}). In the literature, there is a widespread consensus on the idea that civil war in developing nations can cause the degeneration of national governance institutions (Collier, et al., 2003, Humphreys, 2005, p. 512, Reno, 1997, 1999, 2003). This appears to be particularly true when weak governments benefit from exogenous support. In such a case, governments are not required to develop state capacity to provide services efficiently to continue to prosecute war (Humphreys, 2003, p. 13, Slantchev, 2010). At the micro level, Brück (2003) argues that certain household characteristics – for instance, female household heads – have the effect of limiting land access in Mozambique, and that war accentuates the influence of these determinants to land access. Furthermore, at the individual level, exposure to civil war tends to be predictive of future propensity toward violence (Miguel, Saiegh, & Satyanath, 2011), which may further strain the effectiveness of local institutions.

On the other hand, there is some evidence that there are no persistent adverse effects of wartime violence on local economic development, due to "rebound effects" (see, e.g., Davis & Weinstein, 2002). In particular, Bellows and Miguel (2008) argue that measures of local political mobilization, like community meeting attendance, memberships in local political groups, and voting, are higher in Sierra Leonean households that directly experienced more intense violence than those that

experienced less or none. Blattman (2009) finds similar results for Uganda. In a more general approach to the impact of violent conflicts on preferences, similar findings for Burundi are also analyzed in Voors, et al. (2012). In this respect, a useful comparison can be made with the hypothesis of heightened social cohesion after natural disasters. In particular, social cohesion seems to rise in the immediate aftermath of a natural disaster; eventually, the effect fades (see, e.g., Hirshleifer, 1987, Ch. 4: Disaster Behavior: Altruism or Alliance?). This phenomenon might be designated the "war dividend" hypothesis (H_{wd}), in contrast to the "weak institutions" hypothesis described above. Moreover, as pointed out by Birner and Resnick (2010), social mobilization of smallholder peasants has to be considered a fundamental engine for shaping national institutions. On the other hand, political mobilization at the individual level does not necessarily proxy well for the effectiveness or inclusiveness of shared local institutions, and there is some evidence that violent conflict may provoke negative coping mechanisms in local institutions, resulting in the exclusion or even persecution of certain sub-populations (Krause, 2010).

There are at least two prominent alternative mechanisms that might influence the post-war biofuels concessions in Mozambique. On the one hand, some assert that post-conflict policy of a government is likely to reward the loyalty of those who stood with it – here termed the "reward hypothesis" (or H_R). On the other hand, it might be argued that post-conflict governments would seek to appease (or punish) armed groups by granting (or withholding) local development projects. This

is not a new observation. Wartime governments routinely reallocate expenditures to punish or appease restive regions. For instance, northern Mali has suffered fiscal "punishment," while Senegal's Casamance region has been "appeased" (Humphreys, 2003, p. 13) – and post-war governments may follow a similar logic to prevent a future conflict. The "appeasement" hypothesis (H_A) might be considered a more likely scenario in the case of a government that had been seriously challenged and forced to make concessions in the peace negotiations process. It might also be considered an alternative manifestation of the reward hypothesis in the case that peace negotiations allowed for the rebel group to transform itself into a political party and recompense its constituents through official state channels. The reward mechanism may even be partly responsible for accentuating ethnic cleavages in civil war(Caselli & Coleman II, 2006). Indeed, RENAMO was persuaded to become a political party by financial inducements offered by third-party actors who included not just other governments (notably that of Italy), but also private companies (Hoddie & Hartzell, 2010, p. 18). By contrast, the "punishment" hypothesis (effectively the converse of H_A) might be thought to hold in situations in which the government has easily won the war and did not make significant concession during peace negotiations.

If biofuels concessions are unequivocally perceived to have "pro-poor" effects, it would be reasonable to claim that communities in which concessions were made were the "beneficiaries" of post-conflict development policy. But if biofuels concessions have generally adverse effects on poverty rates or food security in the

immediate environs – in spite of a positive overall effect on the economy – then we might reasonably conclude that local communities bear the social costs of the biofuel industry. We take the latter view, postulating that awarding a biofuels concession appears to be a net negative for nearby residents. This stance is corroborated by the local resistance campaigns and domestic controversy over concessions. In particular for Mozambique, Deininger et al. (2011, pp. 64-68) report that the expected benefits in terms of job generation and technology transfer did not occur.

In sum, the weak institutions hypothesis would be supported if areas hardest hit by violence saw more lands granted to biofuels concerns and fewer community land grants (and the war dividend hypothesis if the opposite phenomena were observed). The appeasement hypothesis would be supported if areas that had supported rebels were spared from biofuels concessions and received more community land grants. Alternatively, the reward hypothesis would be supported if areas that had supported government forces were spared from biofuels concessions. Note that these latter two hypotheses are neither mutually incompatible, nor incompatible with the weak institutions hypothesis articulated above.

