Landmines and Spatial Development
Appendix V
Correlates of Landmines *

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Abstract

This appendix first presents the analysis of the correlates to landmines across Mozambican localities. Second, the appendix reports the cross-sectional analysis of the correlates of the timing of demining operations, distinguishing between the initial demining intervention and the last operation, leading to locality's full clearance.

*Additional material can be found at www.land-mines.com

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Contents

1 Correlates of Confirmed Hazardous Areas

This section reports the results of the analysis that explores the correlates of Confirmed Hazardous Areas (CHAs) at the locality level. First, we report the analysis of the correlates of contamination ("extensive" margin). Second, we report the analysis of the correlates of the intensity of contamination ("intensive" margin). Table 1 reports summary statistics of all variables used in the Appendix across Mozambican localities.[1]

1.1 Extensive Margin. Linear Probability Model Estimates

Table 2 reports linear probability model (LPM) estimates on the correlates of the presence of CHAs across Mozambican localities. The dependent variable is an indicator that takes the value of one if there is at least one confirmed hazardous area (CHA) in a Mozambican locality (administrative division 4). The dependent variable equals zero for localities without any contamination. Out of 1077 localities with population information in the pre-war population census, 786 had at least on CHA, while the remaining localities were not contaminated.[2]

Given the vast size of the country, its huge regional diversity, and the differential impact of the war of independence and the subsequent civil war across regions, we always include province-level (administrative unit 1) fixed effects. The constants (not reported) are highly significant, as contamination was significantly higher in Inhambane and to a lesser extent in Sofala and Maputo as compared to Gaza and Tete. This accords with the historical narrative (detailed in Appendix I and Appendix II).

All specifications include the log land area, a highly significant variable. Naturally, larger in terms of landmass localities are significantly more likely to be contaminated. In columns (2)-(9) we examine the predictive power of a set of potential correlates of minefields (CHA), conditioning on locality's size and provincial location.

In column (2), we examine the role of the locality sharing borders with South Africa (16), Zimbabwe (39), Malawi (51), Tanzania (15), Zambia (14), and Swaziland (7), respectively. In line with the narratives on the history of the war of independence and the civil war, the probability of contamination is lower for adjacent to Zambia localities in the North-West, as Zambia was not much involved to conflict.

In column (3), we investigate the link between landmine contamination and geographic characteristics, namely elevation, soil suitability of agriculture, malaria ecology, and proximity to the coast. We also include the log number of towns and villages to explore whether localities with more populated areas are also more likely to be mined. Conditional on locality size and province, localities with a higher number of villages-towns are more likely to be mined. Moreover, contamination is related to

[1]We report estimates across 1077 localities with population data in the 1980 Census. The results are similar in the full sample of 1187 localities.

[2]Probit ML estimates are similar and omitted for brevity.

malaria prevalence, a result that may be driven by the link between malaria ecology and conflict (e.g., Cervellati, Sunde, and Valmori (2017) and Cervellati, Esposito, Sunde, and Valmori (2017)).

In column (4), we look at the relationship between landmine placement and the colonial transportation network (in 1973). We augment the specification with indicator variables that reflect the presence of paved roads, unpaved roads, trails, railways, and navigable rivers, in each locality. Contamination is higher in connected, as opposed to non-connected to the colonial transportation system localities. Paved roads and trails increase the likelihood of contamination in a locality; having also a railway crossing a locality increases the probability of contamination by 12.7% whereas the presence of navigable rivers does not seem to play a role. It is useful to keep in mind that the three main railways run along paved as well as unpaved roads forming the so-called "development corridors".

In column (5), we explore the association between contamination and civil war incidents (using data from Domingues et al. (2011), Robinson (2006), Sundberg, Lindgren, and Padskocimaite (2010), and Sundberg and Melander (2013)). While the civil war data are far from being complete, the coefficient on the civil war incident indicator that equals one for localities experiencing major conflict (16% of the sample) is positive and highly significant. Localities experiencing a major civil war event faced a 22% increased likelihood of landmine contamination.

In columns (6), (7), and (8) we augment the specification with proxies of early development. In column (6) we use a dummy variable that identifies localities hosting a commercial harbor (*cantinas*) in 1965. The estimate is significantly positive suggesting that localities of commercial importance during the colonial era were systematically more likely to be mined. In column (7) we use a dummy variable that equals one for lit in 1992 localities. It is important to keep in mind that mine contamination is likely to have influenced the level of development, as recorded in luminosity at the end of civil war in 1992. Lit localities appear to have been systematically mined.

In column (8), we proxy early development with log population density in 1980, using the first post-independence population census (that is also largely pre-civil-war as during $1977-1980$ the warfare was small-scale, almost exclusively targeting infrastructure). Similarly to the specifications in (6) and (7), there is a significantly positive correlation between population density and landmine contamination.

In column (9), we control simultaneously for all variables. A locality's landmass, its population density, the experience of a civil war event and proximity to the colonial transportation network remain robust predictors of landmine contamination. These results are in line with the historical narrative of landmine contamination during $1964-1992$, regarding the targeting of the transportation infrastructure, its proximity to the borders as well as the rather indiscriminatory nature of landmine contamination. Nevertheless, even if one takes into account all these historical, geographic, and population features the predictive power of this rich model (that also included province constants) is still modest, accounting for 22.7% of the overall variation in the extensive margin of landmine presence.

