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After Janjaweed?
Socioeconomic Impacts of the Conflict in Darfur

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Abstract

In this article, we use a unique database on 542 villages in southwestern Darfur to analyze patterns of population growth and land reallocation that have emerged as a consequence of the recent conflict. Our analysis demonstrates that a displacement from this region alone of more than 300,000 people from three targeted African groups has occurred and that villages have been repopulated by Arab and other African groups. Almost a fourth of all villages have been squatted by newly settled populations. The probability of squatting is shown to be largest in peripheral areas with good access to surface water, where soils are of good quality, and where many households from targeted tribes have fled. A key challenge in post-conflict reconstruction will therefore be the restoration of rights to land.

Key words: Population growth, land redistribution, reconstruction, Darfur
JEL Classification codes: P16, O41

*The findings, interpretations, and conclusions expressed in this paper are entirely those of the author. Although data has been generously shared by some international organizations, our research has been fully independent at all stages. Eyerusalem Siba has provided essential input throughout this project. Email: ola.olsson@economics.gu.se.

1 Introduction

In August, 2009, the commander of the UN troops in Darfur, General Martin Agwai, proclaimed that the conflict that had taken 300,000 lives and left some 2.7 million people displaced, was effectively over. What remained was "...banditry, localised issues, people trying to resolve issues over water and land at a local level." (Howden, 2009). Although this conclusion has been strongly criticized by several Sudan observers (see for instance Reeves, 2009), it at least points towards a future when Janjaweed attacks have ceased and post-conflict reconstruction can be initiated.

In this article, we use data from 542 villages in southwestern Darfur, hosting a total population of about 786,000 people, to examine two critical issues for post-conflict policy; patterns of population growth and land redistribution that have emerged as a result of the conflict. Our analysis shows that whereas total population has decreased by about a third, the civilian population from the three rebel tribes has decreased by 57 percent. Non-rebel groups, belonging to Arab and other African tribes, have instead increased their population in the region. Our regression analysis further shows that widespread squatting by non-rebel groups has mainly taken place in peripheral villages, far from administrative centers, with relatively good soils and access to water and where many rebel tribe households have been displaced. Taken together, these patterns clearly indicate a massive redistribution of land which will require urgent attention if a stable peace is to be accomplished in the region.

The data used in this article has been collected by an international organization operating in the area and has previously featured in only two other papers. Olsson and Siba (2009) investigate whether patterns of attacks by the combined Janjaweed and government forces can be mainly explained by ethnic cleansing ambitions or by attempts at capturing attractive lands with good access to water and fertile soils. The analysis clearly suggests that the presence of rebel tribe households is a key variable for understanding attacks on villages, but that resource variables also have some explanatory power. In a working paper, Olsson and Valsecchi (2010) develop various measures of ethnic cleansing and then apply them to the same data.

A few other papers have also exploited micro data from Darfur to assess the social and economic impacts of the crisis. The only other work that is somewhat related to ours is that of Vanrooyen et al (2008) who analyze the destruction of livelihoods as a consequence of the conflict. Their study is based on interviews with 46 household heads who are currently refugees in Chad but who are originally from three villages in Darfur. The study documents extensive losses of livelihoods such as livestock and lands, as well as personal property. The authors also estimate the extent of killings and identify whether the attackers belonged to the Arab militias,

the government military, or both.[1]

The research in this paper is also related to a growing literature on the determinants and effects of mass violence on a micro level (see Blattman and Miguel, 2008, for an overview of this literature). Both André and Platteau (1998) and Verwimp (2005) use individual-level data from individual Rwandan villages and show that land stress appears to have played a key role for the conflict outbreak in 1994. In a study of 5,200 villages in Aceh, Indonesia, Czaika and Kis-Katos (2009) find that ethnic identity does not seem to matter much for (forced) migration patterns and that traditional socio-economic variables behind migration retained an important role. Other studies (on Nepal) include Murshed and Gates (2005) and Do and Iyer (2007). There is also a small literature on post-conflict reconstruction which so far has had a macro focus (Collier and Hoeffler, 2004).

Our study is unique in the sense that our sample of villages actually makes up the universal population of villages in southwestern Darfur. The organization that collected the data had an explicit aim of covering every rural village in the area. Hence, unlike Vanrooyen et al (2008) and many other micro studies, issues regarding sampling and representativity are less relevant for us. A second unique feature of our study is the number of villages covered - 542 as compared to three in Vanrooyen et al (2008) - and the detailed information regarding the ethnic composition of the village population before and after conflict.[2] Thirdly, our work is the first to document the massive population changes among certain groups in the area and the associated patterns of land redistribution from dispossessed rebel tribe populations to Arab and other African populations.