Stated succinctly then:

- H_{WI}: The greater intensity of violence that occurred within a district, the larger the total area of biofuels concessions (and smaller the area of community land grants) will be;
    - H_{WD} (Obverse): The greater intensity of violence that occurred within a district, the smaller the total area of biofuels concessions (and larger the area of community land grants) will be;

- H_A: The greater the number of rebel headquarters and presences within a district, the smaller the total area of biofuels concessions (and larger the area of community land grants) will be; and
- H_R: The greater the number of rebel headquarters and presences within a district, the larger the total area of biofuels concessions (and smaller the area of community land grants) will be.

3. Empirical Strategy

The empirical strategy is based on a cross-sectional, district-level dataset describing wartime events during Mozambique's 16-year-long civil war, and subsequent government land policy. The dataset has an N of 142, which includes all rural and metropolitan districts. Data sources vary widely (as noted in Table 3 below), but the Domingues (2011) dataset on Mozambican war events exclusively informs the war-related variables. The outcome variables – agricultural concessions, recognized community land grants, and their overlaps – are derived from the World Bank report by Deininger et al. (2011) and a geographic information system (GIS) shapefile that informed that report. All data was generated using ArcGIS software.[4] Table 1 gives some descriptive statistics of the outcome variables. Their distributions are heavily skewed, zero-inflated, and the variances are greater than the means, suggesting our use of a negative binomial model with a log link (see, e.g., Mullahy, 1997). The dispersion parameter estimated in simple negative binomial models for the outcome variables of logged concessions, logged community

[4] A codebook is available from the corresponding author upon request.

land grants, and logged overlapping land against logged battle intensity were all non-zero (55.73, 322.77, 204.76) and significant at the $p < 0.01$ level, confirming this intuition. The log link permits a model defined by $\ln(E[y|X]) = Xb$, rather than $E(\ln[y|X]) = Xb$ if the outcome variable ($y = 0$ in many cases) were directly logged itself (Gourieroux, Montfort, & Trognon, 1984).

Table 1. Descriptive statistics for outcome variables (areas in Km²)

Statistic	Concessions	Community Grants	Overlaps
p5	0	0	0
p10	0	0	0
P25	0	0	0
p50	42.8	0	0
p75	238.2	224.9	19.7
p90	720.7	1140.6	226.6
p95	897.6	3027.1	431.9
mean	208.7	500.8	89.40141
variance	121932.7	1837787	83365.23
min	0	0	0
max	1775	8479.6	1933.1
skewness	2.24	3.71	4.551411

The NB log link estimator has been employed often in political science and medicine (e.g., Cheung, 2002, Prakash & Potosi, 2006). Following Ver Hoeff and Boveng (2007), the random outcome variable Y exhibits a negative binomial distribution as $Y \sim NB(\mu, \kappa)$, parameterized such that

$$E(Y) = \mu$$

$$var(Y) = \nu_{NB}(\mu) = \mu + \kappa \mu^2, \quad (1)$$

where μ is the distribution mean, κ is a dispersion parameter, and $\mu > 0$ and $\kappa > 0$. The relationship between $E(Y_i)$, the expected area of concessions in square kilometers in district i, and $LNHWI_i$, the logged intensity of violence in district i, in a negative binomial model can be expressed

$$E(Y_i) = \mu_i = exp(\beta_0 + \alpha LNHWI_i + \beta_1 X_{i1} + \beta_2 X_{i2} + \cdots + \beta_q X_{iq} + \varepsilon_i), \quad (2)$$

where α and $\beta_1, \beta_2, \ldots, \beta_q$ are regression coefficients, and $X_{i1}, X_{i2}, \ldots, X_{iq}$ are control variables.The land use variables are derived by "unioning" a land use shapefile and a Mozambique districts shapefile. The former is a hybrid of the World Bank concessions file provided by the team and the digitized map from p. 189 of that report (Deininger, et al., 2011).

In order to test the "weak institutions"/ "war dividend" hypotheses over and against the "appeasement" and "reward" hypotheses, it is necessary to distinguish between communities in which violence took place on the one hand, and communities that hosted or otherwise supported rebel and government forces on the other. The "weak institutions" hypothesis would implicate the former; the "appeasement" and "reward" hypotheses the latter. Therefore, we extract from the Mozambican Civil War Events database (1) battles and one-sided violence to test the "weak institutions" hypothesis, (2) rebel "presence" and headquarters to test the "appeasement" hypothesis, and (3) government military "presence" and headquarters to test the "reward" hypothesis.

The civil war events dataset did not list specific reported casualty numbers from each battle and attack. In order to build a district-level index of wartime violence, then, we classified certain types of events that would likely have adverse impacts on local communities, and weighted each type either a 1 or a 2. "Undetermined type of violence" events and acts of sabotage or attacks on physical capital were classified as 1, while battles and one-sided attacks on civilian populations were classified as 2. Each district was then assigned the sum of these classifications. Similarly when building the index of district-level rebel support, we assigned a 1 to reported rebel presence and a 2 to reported rebel bases. The index of government support summed 1s indicating government troop presences, and 2s for reports of provinces being fully under government administrative control. Residuals plots and R-square measures suggested that the logs of the indices for H_{wi}, H_r, and H_a were more appropriate than the raw indices. Table 2 contains descriptive statistics of the predictor variables from the dataset.