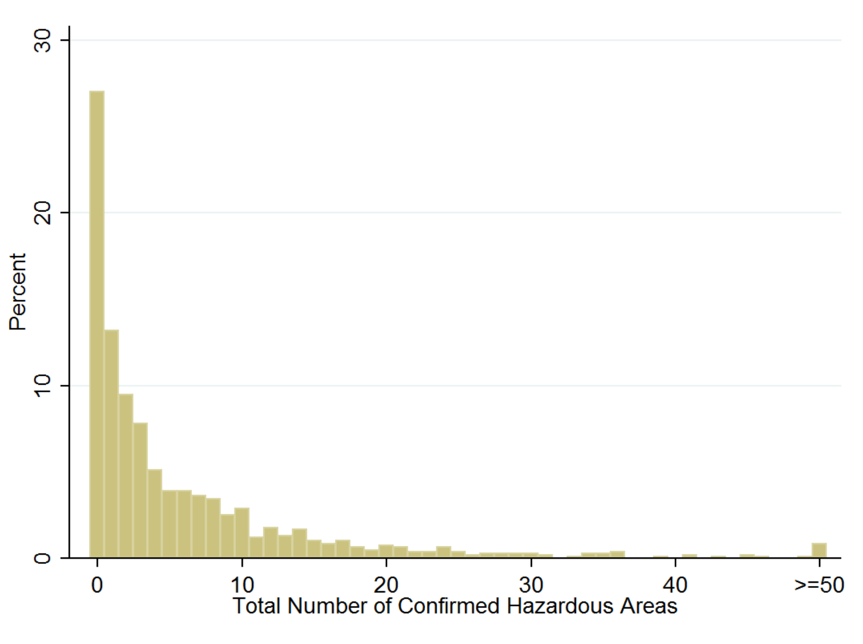


Figure 1: Distribution of Confirmed Hazardous Areas by Locality

1.2 Extensive and Intensive Margin. Poisson ML Estimates

We repeated the analysis on the correlates of landmine contamination looking at both the intensive and the extensive margin. Figure 1 plots the distribution of confirmed hazardous areas (CHA) across all Mozambican localities.

We then estimated regressions associating the number of CHA to the various geographic, locational, population, and economic variables we used before. As the outcome variable is a count we estimated maximum-likelihood Poisson models (see Wooldridge (2002) and Cameron and Trivedi (2013)).[3] Table 3 presents the Poisson ML estimates. The structure of the table follows Table 2. All specifications include province fixed effects and log land area. The count-model estimates are quite similar to the linear probability model results. Larger in size and more populous as of 1980 localities, with more villages/towns, a history of civil war events, and with access to colonial paved roads and railways, are significantly more mined (more CHAs). Furthermore, the Poisson ML estimates uncover a positive association between contamination and proximity to the South African border, where several large minefields were placed during the Civil War, as the Mozambican government was trying to cut down RENAMO's supply lines from the South African Special Forces.

[3]As there is some evidence of overdispersion in the dependent variable, we have also experimented with Negative Binomial ML estimation. The results are similar and not reported for brevity.

1.3 Summary

The simple cross-locality analysis on the correlates of landmine placement accord well with the history of the war of independence and the civil war and the widespread use of landmines (see Appendix *I*). The cross-sectional correlations in 2 and 3 show with formal econometric techniques that landmine use was concentrated in some border regions (mostly with Malawi), in major villages/towns, and in roads-railroads.

2 Correlates of the Timing of Clearance

The demining process went through roughly three phases from 1992 to 2015 (see Section 2 of the paper and Appendix *II*). A distinctive feature of the 24 year-long process was the lack of coordination, prioritization, and centralization in the initial phases. Landmine clearance was highly heterogeneous both spatially and temporally. In this Section we examine the correlates of the timing of clearance, checking whether the timing of intervention is associated to observable characteristics.

2.1 Timing of Clearance

Before reporting the correlates of the time of demining, it is important to distinguish between two key dates of clearance. The first corresponds to the year that the first demining operation took place in a given locality. The second reflects the date that the demining operations were completed in a given locality, leading to full clearance of the locality from CHAs. Most of the (855) contaminated localities had more than one CHA (see Figure 2); as such there were multiple interventions in a given locality, often by different operators.

Table 4 tabulates the number of years between the first and the last clearance operation and the corresponding percentage of localities. 22% of contaminated localities was cleared within the same calendar year. But for around 40% of contaminated localities, more than 10 years elapsed between the first and the last intervention. The median (average) number of years to clear a locality is 6 (6.98) years with a standard deviation of 5.93. When we exclude localities where clearance was completed in the same year, the average number of years to clear a district is 9 years (median is 8) with a standard deviation of 5.22.

At first glance, it looks puzzling that once clearing operations start it would take 7 years before the locality is fully cleared, especially because demining operations last on average 2 months.