The article is structured as follows: In section two, we provide a brief background to the conflict in Darfur and to the existing system of property rights to land. Section three presents the empirical analysis and discusses the data, descriptive statistics, individual village examples, and finally the regression exercises. Section four contains a discussion of the policy-implications of our results, whereas section five concludes.

[1] In addition, two studies use data from the US State Department Atrocities Documentation Survey, based upon a random sample of 1,136 Darfur refugees from 20 camps in Chad (Hagan and Rymond-Richmond, 2008; Hagan et al, 2009). The main dependent variables in these studies are the use of racial epithets during attacks and the level of sexual victimization. Deporteere et al (2004) collected a random sample of 3,175 households among the internally displaced population in Western Darfur as of June 2004, in order to assess mortality rates in the region.

[2] A limitation of our study is, on the other hand, the lack of household or individual level data.

2 The Darfur conflict

2.1 General background

Darfur is Sudan's westernmost province, bordering Chad to the west. It has an area of roughly 500,000 square kms (equivalent to the size of Spain) and stretches from uninhabited desert areas in the north, to a Sahelian semi-arid area in the center, and a more fertile savanna landscape in the south. The cultural core part of the region is the Jebel Marra mountains where rains are relatively abundant and which historically has been the homeland of Darfur's dominant tribe, the Fur.[3] The area has no lakes, no rivers, and is one of the most landlocked places on earth. As of early 2010, it has no known oil reservoirs.

It is estimated that Darfur as a whole hosts some 6.5 million people, divided up into the three provinces North Darfur, West Darfur, and South Darfur, each with their own 'capital' city. The Fur is the largest tribe with some 2 million inhabitants, but the region is populated by a mosaic of some 60-70 distinct ethnic groups. Although any categorization is problematic, the population is often divided into old 'African' tribes, like the Fur and the Masalit, who have been present in the region for a long time and who have their own *dars*, or homelands, which traditionally constituted partially independent jurisdictions. Among the African tribes, there are also 'new Africans', like the Tama, Dajo, and Borgo, who are smaller and have historically had weaker rights to land. Most African tribes are sedentary crop farmers. A third ethnic category are the Arabs, who are typically camel or cattle nomads. It is important to note that more or less all tribes in the area are Muslim and that Arabic serves as a lingua franca in the region.

For centuries, Darfur was an independent sultanate dominated by the Fur people.[4] Although the central parts of Sudan came under British control after the battle of Omdurman in 1898, Darfur was not integrated into the Sudanese colony until 1916. A period of neglect and marginalization now started which would continue even after Sudan's independence in 1956. Darfur played only a minor role in the long civil war between the north and the south of the country that ranged during 1956-72 and then continued after 1983. A peace and power-sharing deal between north and south was finally struck in 2005.

The general decrease in rainfall from the early 1970s and the big Sahelian drought in 1985 put a great strain on the relationship between cultivators and nomads in Darfur.[5] Although precipitation generally declined by about 20 percent from 1975

[3] The name 'Darfur' means literally 'the land of the Fur'.

[4] For an extensive account of Darfur's history, see for instance Prunier (2007).

[5] Olsson (2009) provides a narrative of how the decline in land quality due to drought caused social interaction and market integration to deteriorate. See also Kevane and Gray (2008) for an empirical analysis of rainfall and conflict in Darfur.

and land quality fell everywhere in Darfur, the more fertile parts around Jebel Marra and in the south nonetheless experienced a dramatic inflow of population. Most of these newcomers were nomads from even drier parts of the Sahel. Clashes between cultivators and nomads over land and grazing rights became common.

The most recent major conflict in Darfur is usually described as having been initiated in February 2003 when two rebel groups, JEM and SLM, announced their opposition to the government in Khartoum and soon started attacking government outposts in the area. Whereas JEM was dominated by certain Zaghawa clans, SLM mainly included Fur, Masalit, and other Zaghawa clans. After a period of confusion, the government mobilized a militia of loyal Arab tribes - the *Janjaweed* - and assisted them in a massive counter-insurgency campaign aimed at civilian villages.[6] The years 2003-04 were the most intense. The standard pattern of attacks was that they started with air raids by government aircraft, whereupon the Janjaweed would move in, mounted on camels, horses, or small pickups, and continued by shooting men, raping girls and women, killing or stealing livestock, poisoning wells, systematically destroying fields, and eventually setting the whole village ablaze. Survivors were driven out into the desert or chased down and killed (Prunier, 2007; Vanrooyen et al, 2008). In this way, some 300,000 people are believed to have succumbed throughout Darfur and 2.7 million people became refugees in Darfur or in camps in neighboring Chad. Many more would have died without the massive international aid operation that soon was in place.