Table 2. Descriptive statistics for main predictor variables.

Statistics	Log Battle Intensity Score	Log Government Troop Presences Index	Log Rebel Presences Index	Years Since War's Beginning (Battles)	Years Since War's Beginning (Gov't Presences)	Years Since War's Beginning (Rebel Presences)
p5	**0**	**0**	**0**	**0**	**0**	**0**
p10	**0**	**0**	**0**	**0**	**0**	**0**
p25	**0**	**0**	**0**	**0**	**0**	**0**
p50	**1.10**	**0**	**0**	**7.24**	**0**	**0**
p75	**2.08**	**0**	**0**	**10.21**	**0**	**0**
p90	**2.77**	**0**	**1.10**	**11.17**	**0**	**6.33**
p95	**3.00**	**0.69**	**1.39**	**12.00**	**5.58**	**7.42**
mean	**1.24**	**0.05**	**0.24**	**5.77**	**0.53**	**1.33**
variance	**1.26**	**0.04**	**0.27**	**23.24**	**4.99**	**7.75**
min	**0**	**0**	**0**	**-1.17**	**0**	**0**
max	**4.08**	**1.39**	**2.77**	**13.39**	**14.08**	**10.17**
skewness	**0.35**	**4.26**	**2.29**	**-0.17**	**4.48**	**1.84**

Control variables included in the dataset (see Table 3) were generated by and large by geographic information system. They fall into three main categories: a) demographic (i.e., rural population density), b) geographic (e.g., total length of major rivers within a district), c) market access (e.g., distance to the nearest grain warehouse) attributes. Distances between districts and grain warehouses, closest cities, etc., were calculated using a road network analysis and assigning the centroid of the district shapefile as the point of origin in any given trip.[5]

[5] Additional information is available in the codebook, available from the corresponding author on request.

Table 3. Control variables by name, description, and source.

Name	Description	Source
LnDistKm2	Natural log of district surface area in Km^2	MIT GIS File: 1314153131_mz_f7districts_2002.shp
PopUrb	Urban population	http://www.citypopulation.de/
PopRur	Total rural population	MIT GIS File: 1314154139_mz_a1villages_2007.shp
PopDensR	Rural population density (people/ Km^2)	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp
TotPop	Total population of the district	MIT GIS File: 1314154139_mz_a1villages_2007.shp; http://www.citypopulation.de/
PopDens	Total population density (people/ Km^2)	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/
FloodKm2	Area (Km^2) of the district in the flood plain	MIT GIS Files: 1314153329_mz_c32flood_1999.shp[6], 1314153131_mz_f7districts_2002.shp
FloodPerc	Percentage of district in the flood plain	MIT GIS Files: 1314153329_mz_c32flood_1999.shp, 1314153131_mz_f7districts_2002.shp
RivLen	Cumulative length (Km) of rivers passing through the district	MIT GIS Files: 1316561501_mz_p53rivers_1999.shp[7], 1314153131_mz_f7districts_2002.shp
Twns5k	Number of towns and cities over 5k inhabitants	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/
CityFID	FID of the nearest city over 50k inhabitants	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp[8]; http://www.citypopulation.de/
CityDist	Distance (Km) from centroid to nearest city	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/
CityRoute	"[Origin] – [Destination]" of route to nearest city by road	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/
TimeByRd	Time (hours) it takes by road to reach the nearest city >50k from district centroid[9]	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314154033_mz_p2roads_2002.shp[10], 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/

[6] "Mozambique (Flood Region, 1999)", created 11 February 1999.
[7] "Mozambique (Major Rivers, 1999)", created 30 January 1999.
[8] Centroids were created for each district, which serve as the basis for all distance measurements to follow.
[9] Using a network analysis, assuming that highways allow for speeds of 90 Km/hr, primary roads 65 Km/hr, and dirt paths 35 Km/hr.
[10] "Mozambique (Roads, 2002)", created 12 March 2002.

Name	Description	Source
DistByRd	Distance (Km) by road to the nearest city >50k from district centroid	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314154033_mz_p2roads_2002.shp, 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/
WHFID	FID number of nearest food warehouse	MIT GIS Files: 1314153131_mz_f7districts_2002.shp, 1314153361_mz_g17warehouses_1999.shp
WHDist	Distance (Km) from district centroid to nearest food warehouse	MIT GIS Files: 1314153131_mz_f7districts_2002.shp, 1314153361_mz_g17warehouses_1999.shp
CapDist	Distance (Km) from district centroid to capital city (Maputo)	MIT GIS Files: 1314154139_mz_a1villages_2007.shp, 1314153131_mz_f7districts_2002.shp; http://www.citypopulation.de/
NGOFID	FID number of nearest NGO field office	MIT GIS Files: 1314153131_mz_f7districts_2002.shp, 1314153540_mz_e624ngos_2004.shp
NGODist	Distance (Km) from district centroid to nearest NGO field office	MIT GIS Files: 1314153131_mz_f7districts_2002.shp, 1314153540_mz_e624ngos_2004.shp[11]
WFPFID	FID number of nearest World Food Programme (WFP) office	MIT GIS Files: 1314153131_mz_f7districts_2002.shp, 1314154113_mz_e624unwfp_1999.shp[12]
WFPDist	Distance (Km) from district centroid to nearest WFP office	MIT GIS Files: 1314153131_mz_f7districts_2002.shp, 1314154113_mz_e624unwfp_1999.shp