Delays reflect the following factures. First, from new "discoveries" of (confirmed) hazardous areas. The government, international agencies, and demining operators had an incomplete picture of the problem in the initial decade. For example, both the 1994 and the 2001 country-wide surveys were incomplete, contained errors and misclassified hazardous areas (see for a discussion and illustrations Appendix II). Moreover, many parts of the country were inaccessible even in 2001, almost a decade after the end of the civil war. The same considerations apply to the 2007 HALO Trust "Baseline Assessment". For example, focusing only on the post-2008 data, 45% of the interventions were performed on "new" confirmed hazardous areas that were not present in the "Baseline Assessment".

Second, some confirmed hazardous areas were cleared at some point, but subsequently mined were found and thus these areas were reclassified as containing explosive war remnants (CHAs). This reflected the poor information of surveying teams in 1994 and in 2001 and the weak capacity of government demining agencies. For example, HALO Trust performed interventions in Lione Village in 2002 and then went back to the village in 2004 to clear additional land mines. ADP completed operation on Matola bridge in 1998 and returned in 2006 to the bridge because new mines were found. Finally, HALO Trust cleared land mines in Chinzunga Minefield in 2010 and then performed additional clearing operations in 2013 on the same spot.

A third factor that exacerbated delays in clearing a given locality was the fact that interventions during $1992-2006$ focused on a single site. For example, a demining operator was involved in clearing electricity pylons or clearing mines blocking access to damns only. This demining operator did not look at other hazardous areas as their contract was solely about clearance of infrastructure. As such, the locality was not freed from contamination, as other sites remained uncleared. It was only after $2007-8$, that a district-by-district approach in clearance was finally implemented.

Panel A of Figure 2 plots the share of localities that got a first demining intervention over time. By the end of 1994, clearance operations had started in just 6.54% (56) of contaminated localities (855). By early 2000, the cumulative percentage (number) of localities where some clearing had taken place was 48.53% (415). It jumps to 89.12% in 2007.

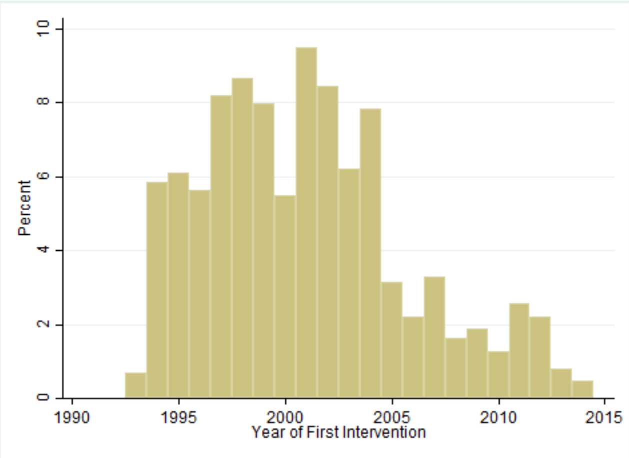
Panel B of Figure 2 depicts the yearly evolution of the share of localities that have been fully cleared. Compared to the starting year of operations, a very different picture emerges. By the end of 1994, when the first democratic elections took place, only 6 (0.7%) contaminated localities had been fully cleared. The percentage (number) slightly increases to 5.61% (48) in 2000, when the National Institute of Demining (IND) starts becoming operational. Indicating how slowly mine clearance proceeded in Mozambique, roughly half (442) localities were fully cleared by the end of 2007.

2.2 Correlates of the First Intervention across Localities

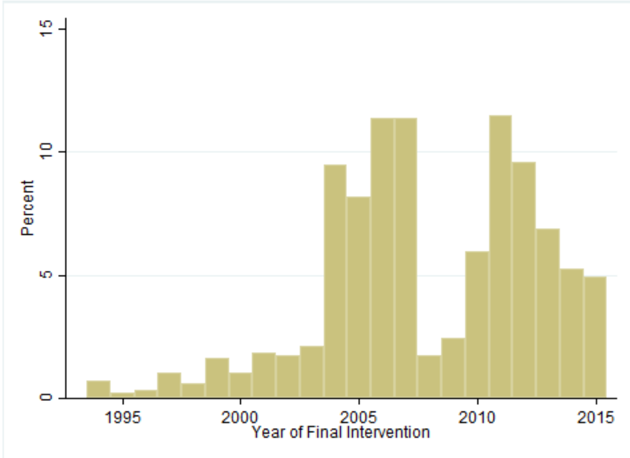
We commence the examination of the correlates of the timing of clearance, investigating the geographical and socioeconomic correlates of the first year of intervention at the locality level. The sample consists of 786 localities that had at least one confirmed hazardous area (CHA) and we have information on the population density as of 1980 (overall 855 localities were contaminated).[4]

Table 5 reports Poisson ML model estimates. The dependent variable is the number of years elapsed between 1992 and the year of the first intervention in a given locality. Thus, the outcome

[4]The results are similar if we use all 855 contaminated localities rather than restricting estimation to those with population info in the 1980 Census.



Panel A: First Intervention



Panel B: Last Intervention

Figure 2: **Distribution of First and Last Intervention by Locality**

variable takes values from one (first clearance took place in 1993) up until twenty one (first clearance in 2013). Figure 2 gives an illustration of the distribution. As before, all specifications include province fixed-effects to account for the non-negligible heterogeneity of clearance across the country. We always control for the land surface of the locality, as larger in terms of land area localities seem to have been targeted earlier than smaller ones.