A Security Council resolution in 2007 decided on a hybrid UN/African Union peacekeeping force called UNAMID which currently includes some 19,000 military and police personnel. Its commander, Martin Agwai, claimed in August 2009 that the large-scale war was actually over although the security situation was still serious (Howden, 2009). Before that, in March the same year, the prosecutor at the International Criminal Court in the Hague issued a warrant of arrest for Sudan's president Omar al-Bashir for war crimes and crimes against humanity in Darfur (ICC, 2009).

2.2 Land

The key natural resource in Darfur is land which is primarily used for cultivation of crops like millet and for raising livestock such as camels or cattle.[7] As in many other developing countries, the main model for land rights in Darfur is customary land tenure, i.e. that sedentary groups own the land surrounding their village communally. In this system, households typically have usufructuary rights to plots but not private property rights in the Western sense of the word. If a household stops using a piece of land, the community leader can reallocate the land to some other household

[6] The word 'Janjaweed' is usually said to mean 'evil horsemen'.

[7] This section draws heavily on mainly Abdul-Jalil (2006), but also O'Fahey and Tubiana (2009).

who is deemed to need it more. Similarly, newcomers from other villages can be given plots if they show a willingness to contribute to the community. Uncultivated land is free for anyone to use.

Another important element of customary land tenure in Darfur is that fields are traditionally left open for grazing animals after harvest, a practice referred to as *talique*. This grazing right is also typically open to nomadic pastoralist groups who are allowed to let their animals graze on farmer lands in exchange for milk or meat. Sedentary groups who keep livestock sometimes even leave their animals in the care of the nomads.

This basic model of customary land tenure has over the years been modified by modern developments. When Darfur was an independent sultanate dominated by the Fur, a system referred to as *hakura* emerged whereby the sultan could grant land rights to holy men, preaching Islam, or to other important persons. With time, there also emerged a system of *administrative hakuras* whereby the sultan allotted certain lands to tribes (or formally to their leaders). This practice usually confirmed the area where tribes were then effectively residing. Such an administrative hakura is more commonly referred to as a *dar* and the largest tribes in Darfur all have a dar of their own, for instance the Fur, the Masalit, the Zaghawa, and the Rezeigat, the latter being a cattle-herding Arab tribe in the south.

The dar-system means that in for instance Dar Masalit, most villages will be dominated by Masalit tribespeople and a Masalit will be head of village. However, people from other tribes are usually also welcome if they are willing to contribute to the well-being of the community and might eventually be given land. Within dars, communal land tenure as described above continues to be the norm. During the colonial era, the British found this arrangement convenient and basically let traditional land institutions remain in place in the name of 'indirect rule'.

It is important to note however that far from all tribes in Darfur have their own dars. When rains started to decline in the 1970s, cattle-rearing nomads from the north and groups from Chad crowded into Darfur. The dar-system of mainly free settlement in villages, jurisdiction carried out by dar-owning tribes, and rights for nomads to let their animals graze farmer lands after harvest, was put under severe pressure. To add even further complexity, the Sudanese government adopted the unregistered land act (ULA) in 1970, stating that all unregistered land would be considered government property. In Darfur's peripheral villages, such registration rarely occurred, implying that groups without dars of their own could claim land as long as it was unoccupied.[8]

Recurrent droughts, large inflows of people, general underdevelopment, and un-

[8] Another law passed in 1984, the Civil Transactions Act, stated that local communities had usufructory rights over land that they effectively occupied (Abdul-Jalil, 2006).

clear land rights, in combination with political manipulations by groups in Chad and other neighboring countries (Prunier, 2007), all contributed to a rapidly deteriorating situation in Darfur during the 1980s and 1990s. Farming tribes like the Fur and the Masalit fought several violent clashes with nomadic tribes during this era. Farmland was increasingly fenced off, leaving the nomads with nowhere to go with their animals. As formulated by Flint and de Waal (2008, p 45): "The fabric of rural life never fully recovered." In 2003, the situation exploded.