Spatial auto-correlation was tested and found to be an issue for two outcome variables – area of community land grants and area of overlap between land grants and corporate concessions – but not for area of corporate concessions alone. Nevertheless, it was decided that the possibility should be controlled for in all controlled models. Therefore, a weight matrix composed of the squared inverse distances from each district centroid to all others was created. The weight matrix was then multiplied in scalar terms by the vectors of the three outcome variables,

[11] "Mozambique (NGO Offices, 2004)", created 14 September 2004.
[12] "Mozambique (UN World Food Program (WFP) Offices, 1999)", created 1 January 1999.

column-summed, and then transposed, to give each district a spatially weighted measure of the neighborhood effects acting on each of the outcomes.

4. Results

In the uncontrolled models, battle intensity is positively and significantly associated with the awarding of corporate concessions by the GoM, except when the (significant) terms are included for average years since battles occurred and the interaction term between the two (see Table 4). On the other hand, district-level support for government and RENAMO forces was significantly associated with lowered levels of concessions, and the effect diminishes over time – faster for strongly supporting districts than for weakly supporting districts.

A similar pattern is evident with government-supporting districts, though it seems that the reward effect decays more slowly than that of appeasement. Districts that supported government but suffered badly during the war receive a further reprieve from concessions granting, as do (to a smaller extent) districts that supported RENAMO and suffered badly.

When the predictor model is overlain on the controls, all predictor variables fall out of statistical significance in the absence of terms for time. As for the alternative hypotheses, the extent of government troop presence retains its negative association with concessions in all controlled models, and is significant in the full model (Model 4-8). On the other hand, the logged extent of rebel presence does not have a significant relationship with the amount of concessions in the district in any model.

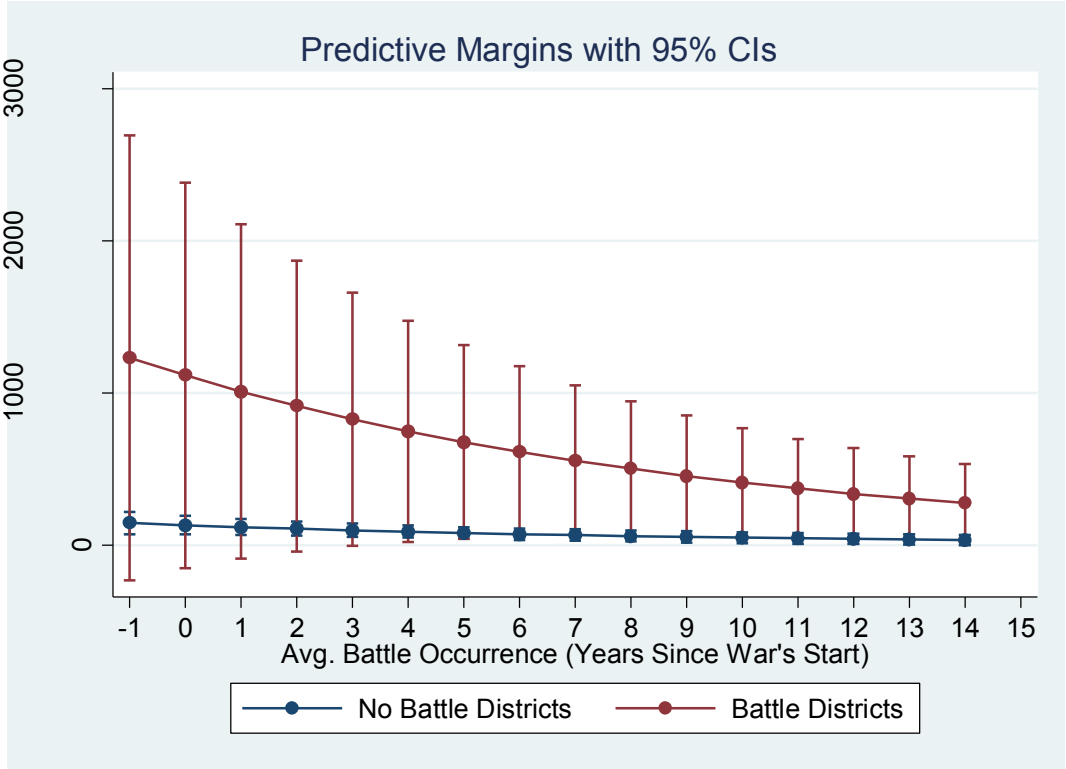
Table 4. Predictors for agricultural concessions in negative binomial log-link models