Across the different specifications, we find that demining began earlier in localities adjacent to the Malawian border; this seems to reflect the response to the early humanitarian emergency and the need to repatriate the large number of refugees (more than 1 million) from camps in Malawi in 1993 – 1994. Conversely, localities along the Zimbabwean border saw a late first intervention. The history of demining operations backs-up this findings as many minefields close to the Zimbabwe cleared in the ending phases. Interventions started earlier in localities with higher population density in 1980 and localities that experienced major civil war events. Elements of the colonial transportation network enter with a negative sign suggesting prioritization of the transportation corridors, however, they are not statistically significant. While in some instances demining prioritized the clearance of roads (with Malawi for example), many roads were left unclear in the early phases.

2.3 Correlates of the Final Intervention across Localities (Full Clearance)

We then examine the geographical, location, and socioeconomic correlates of the final year of interventions (full clearance) looking again on localities with at least one confirmed hazardous area (CHA). The dependent variable is the number of years between 1992 and the year of the last clearing operation in a given locality. Thus, the dependent variable takes values from zero up to twenty three. Figure 2 gives an illustration of the distribution.

Table 6 reports Poisson ML estimates. The table mirrors 5. The province constants -included in all specifications- are highly significant, as clearance was completed in the Northern provinces before the Centre and the South. Log land area and enters in all permutations with a significantly positive coefficient. So, although demining operations start earlier in large (in terms of area) localities (often close to the borders), these localities are fully cleared from landmines later.

Adjacent to Zimbabwe, Swaziland, and Tanzania localities were cleared at a later stage. This accords well with the historical narrative of landmine clearance (see Appendix *II*). For example the large minefields on the Tanzanian border, laid by the Portuguese during the war of independence, were cleared by HALO Trust just before the completion of their activities in the Northern Provinces. Likewise, some large minefields in the Zimbabwe border, laid by the Rhodesian armed forces and by FRELIMO in the early stages of the civil war, were cleared in the end (and minefields on the Zimbabwe side are currently cleared). Features of early development, presence of commercial hubs, the 1973 transportation network, population density in 1980, and light density in 1992 are not much correlated with the timing of localities' full clearance from landmines and UXOs. Moreover, the increase in the R^2 when adding the rich vector of potential covariates in column (9) is tiny, 33.9% as compared to 0.32 when we solely add province constants and log land area.

The timing of localities' full clearance is likely affected by the extent of contamination, which, however, was far from known when demining operations started in 1992 (and even in 2001 when the Landmine Impact Survey was conducted). In localities with more CHAs, clearing may take longer, *ceteris paribus*. So, we re-estimated the Poisson ML specifications associating the timing of full clearance with the various locational, geographic, and socioeconomic variables, conditioning on the degree of contamination. To that effect, we assign contaminated localities into five quintiles based on the number of CHA and rerun the Poisson ML model augmenting the specifications with these dummy variables.

Table 7 reports the results. Before discussing the estimates it is important to stress that these specifications are far from ideal, as the government, demining operators, donors, and the United Nations had a scattered and incomplete knowledge of the spatial distribution of contamination. Not surprisingly localities with fewer CHAs were cleared earlier. Conditioning on the degree of contamination renders most variables insignificant. It is instructive to look at the difference in the predictive power between the specification in column (1) to that of column (9). Adding these 20 covariates reflecting important geographic and socioeconomic traits the fitted R^2 barely increases.

2.4 Summary

The analysis of the correlates of the timing of landmine clearance shows that the process of rendering localities landmine-free did not follow a systematic pattern. While some areas experienced earlier interventions (for example larger in terms of size localities and somewhat more developed localities), the timing of full clearance is not systematically related to locational and socioeconomic features. These simple cross-sectional results fit with the narrative (detailed in Appendix II) of landmine clearance and its key features: the lack-of-coordination among demining operators and the government; the weak capacity of the governmental agencies dealing with demining (CND and IND), the ad-hoc and short-term nature of landmine clearance operations, with NGOs being financially constrained, the flaws of the 1994 and 2001 nation-wide surveys, and the swings in donor support.

Table 1: **Descriptive Statistics**

	Population Sample					
	Observations	Mean	Standard Deviation	Median	Min	Max
Share of Contaminated localities in 1992	1077	0.730	0.444	1.000	0	1
Number of Threats in 1992	1077	6.534	14.715	3.000	0	238
Lit 1992	1077	0.104	0.305	0.000	0	1
Adjacent Zimbabwe (dummy)	1077	0.032	0.175	0.000	0	1
Adjacent Zambia (dummy)	1077	0.013	0.113	0.000	0	1
Adjacent South Africa (dummy)	1077	0.014	0.117	0.000	0	1
Adjacent Malawi (dummy)	1077	0.044	0.204	0.000	0	1
Adjacent Swaziland (dummy)	1077	0.006	0.080	0.000	0	1
Adjacent Tanzania (dummy)	1077	0.014	0.117	0.000	0	1
Elevation	1077	0.327	0.332	0.209	0	1.73
Malaria Ecology	1077	11.191	3.446	11.239	.267	18.6
Suitability of Agriculture	1077	0.485	0.190	0.452	.0895	.968
Log - Number of Villages	1077	2.080	0.808	2.079	0	4.49
Log - Distance Coast	1077	-2.243	1.085	-2.113	-4.6	-.372
Paved Road 1973 (dummy)	1077	0.182	0.386	0.000	0	1
Unpaved Road 1973 (dummy)	1077	0.021	0.145	0.000	0	1
Trail 1973 (dummy)	1077	0.669	0.471	1.000	0	1
Railway Colonial (dummy)	1077	0.131	0.337	0.000	0	1
Navigable River (dummy)	1077	0.228	0.420	0.000	0	1
Cantina 1965 (dummy)	1077	0.608	0.488	1.000	0	1
Civil War (dummy)	1077	0.165	0.372	0.000	0	1