3 Empirical analysis

3.1 Data

The data used in this study was collected by an international organization operating in Darfur.[9] A total of 562 villages in the southern part of West Darfur were visited by data collecting teams on several occasions, starting in 2004. Figure 1 gives a general overview of the sampled region. The data collection covered eight administrative units with a total size of about 25,000 sq km (almost equivalent to the size of Belgium and roughly 5 percent of Darfur's total territory). The main purpose of the data collection was to provide reliable information to aid organizations in the area concerning general geographical characteristics, number of refugees, whether villages had been destroyed or not, and information regarding access to health, education, and water facilities. The team had an explicit aim of covering *all* rural villages in the area as well as most smaller towns. Some larger towns were however excluded from the analysis.

For each village, data on the ethnic composition of the population before and after the onset of the crisis in 2003 was collected as well as the number of people fleeing. Data concerning the situation before the crisis was obtained by retrospection through interviews with traditional and administrative authorities as well as with ordinary villagers. The teams also gathered information about which villages that had been squatted since the conflict, i.e. where newcomers had moved in to take over land from fleeing populations. 20 villages had inconsistent numbers on ethnic composition and were therefore excluded, leaving a sample of 542 villages that is used in the statistical analysis. Taken together, these villages had a population of roughly 786,000 people before the crisis.[10] After the crisis, this number had decreased to about 525,000, i.e. a fall of about a third.

[9] Given the current security situation in Darfur, we have agreed not to disclose the identity of the organization(s) that have provided the data that our study builds upon. Until the situation in the area improves, more details about the data will only be communicated through personal correspondence with the author.

[10] The figure is calculated as 142,906 households times 5.5 individuals, which is the average household size in Darfur according to an estimate in Deporteere et al (2003).

The data above unfortunately did not include any useful proxies for land quality or access to natural resources. Using satellite images in Google Earth, we identified each village and calculated the distance in kms from the village to the nearest major wadi (at least 100 meters wide). Wadis are seasonally dry rivers which are a key source of surface water for both cultivators and livestock herders. From Google Earth, we also obtained data on altitude for each village in the sample. From FAO (1998), we further extracted information on average annual rainfall, temperature, vegetational cover and inherent soil quality.[11]

3.2 Descriptive statistics

The variables used in the empirical analysis are shown in table 1. Our analysis has three dependent variables. The first one is *popgrowth*, measuring population growth in percent from before the crisis to the latest available observation.[12] Typically, this variable has been assessed when some time has elapsed since the initial attack so that there has potentially been time for people to return.

The table shows that the average village had a negative population growth rate of roughly 34 percent. The standard deviation is however large and growth rates range from -100 percent for abandoned villages to 800 percent positive growth.[13] Figure 2 shows the distribution of population growth among villages in the eight administrative regions. It is noteworthy that Mukjar has been exceptionally adversely affected by the conflict with a median value of -1 among its 65 villages (i.e. a negative population growth of 100 percent). Zalingei has the highest median (-0.097) whereas Habila has a few villages that have grown at an exceptional rate.

The second dependent variable is *popincrease* which simply measures the change in the number of resident households from before the crisis to the latest observation. On average, about 88 households have left the villages in our sample. The extreme values are very large; Deleij witnessed a population increase of 6,581 households from a level of 1,264, whereas as many as 7,200 (mainly Fur households) abandoned the large town of Tanako along the Wadi Saleh with no one returning. In total, the number of households in the area declined by 47,454. Figure 3 shows the distribution of this population decline among rebel tribe and non-rebel populations across the eight administrative units. The figure documents one of the key findings of this paper; that the negative population growth in the region can be more or less completely attributed to displacements of Fur and Masalit households, i.e. of people

[11] See Olsson and Siba (2009) for a more detailed description of the data.

[12] It is only available for 530 observations since 12 settlements are newly founded and did not exist before the crisis. The median village was last visited in October, 2007.

[13] The village with the largest population growth was Dar Al Salam in Habila administrative unit which experienced an increase from 29 households of the Borgo tribe before the conflict to 261 households when the village was last visited in June 2006. Most of the newcomers were refugees (158) and IDPs (50).

from the rebel tribes. In total, 57,263 rebel tribe households (equivalent to about 57 percent of the original rebel tribe population) have left their villages whereas non-rebel groups have increased with 9,809 households. Garsila and Um-Kher have the largest net declines, whereas the 51 villages in Forobaranga even increased their total population by 1,051 households thanks to an inflow of 3,076 non-rebel tribe households.