	Uncontrolled Models				Controlled Models†			
LABELS	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Log Battle Intensity Score	**0.322*** **	**0.476*** **	**0.378*** **	**0.557*** **	0.00401	**0.310***	0.00152	0.265
	(0.0720)	(0.118)	(0.0775)	(0.131)	(0.131)	(0.179)	(0.139)	(0.189)
Log Government Troop Presences Index			**-1.342*** **	-1.407			-0.0257	**-4.266*** **
			(0.451)	(1.104)			(0.607)	(1.349)
Log Rebel Presences Index			-0.216	-0.757			0.0444	0.622
			(0.183)	(0.515)			(0.217)	(0.633)
Years Since War's Beginning (Battles)		**-0.0479***		**-0.0536***		**-0.103*** **		**-0.0996*** **
		(0.0274)		(0.0290)		(0.0389)		(0.0384)
Years Since War's Beginning (Gov't Presences)				0.0290				**0.325*** **
				(0.0881)				(0.109)
Years Since War's Beginning (Rebel Presences)				0.0930				-0.0898
				(0.0854)				(0.102)
Constant	**4.871*** **	**4.945*** **	**4.886*** **	**4.946*** **	**7.415***	6.722	**7.341***	6.693
	(0.123)	(0.134)	(0.123)	(0.136)	(4.137)	(4.181)	(4.159)	(4.151)
Observations	142	142	142	142	142	142	142	142
Degrees of freedom	140	139	138	135	122	121	120	117
AIC	12.57	12.56	12.54	12.54	11.72	11.69	11.75	11.67
Log likelihood	-890.5	-889.0	-886.1	-883.3	-812.3	-808.8	-812.3	-803.8

† All controlled models correct for spatial auto-correlation.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 4 illustrates that high battle intensity during the war is associated with larger corporate land concessions in the post-war era, and that larger corporate concessions are expected when battles occurred earlier in the war.

Figure 4. Predicted agricultural concessions as a function of average time elapsed since battles, by districts that did and did not experience battles.

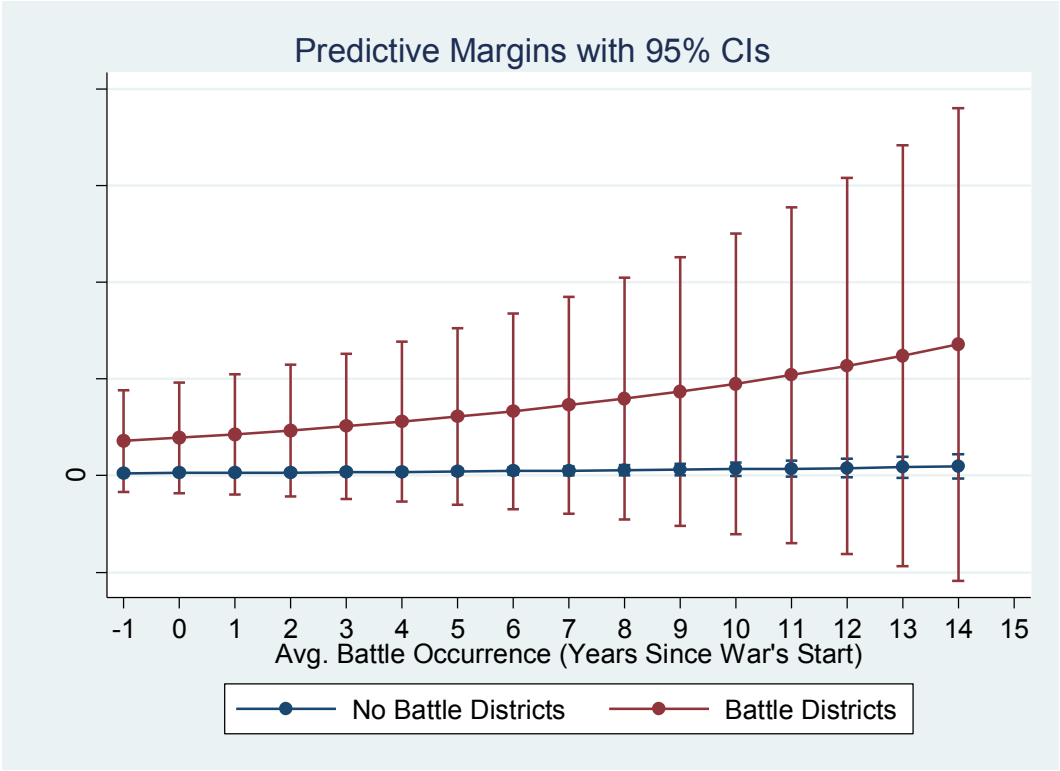


Source: The authors, based on Model 4(8).