Notes: The table gives summary statistics for the main variables across Mozambican localities for which information on population across the different censi (1980, 1997, 2007); this is the unit of analysis. The Data Appendix gives detailed variable definitions and data sources.

Table 2: **Correlates of Minefields - Linear Probability. Province FE**

	Threat (dummy)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Adjacent Zimbabwe (dummy)		0.057							0.110
		(0.088)							(0.072)
Adjacent Zambia (dummy)		-0.227**							-0.076
		(0.114)							(0.092)
Adjacent South Africa (dummy)		0.043							0.024
		(0.101)							(0.110)
Adjacent Malawi (dummy)		-0.041							-0.092
		(0.067)							(0.066)
Adjacent Swaziland (dummy)		-0.081							-0.162**
		(0.049)							(0.073)
Adjacent Tanzania (dummy)		-0.026							0.055
		(0.132)							(0.128)
Elevation			0.086						0.110
			(0.132)						(0.122)
Malaria Ecology			0.021**						0.022***
			(0.009)						(0.008)
Suitability of Agriculture			-0.126						-0.142
			(0.095)						(0.094)
Log - Number of Villages			0.074***						0.044*
			(0.026)						(0.024)
Log - Distance Coast			0.061						0.062
			(0.042)						(0.040)
Paved Road 1973 (dummy)				0.116***					0.104***
				(0.038)					(0.039)
Unpaved Road 1973 (dummy)				0.084					0.116
				(0.116)					(0.113)
Trail 1973 (dummy)				0.167***					0.122***
				(0.036)					(0.032)
Railway Colonial (dummy)				0.127***					0.100**
				(0.044)					(0.042)
Navigable River (dummy)				0.025					0.004
				(0.034)					(0.034)
Civil War (dummy)					0.225***				0.153***
					(0.025)				(0.027)
Cantina 1965 (dummy)						0.115***			0.050*
						(0.027)			(0.029)
Lit							0.089**		-0.021
							(0.043)		(0.044)
Log - Population Density 1980								0.068***	0.035**
								(0.013)	(0.014)
Log - Land	0.079***	0.079***	0.028*	0.077***	0.082***	0.074***	0.082***	0.148***	0.067***
	(0.014)	(0.014)	(0.015)	(0.013)	(0.013)	(0.014)	(0.014)	(0.018)	(0.020)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	.115	.114	.155	.165	.148	.13	.118	.134	.226
Observations	1077	1077	1077	1077	1077	1077	1077	1077	1077

Notes: The table reports the linear probability model (LPM) estimates associating the presence of confirmed hazardous areas (CHAs) at the locality level with location, geography, and other locality characteristics. In all specifications the dependent variable is an indicator variable that takes on the value of one if a at least one confirmed threat was present in the locality. All specifications include the log of land area and province fixed effect. In Column (1), we control for the log landmass. In column (2), we control for the (log) distance of the municipality centroid from the border of South Africa, Zimbabwe, Malawi, Tanzania, Zambia, and Swaziland. In Column (3), we control for geographic and location characteristics at municipality level such as mean elevation, malaria stability index, suitability of agriculture, (log) distance from the closest big city (Maputo, Beira or Nacala), and (log) distance from the coast. Column (4) introduces transportation network elements at colonial time (1973) like presence of paved road (dummy), unpaved road (dummy), trail (dummy), railways (dummy). In columns (5), (6), (7), and (8) we include a dummy for Civil War events, an indicator for the presence of colonial commercial harbors (*Cantinas*), a dummy equal one if the municipality is lit in 1992, and the (log) of population density in 1980. In Column (9) we controls for all the controls together. The Data Appendix gives detailed variable definitions and data sources. Below the estimates, the table gives standard errors clustered at the Admin-2 level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3: **Correlates of Minefields - Poisson ML. Province FE**