The third dependent variable in our empirical analysis is *squatted* which is a binary dummy for whether the village has been squatted by newcomers or not. 125 villages have been squatted, i.e. almost a fourth of all villages. All of these had previously been destroyed or abandoned. Figure 4 shows the distribution of squatted villages over the eight administrative units. Visual inspection of figures 3 and 4 together strongly suggests that squatting has mainly occurred in areas where large numbers of rebel households have been displaced. Note that no village has been squatted in Zalingei.

Moving on to the independent variables, our measures of the population's ethnic composition are of course central. The variable *rebels_B* measures the share of Fur, Masalit, and Zaghawa households among the total population of villages before the conflict.[14] The vast majority of these households are civilian since the actual rebel fighters are usually not residing in the villages during this period. The mean value is 0.6, but this obscures the fact that rebel tribes have a segregated settlement pattern in the sense that they typically live in ethnically homogenous villages.[15] In our sample, 327 villages (60.3 percent of total) were either destroyed or abandoned (*destroyed_2*). After conflict, the share of rebel tribe households had fallen to about 20 percent (*rebels_A*=0.197). The mean level of population growth among rebel tribes is -46 percent (*rebelgrowth*). On average, villages had a 21 percent Arab population (*arabs_B*) and a 15.6 percent population of new African groups before the conflict (*newAfr_B*). After the conflict, our data show that these shares had changed to 29 and 13 percent respectively, i.e. a large Arab expansion (not shown in table 1). One last ethnic indicator is *EF_B*, measuring the ethnic Gini coefficient in each village. It has the standard interpretation of showing the probability that two randomly chosen households belong to different ethnic groups.[16] The mean value is quite low, only 0.16, which reflects the fact that many villages are ethnically homogenous and thus score 0.

Our proxies for natural resources and climate variables include distance to a major wadi (*d_wadi*), which has an average value of 6.34 kms. Average *rainfall*

[14] The label "_B" in the variables described below will denote "before conflict" whereas "_A" will denote "after conflict", i.e. at the latest observation.

[15] In the sample, there are 275 villages where the village population consist exclusively of Fur, Masalit or Zaghawa.

[16] See for instance Alesina et al (2003).

is about 705 mms and average *temperature* 25.3 degrees Celsius. Two indicators for *vegetation* and *soilquality* are also included as controls. Since the area studied is rather small, local variations in these climatic variables are also relatively small. *d_ admin* shows the distance in kms from the village to the administrative center in each administrative unit. Likewise, *d_ elgen*, *d_ elfash*, and *d_ nyala* measure the distance from each village to Darfur's three capitals El Geneina (West Darfur), El Fasher (North Darfur) and Nyala (South Darfur).

Average population before conflict (*popsize_ B*) is 264 households, whereas the median (not shown) is only 123. The largest unit in our sample is Tanako with a population of 7200 households. Finally, *n_ popsize* is the size of the population before conflict in a constructed neighborhood of 0.1 latitude degree by 0.1 longitude degree grid cells. In either north-south or east-west direction, a 0.1 degree distance is equivalent to about 10-11 kms. Our sample contains 151 populated such cells and *n_ popsize* should thus be thought of as population density.

3.3 Village examples

In order to get a stronger sense for the situation in the villages in our sample, we will briefly present a few examples. The locations of the villages are shown on the map in figure 1. A very typical village in terms of population size is for instance Taranga, located in Bindisi just 3.9 kms north of Bindisi town, the administrative center. Before the conflict, Taranga had a population of 120 households, all of them belonging to the Fur tribe. The village has a rather favorable location, only 2.5 kms from one of the major wadis in West Darfur and hence considered to be suitable for growing crops like millet. Expected *rainfall* in this area is somewhat above average (730 mms) and the village itself is located at an *altitude* of 667 meters. The neighborhood population density before conflict was quite high (*n_ popsize*=2,839 households) and people were distributed over 7 nearby villages which all had a homogenous rebel tribe population.

When the combined Janjaweed and government forces attacked the area, Taranga was destroyed and all of its 120 households fled.[17] All the population in the neighboring villages also fled, but eventually many refugees returned to nearby Bindisi town which increased its population from 1,800 to 3,763 households. When the data collecting teams last visited Taranga on October 4, 2007, the village was still abandoned and empty and had neither squatters nor returning refugees.