In the absence of the control variables suite or the time terms, violence exposure is significantly and positively associated with the number of square kilometers of community land grant claims (see **Table 5**): districts that experienced high battle intensity tend to have larger land grant areas than those that experienced low or no battle intensity. The significance fades in the final control model, but the time variable remains significant.

Figure **5** illustrates that districts that experienced high intensity violence are predicted to successful apply for more community land grants, as are those more recently affected.

Figure 5. Predicted community land grants as a function of average time elapsed since battles, by low, medium, and high battle intensity.



Source: The authors, based on Model 5(8).

Table 5. Predictors for community land grants in negative binomial log-link models

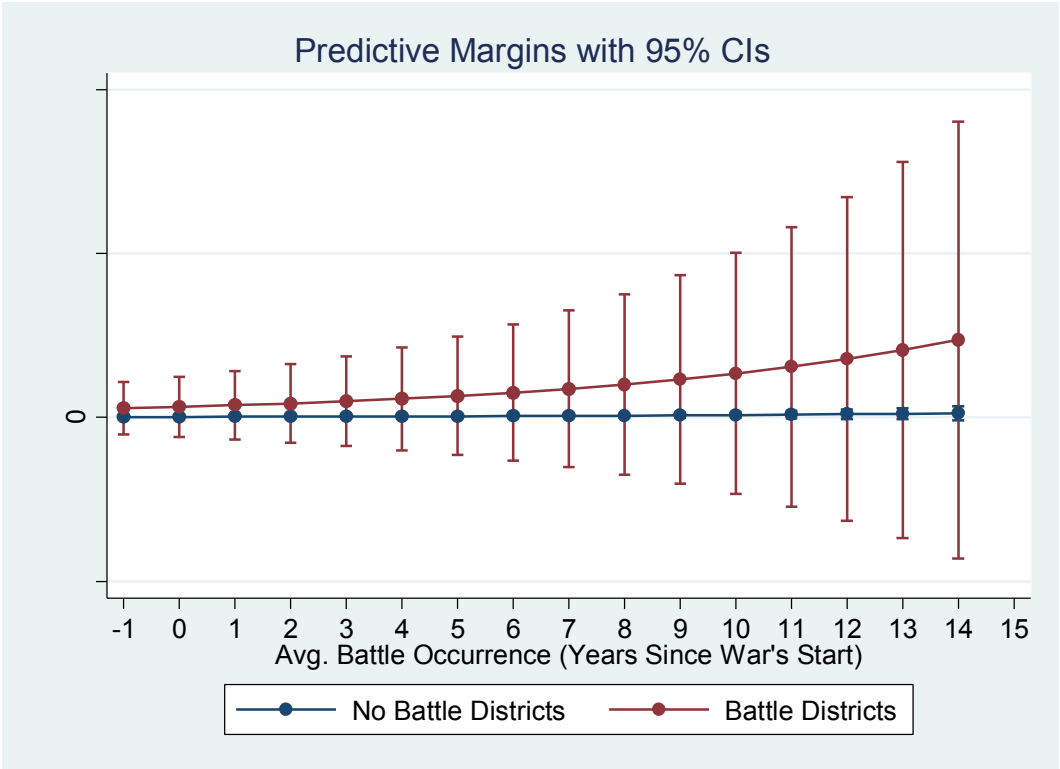
	Uncontrolled Models				Controlled Models†			
LABELS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Battle Intensity Score	**0.263*** **	**0.418*** **	**0.324*** **	**0.465*** **	**0.755*** **	**0.463** **	**0.863*** **	0.373
	(0.0862)	(0.115)	(0.0975)	(0.125)	(0.145)	(0.185)	(0.156)	(0.228)
Log Government Troop Presences Index			**1.055** **	-0.561			-0.536	**-4.376*** **
			(0.487)	(1.299)			(0.566)	(1.580)
Log Rebel Presences Index			**-0.717*** **	0.610			-0.262	**2.770*** **
			(0.200)	(0.695)			(0.234)	(1.008)
Years Since War's Beginning (Battles)		**-0.0490** **		**-0.0492** **		**0.0801** **		**0.0889** **
		(0.0219)		(0.0217)		(0.0364)		(0.0404)
Years Since War's Beginning (Gov't Presences)				0.0319				**0.215** **
				(0.0799)				(0.104)
Years Since War's Beginning (Rebel Presences)				**-0.244** **				**-0.497*** **
				(0.105)				(0.171)
Constant	**5.857*** **	**5.930*** **	**5.859*** **	**5.996*** **	**-27.65*** **	**-27.50*** **	**-28.95*** **	**-24.75*** **
	(0.136)	(0.145)	(0.137)	(0.148)	(6.426)	(6.172)	(6.428)	(6.472)
Observations	142	142	142	142	142	142	142	142
Degrees of freedom	140	139	138	135	122	121	120	117
AIC	14.40	14.37	14.34	14.29	11.09	11.07	11.10	11.07
Log likelihood	-1020	-1018	-1014	-1008	-767.4	-765.0	-766.0	-761.0

† All controlled models correct for spatial auto-correlation.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6 shows that the battle intensity variable has a consistently negative, but not statistically significant relation to overlapping land claims.. The variable for government and rebel presences by and large demonstrate insignificant relationships to the size of overlapping land claims – consistently negative in the former case, consistently positive in the latter. The two become significant only in the uncontrolled Model 6(4).