	Number of Threats (count)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Adjacent Zimbabwe (dummy)		-0.010							0.263
		(0.452)							(0.346)
Adjacent Zambia (dummy)		-1.443***							-0.946**
		(0.416)							(0.367)
Adjacent South Africa (dummy)		0.535**							0.713***
		(0.232)							(0.218)
Adjacent Malawi (dummy)		0.136							-0.092
		(0.208)							(0.243)
Adjacent Swaziland (dummy)		-0.121							-0.037
		(0.337)							(0.230)
Adjacent Tanzania (dummy)		-0.226							0.332
		(0.303)							(0.307)
Elevation			0.179						-0.314
			(0.754)						(0.962)
Malaria Ecology			0.014						0.020
			(0.033)						(0.040)
Suitability of Agriculture			0.264						0.128
			(0.364)						(0.295)
Log - Number of Villages			0.361***						0.266**
			(0.119)						(0.118)
Log - Distance Coast			-0.003						0.176
			(0.134)						(0.142)
Paved Road 1973 (dummy)				0.709***					0.655***
				(0.119)					(0.113)
Unpaved Road 1973 (dummy)				0.063					0.116
				(0.239)					(0.235)
Trail 1973 (dummy)				0.268					0.210
				(0.184)					(0.152)
Railway Colonial (dummy)				0.400*					0.465**
				(0.229)					(0.191)
Navigable River (dummy)				-0.216					-0.221
				(0.167)					(0.176)
Civil War (dummy)					0.696***				0.477***
					(0.170)				(0.163)
Cantina 1965 (dummy)						0.213			-0.102
						(0.152)			(0.139)
Lit							0.188		-0.341**
							(0.163)		(0.133)
Log - Population Density 1980								0.273***	0.151**
								(0.057)	(0.059)
Log - Land	0.348***	0.338***	0.267***	0.437***	0.330***	0.337***	0.355***	0.617***	0.412***
	(0.050)	(0.051)	(0.061)	(0.064)	(0.045)	(0.049)	(0.050)	(0.071)	(0.075)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1077	1077	1077	1077	1077	1077	1077	1077	1077
Log Likelihood	-6657	-6598	-6440	-6127	-6344	-6624	-6645	-6413	-5635
R2 Fitted	.111	.114	.151	.199	.148	.113	.124	.134	.266

Notes: The table reports the Poisson Maximum Likelihood (ML) estimates associating the presence of confirmed hazardous areas (CHAs) at the locality level with location, geography, and other locality characteristics. In all specifications the dependent variable is the number of confirmed hazardous areas present in the locality. All specifications include the log of land area and province fixed effect. In Column (1), we control for the log landmass. In column (2), we control for the (log) distance of the municipality centroid from the border of South Africa, Zimbabwe, Malawi, Tanzania, Zambia, and Swaziland. In Column (3), we control for geographic and location characteristics at municipality level such as mean elevation, malaria stability index, suitability of agriculture, (log) distance from the closest big city (Maputo, Beira or Nacala), and (log) distance from the coast. Column (4) introduces transportation network elements at colonial time (1973) like presence of paved road (dummy), unpaved road (dummy), trail (dummy), railways (dummy). In columns (5), (6), (7), and (8) we include a dummy for Civil War events, an indicator for the presence of colonial commercial harbors (*Cantinas*), a dummy equal one if the municipality is lit in 1992, and the (log) of population density in 1980. In Column (9) we controls for all the controls together. The Data Appendix gives detailed variable definitions and data sources. Below the estimates, the table gives standard errors clustered at the Admin-2 level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4: Total Number of Years to Clear a Locality

Total Number of years to fully clear a locality	Number of Localities	Percentage of Muncipalities
	(1)	(2)
0	191	22.34
1	35	4.09
2	37	4.33
3	37	4.33
4	52	6.08
5	52	6.08
6	45	5.26
7	37	4.33
8	38	4.44
9	38	4.44
10	37	4.33
11	27	3.16
12	42	4.91
13	40	4.68
14	30	3.51
15	28	3.27
16	27	3.16
17	17	1.99
18	18	2.11
19	8	0.94
20	16	1.87
21	3	0.35
Total	855	100

Notes: The table tabulates the time elapsed between the first and last intervention in the Mozambican localities, for which information on population across the different censi (1980, 1997, 2007). For further details on the duration of intervention see Appendix III.

Table 5: **Number of Years until First Intervention. Poisson ML. Province FE**

	Number of Years until First Intervention								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Adjacent South Africa (dummy)		-0.002							-0.002
		(0.096)							(0.126)
Adjacent Zimbabwe (dummy)		0.258***							0.214***
		(0.081)							(0.082)
Adjacent Malawi (dummy)		-0.336**							-0.256*
		(0.149)							(0.148)
Adjacent Tanzania (dummy)		0.078							0.039
		(0.069)							(0.100)
Adjacent Zambia (dummy)		0.195							0.051
		(0.144)							(0.126)
Adjacent Swaziland (dummy)		0.012							0.110
		(0.126)							(0.094)
Elevation			-0.054						-0.027
			(0.173)						(0.171)
Malaria Ecology			-0.015						-0.016
			(0.011)						(0.012)
Suitability of Agriculture			-0.236*						-0.145
			(0.138)						(0.123)
Log - Number of Villages			-0.053						-0.016
			(0.034)						(0.033)
Log - Distance Coast			0.015						0.009
			(0.051)						(0.053)
Paved Road 1973 (dummy)				-0.086					-0.036
				(0.058)					(0.061)
Unpaved Road 1973 (dummy)				-0.180					-0.219*
				(0.123)					(0.117)
Trail 1973 (dummy)				-0.115***					-0.065
				(0.043)					(0.044)
Railway Colonial (dummy)				-0.114					-0.083
				(0.093)					(0.081)
Navigable River (dummy)				-0.020					-0.011
				(0.061)					(0.059)
Civil War (dummy)					-0.267***				-0.230***
					(0.053)				(0.054)
Cantina 1965 (dummy)						-0.098**			-0.011
						(0.040)			(0.041)
Lit							-0.065		0.046
							(0.056)		(0.054)
Log - Population Density 1980								-0.077***	-0.046**
								(0.022)	(0.022)
Log - Land	-0.030*	-0.041**	-0.018	-0.034*	-0.039**	-0.027	-0.032*	-0.107***	-0.088***
	(0.017)	(0.018)	(0.021)	(0.018)	(0.017)	(0.018)	(0.018)	(0.023)	(0.031)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	786	786	786	786	786	786	786	786	786
Log Likelihood	-2399	-2377	-2385	-2378	-2365	-2392	-2398	-2383	-2319
R2 Fitted	.103	.128	.125	.134	.139	.112	.106	.126	.197

Notes: The table reports the Poisson Maximum Likelihood (ML) estimates associating the timing of the first intervention at the locality level with location, geography, and other locality characteristics. In all specifications the dependent variable is the number of years (from 1 to 22) until first intervention took place in the locality (from 1992). All specifications include the log of land area and province fixed effect. In Column (1), we control for the log landmass. In column (2), we control for the (log) distance of the municipality centroid from the border of South Africa, Zimbabwe, Malawi, Tanzania, Zambia, and Swaziland. In Column (3), we control for geographic and location characteristics at municipality level such as mean elevation, malaria stability index, suitability of agriculture, (log) distance from the closest big city (Maputo, Beira or Nacala), and (log) distance from the coast. Column (4) introduces transportation network elements at colonial time (1973) like presence of paved road (dummy), unpaved road (dummy), trail (dummy), railways (dummy). In columns (5), (6), (7), and (8) we include a dummy for Civil War events, an indicator for the presence of colonial commercial harbors (*Cantinas*), a dummy equal one if the municipality is lit in 1992, and the (log) of population density in 1980. In Column (9) we controls for all the controls together. The Data Appendix gives detailed variable definitions and data sources. Below the estimates, the table gives standard errors clustered at the Admin-2 level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6: **Number of Years until Last Intervention. Poisson ML. Province FE**

	Number of Years until Last Intervention								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Adjacent South Africa (dummy)		0.035							0.025
		(0.038)							(0.038)
Adjacent Zimbabwe (dummy)		0.122***							0.125***
		(0.043)							(0.047)
Adjacent Malawi (dummy)		-0.016							-0.033
		(0.053)							(0.052)
Adjacent Tanzania (dummy)		0.062							0.120**
		(0.057)							(0.059)
Adjacent Zambia (dummy)		-0.067							-0.083
		(0.109)							(0.105)
Adjacent Swaziland (dummy)		0.061**							0.064*
		(0.027)							(0.037)
Elevation			0.058						0.036
			(0.088)						(0.091)
Malaria Ecology			-0.003						-0.001
			(0.007)						(0.007)
Suitability of Agriculture			-0.042						-0.046
			(0.061)						(0.062)
Log - Number of Villages			0.023						0.018
			(0.017)						(0.017)
Log - Distance Coast			-0.001						0.011
			(0.023)						(0.024)
Paved Road 1973 (dummy)				0.037					0.037
				(0.027)					(0.031)
Unpaved Road 1973 (dummy)				0.015					0.010
				(0.038)					(0.037)
Trail 1973 (dummy)				0.021					0.016
				(0.020)					(0.019)
Railway Colonial (dummy)				-0.007					-0.001
				(0.037)					(0.035)
Navigable River (dummy)				-0.029					-0.034
				(0.023)					(0.023)
Civil War (dummy)					0.023				0.003
					(0.021)				(0.023)
Cantina 1965 (dummy)						0.033			0.022
						(0.020)			(0.020)
Lit							0.002		-0.017
							(0.030)		(0.033)
Log - Population Density 1980								0.020*	0.014
								(0.011)	(0.012)
Log - Land	0.030***	0.026***	0.024**	0.032***	0.030***	0.029***	0.030***	0.049***	0.034*
	(0.009)	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.014)	(0.018)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	786	786	786	786	786	786	786	786	786
Log Likelihood	-2179	-2174	-2175	-2176	-2178	-2177	-2179	-2177	-2166
R2 Fitted	.32	.329	.331	.324	.321	.322	.32	.32	.339