Figure 6 illustrates the results of Model 6-8, showing that districts that experienced high intensity violence are predicted to receive less community land grants, as are those less recently affected.

Figure 6. Predicted overlaps between concessions and land grants as a function of average time elapsed since battles, by low, medium, and high battle intensity.



Source: The authors, based on Model 6(8).

Table 6. Predictors for conflicting land claims in negative binomial log-link models

	Uncontrolled Models				Controlled Models†			
LABELS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Battle Intensity Score	0.106	-0.0458	0.158	-0.0180	0.148	-0.246	0.175	-0.200
	(0.0813)	(0.119)	(0.0996)	(0.134)	(0.177)	(0.233)	(0.182)	(0.265)
Log Government Troop Presences Index			-0.547	**-3.492****			-0.513	-0.919
			(0.475)	(1.421)			(0.612)	(1.591)
Log Rebel Presences Index			-0.123	**0.942***			0.0436	-0.510
			(0.212)	(0.565)			(0.241)	(0.870)
Years Since War's Beginning (Battles)		**0.0442***		0.0425		**0.126****		**0.142*****
		(0.0265)		(0.0261)		(0.0490)		(0.0538)
Years Since War's Beginning (Gov't Presences)				**0.268****				0.0365
				(0.130)				(0.126)
Years Since War's Beginning (Rebel Presences)				**-0.184***				0.157
				(0.101)				(0.145)
Constant	**4.357*****	**4.279*****	**4.341*****	**4.282*****	3.680	4.480	2.936	1.534
	(0.131)	(0.135)	(0.132)	(0.136)	(5.871)	(5.827)	(5.937)	(5.973)
Observations	142	142	142	142	142	142	142	142
Degrees of freedom	140	139	138	135	122	121	120	117
AIC	11.01	11.01	11.03	11.02	7.743	7.707	7.766	7.724
Log likelihood	-780.0	-778.6	-779.1	-775.6	-529.7	-526.2	-529.4	-523.4

† All controlled models correct for spatial auto-correlation.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Having examined the three outcome variables (concessions, community land grants, and overlaps) in sequence, it is useful to put these into conversation with our one principal and two alternative hypotheses via adjusted predictions in Table 7. Going from the 5th to the 95th percentiles in logged battle intensity is predicted to produce an increase of around 120% in corporate concessions, a 360% increase in community land grants, and a decrease of 58% in overlapping lands. The same percentile increase in logged support for government forces is predicted to produce a 99% decrease in concessions, a 7% increase in community land grants, and a 42% decrease in overlapping land claims. Finally, going from the 5th to the 95th percentile of rebel support is predicted to produce an increase of 137% in corporate concessions, an increase of around 4500% in community lands, and a decrease of 43% in overlapping lands.

Table 7. Adjusted predictions for concessions, community land grants, and overlaps for low and high values of predictors (Km²)[13]

	Percentile	areaconc		areacomm		areaover	
lnhwi	**5th**	219.22		2657.78		829.21	
		1.91	436.53	-2015.74	7331.30	-349.74	2008.16
	95th	486.16		9653.53		348.09	
		114.28	858.03	-3237.12	22544.18	-94.79	790.96
	95th-5th Difference	266.93		6995.75		-481.12	
		-163.78	697.65	-6715.94	20707.45	-1740.51	778.27
lnhr	**5th**	676.04		10530.88		517.69	
		-262.32	1614.39	-17936.76	38998.52	-21.00	1056.39
	95th	35.17		503.98		298.21	
		5.99	64.35	-24.95	1032.91	-515.01	1111.43
	95th-5th Difference	-670.04		-10026.90		-219.49	
		-1608.85	268.77	-38499.46	18445.65	-1194.95	755.97
lnha	**5th**	316.51		1517.59		586.68	
		76.78	556.25	424.05	2611.14	-299.84	1473.21
	95th	749.56		70365.40		343.73	
		-682.81	2181.93	-133817.70	274548.50	-195.51	882.98
	95th-5th Difference	433.05		68847.81		-242.95	
		-1019.25	1885.34	-135338.22	273033.83	-1280.60	794.70

When comparing the relative effects of each predictor – violence, support for government, support for rebels – it is important to recall that a relationship's magnitude is distinct from its strength. In fact, if OLS regressions are run on the logged outcome variables, the R-square statistics of the battle intensity variables eclipses those of the government and rebel support indices (see Table 8). That is,

[13] All adjusted predictions obtained using the post-estimation margins command in Stata at the 5th and 95th percentile values. The standard errors of the differences were calculated using the formula) $CI_{95th-5th} = Value_{5th-5th} \pm 1.96\sqrt{SE_{5th}{}^2 + SE_{95th}{}^2}$.

wartime violence outstrips the other two variables in its power to explain the variation in all three post-conflict outcomes.

Table 8. R-square statistics for single-predictor OLS regressions on concessions, community land grants, and overlaps.

	Concessions	Community Lands	Overlaps
Log Battle Intensity Index	0.095	0.079	0.094
Log Government Support Index	0.002	0.007	0.012
Log Rebel Support Index	0.000	0.015	0.015

5. Discussion

We believe that the results paint a nuanced portrait of the effects of Mozambique's war on post-conflict land policy. We had hypothesized that districts experiencing higher-intensity violence would have more corporate concessions, because wartime violence severely affects the capacity for community protest. We found no definitive evidence one way or another on this, though the models do lean in that direction. However, the fact that more recent violence is associated with smaller concessions may hint that some form of the 'war dividend' story is also at work. That is, social cohesion may rise due to war; this effect may make local communities better able to resist land concessions. However such a 'war dividend' fades with time. As

previously noted, this would be in line with accepted findings from literature on disasters. Figure 4 could also suggest a sort of Goldilocks effect: social cohesion in districts that were heavily conflict-affected fades more rapidly than in those lightly affected. However, clearly the problem is that we cannot exclude the possibility that GoM has purposely avoided granting concessions in areas recently devastated by violence.

Further complications arise when interpreting the results of Model 4-8, predicting community land grants. Here, the war dividend mechanism might be more unequivocally at work. Recently conflict-affected districts receive larger land grants, and more intense violence is associated with larger, not smaller, grant area. In other words, the "weak institutions" hypothesis is rejected in this case. The capacity to secure and maintain communal property seems to be galvanized by both the recentness and intensity of violence.

Finally, our analysis of land use conflicts between corporate concessions and community grants revealed that recent violence is predictive of more conflicted lands, while higher violence is predictive of less. One possible part of the explanation is that, as we found above, recent battles seem to galvanize more community land grant claims (possibly through the political mobilization mechanism), implying that there would simply be more possible community claims with which to come into conflict in districts that experienced recent battles. Less conflict-affected districts generally receive smaller corporate concessions and

smaller community grants (seemingly making overlap less likely between the two), and they are in fact predicted to host less conflicting land claims.

One of the more interesting questions to come out of the analysis is: Why does high-intensity violence seem to undermine communities' resistance to concessions, while seemingly galvanizing their communal initiatives? After all, heightened resistance to concessions and weakened claims to community lands might just as easily be expected in the aftermath of high-intensity violence. War might plausibly have selected for reactive institutions capable of defending their constituents from the litany of exogenous threats, while selecting *against* those institutions devoted to long-term planning. Such an hypothesis would be in line with recent work by Hiatt (2012), which suggests that, in the context of civil and political violence, businesses in Colombia that engaged in comprehensive planning between 1997 and 2001 were 12% more likely to fail than those that did not, presumably due to the highly uncertain nature of the future. Moreover, collective enterprises might require a degree of social trust to function smoothly, and in the aftermath of extreme violence, such trust might be damaged or absent.

One speculative answer is that war actually selected for self-sufficient communities, making communal initiatives that promise a degree of collective security against shocks an attractive proposition (see, e.g., Demsetz, 1967, Ellickson, 1993). Conversely, war may also break the "vertical" social capital bonds that link local communities to national government, making local efforts to resist

top-down policies less effective.[14] This interpretation jibes with other accounts of the effects of war on social capital, particularly observations of boosted intra-group cohesion and inter-group fragmentation (Caselli & Coleman II, 2006, Fafchamps & Gubert, 2007, Kabamba, 2008, McDougal, 2011, Varshney, 2001). This conclusion may represent an accommodation between those who bemoan the effects of violence on local institutions, and those, like Bellows and Miguel, who note its possibly salutary effects.

Our dataset does not contain any information on the corporations to which the concessions were made, and so no attempt was made at assigning a Hirfindhal-Hirschman Index to each concession based its concessionaire. We are therefore unable to say if a handful of corporations predominate and, if so, if corruption plays a possible role in determining the location of concessions.

The international community, in the form of UNDP, the World Bank, USAID and other agencies, is increasingly showing a policy interest in the promotion of social, urban, and community resilience in fragile states. It is important to remember that social cohesion is often born of the very state fragility from which we seek to insulate people, and that attempts at bolstering post-conflict resilience might well be anchored in those local institutions formed in response to uncertainty. At the same time, though, recognition that communities hardest hit by war are more likely to be imposed upon to make sacrifices in the post-conflict period

[14] For a discussion of the importance of "vertical" capital to local economic development, see Woolcock (1998).

suggests that reestablishing vertical channels for local groups to access central authorities should be a priority.

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