Notes: The table reports the Poisson Maximum Likelihood (ML) estimates associating the timing of the last intervention at the locality level with location, geography, and other locality characteristics. In all specifications the dependent variable is the number of years (from 1 to 23) until last intervention took place in the locality (from 1992). All specifications include the log of land area and province fixed effect. In Column (1), we control for the log landmass. In column (2), we control for the (log) distance of the municipality centroid from the border of South Africa, Zimbabwe, Malawi, Tanzania, Zambia, and Swaziland. In Column (3), we control for geographic and location characteristics at municipality level such as mean elevation, malaria stability index, suitability of agriculture, (log) distance from the closest big city (Maputo, Beira or Nacala), and (log) distance from the coast. Column (4) introduces transportation network elements at colonial time (1973) like presence of paved road (dummy), unpaved road (dummy), trail (dummy), railways (dummy). In columns (5), (6), (7), and (8) we include a dummy for Civil War events, an indicator for the presence of colonial commercial harbors (*Cantinas*), a dummy equal one if the municipality is lit in 1992, and the (log) of population density in 1980. In Column (9) we controls for all the controls together. The Data Appendix gives detailed variable definitions and data sources. Below the estimates, the table gives standard errors clustered at the Admin-2 level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: **Number of Years until First Intervention. Poisson ML. Province FE. Controlling for CHAs Contamination.**

	Number of Years until Last Intervention								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CHAs - 1st Quintile	-0.305***	-0.303***	-0.304***	-0.306***	-0.308***	-0.304***	-0.305***	-0.304***	-0.304***
	(0.026)	(0.027)	(0.025)	(0.026)	(0.027)	(0.027)	(0.026)	(0.027)	(0.027)
CHAs - 2nd Quintile	-0.116***	-0.109***	-0.116***	-0.119***	-0.119***	-0.115***	-0.115***	-0.115***	-0.115***
	(0.026)	(0.027)	(0.026)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)	(0.027)
CHAs - 3rd Quintile	-0.108***	-0.106***	-0.106***	-0.108***	-0.110***	-0.107***	-0.108***	-0.107***	-0.106***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
CHAs - 4th Quintile	-0.047***	-0.043***	-0.049***	-0.047***	-0.048***	-0.047***	-0.047***	-0.047***	-0.044***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.016)
CHAs - 5th Quintile	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Adjacent South Africa (dummy)		0.015							0.009
		(0.034)							(0.038)
Adjacent Zimbabwe (dummy)		0.083***							0.076**
		(0.029)							(0.033)
Adjacent Malawi (dummy)		-0.066							-0.070
		(0.051)							(0.053)
Adjacent Tanzania (dummy)		0.035							0.070
		(0.057)							(0.065)
Adjacent Zambia (dummy)		0.037							0.007
		(0.102)							(0.099)
Adjacent Swaziland (dummy)		0.028*							0.030
		(0.016)							(0.031)
Elevation			0.020						0.002
			(0.076)						(0.079)
Malaria Ecology			-0.004						-0.004
			(0.006)						(0.006)
Suitability of Agriculture			-0.053						-0.038
			(0.053)						(0.054)
Log - Number of Villages			0.008						0.011
			(0.014)						(0.014)
Log - Distance Coast			-0.003						0.006
			(0.020)						(0.022)
Paved Road 1973 (dummy)				0.013					0.012
				(0.023)					(0.027)
Unpaved Road 1973 (dummy)				0.001					-0.004
				(0.026)					(0.027)
Trail 1973 (dummy)				-0.004					-0.004
				(0.018)					(0.018)
Railway Colonial (dummy)				-0.006					-0.001
				(0.034)					(0.032)
Navigable River (dummy)				-0.033					-0.035*
				(0.020)					(0.020)
Civil War (dummy)					-0.013				-0.023
					(0.021)				(0.021)
Cantina 1965 (dummy)						0.018			0.024
						(0.019)			(0.018)
Lit							0.011		0.015
							(0.025)		(0.026)
Log - Population Density 1980								0.003	-0.000
								(0.010)	(0.011)
Log - Land	0.007	0.004	0.005	0.008	0.006	0.006	0.007	0.009	0.001
	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)	(0.008)	(0.008)	(0.011)	(0.015)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	786	786	786	786	786	786	786	786	786
Log Likelihood	-2108	-2105	-2105	-2106	-2107	-2107	-2108	-2108	-2101
R2 Fitted	.467	.472	.47	.469	.467	.468	.468	.467	.48

Notes: The table reports the Poisson Maximum Likelihood (ML) estimates associating the timing of the last intervention at the locality level with location, geography, and other locality characteristics. In all specifications the dependent variable is the number of years (from 1 to 23) until last intervention took place in the locality (from 1992). All specifications include the log of land area, province fixed effect, and quintiles of contamination of confirmed hazardous areas. In Column (1), we control for the log landmass and quintiles of contamination of confirmed hazardous areas. In column (2), we control for the (log) distance of the municipality centroid from the border of South Africa, Zimbabwe, Malawi, Tanzania, Zambia, and Swaziland. In Column (3), we control for geographic and location characteristics at municipality level such as mean elevation, malaria stability index, suitability of agriculture, (log) distance from the closest big city (Maputo, Beira or Nacala), and (log) distance from the coast. Column (4) introduces transportation network elements at colonial time (1973) like presence of paved road (dummy), unpaved road (dummy), trail (dummy), railways (dummy). In columns (5), (6), (7), and (8) we include a dummy for Civil War events, an indicator for the presence of colonial commercial harbors (*Cantinas*), a dummy equal one if the municipality is lit in 1992, and the (log) of population density in 1980. In Column (9) we controls for all the controls together. The Data Appendix gives detailed variable definitions and data sources. Below the estimates, the table gives standard errors clustered at the Admin-2 level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

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