To the northwest, along the western banks of Wadi Saleh, lies the Masalit village of Mangarsa in Forobaranga administrative unit. Before the conflict, this village hosted 210 households, all of them Masalit. The area in which Mangarsa is located

[17] Using Google Earth, one can easily observe numerous black circles which are the remnants of burned huts; a characteristic feature of destroyed villages.

is one of the most fertile in the sampled region, close to one of Darfur's largest wadis with groves of protective planted trees nearby. The village lies right by a road that runs along the wadi banks and the wadi itself is only 1,650 meters away. The area offers both good pasture and cultivation potential. The village hosted a permanent primary school as well as a health clinic.

After the conflict broke out in 2003, the Arab militias moved along the road from one village to the next and destroyed every village on the western banks of Wadi Saleh, even those where no rebel tribes resided.[18] The attackers reached Mangarsa in December, 2003, and the whole population fled but returned after a while so that by October, 2007, 237 Masalit households were again populating the place and the school was once again put in operation with the assistance of an aid agency. This was the only village in this portion of the western wadi banks where a destroyed village was actually repopulated. On the eastern side of the wadi, very few villages were attacked at all.

About 65 kms to the east is Baya, a rather large community before the conflict with 530 households, all of them Fur. The village is located in a valley with a wadi only 510 meters to the east and with mountains to the north and south. The neighborhood is the most densely populated in our sample (8,917 households distributed over about 120 sq kms) with 12 Fur villages and one Zaghawa village. Not surprisingly, this strong concentration of rebel tribe populations was a tempting target for the Arab militias. The efficiency of the attackers was striking; every one of the 13 villages was destroyed or abandoned and all 8,917 households fled the area. By October, 2007, only 15 Fur households had dared to return to one of these villages. However, no less than 9 of the villages were squatted by Arab newcomers. In Baya, 10 households from the Meseriya tribe (one of the largest Arab tribes in West Darfur) had taken over the village when the teams visited the place in December, 2006.

Finally, in the northeastern part of our sampled region, in Zalingei administrative unit and at an altitude of 949 meters, we find the small village of Yathriba, settled by only 46 households from three Arabic tribes and by the African tribe Gimier. Ethnic fractionalization is here far above average (EF_B=0.674). Population density in the neighborhood is low with only 686 households, and 63 percent of this population is from rebel tribes. Despite this risk of spillover effects from neighboring villages, Yathriba was not attacked by the militias and not a single household was forced to flee. Remarkably, this Arab-dominated village had even accepted three refugee Fur households when the teams made their visit in June, 2007. This is just one example among several others of that certain Arab-dominated villages accepted an inflow of

[18] For instance, one of Mangarsa's nearest neighbor villages to the south, Hilt Bargo, was destroyed and all its 35 households fled despite its population being Borgo, a non-rebel African tribe.

rebel tribes in the course of conflict. This fact indicates that the militias are not necessarily representative of the broader Arab population in the area who often have lived in peace with their African neighbors for as long as anyone can remember.

3.4 Regression analysis

In this section, we conduct a series of regression analyses in order to improve our understanding of the pattern of population change and land reallocation. Although our main aim is not to test a specific hypothesis or to try to establish causalities, the descriptive statistics clearly suggested that the proportion of pre-conflict rebel tribe populations appeared to be a key explanatory factor for both population growth and squatting. In this section, we analyze whether this tendency remains when we control for a large number of additional independent variables in formal regressions.

In table 2, we show the results when we use the population growth rate as the dependent variable in an OLS regression. The key tendency is immediately clear; regardless of what control variables we use, the estimate for *rebels_B* is always negative and significant. The straightforward interpretation of the coefficient in, for instance, column 1 is that an increase in the proportion of rebel tribes from 0 to 1 would decrease the population growth rate by almost 90 percentage units. Figure 5 shows the conditional correlation based on this specification.

The set of additional explanatory variables consistently include the natural resource and climate variables *d_wadi, rainfall, temperature, vegetation*, and *soilquality*. None of these seem to have had any important impact except perhaps *soilquality*. The negative and weakly significant estimate for this latter variable seems to suggest that population declines have been more severe in areas with better soils. We further always include *d_admin, popsize_B*, and *n_popsize*. Out of these, only *d_admin* is sometimes significant. The negative estimate implies that population declines were larger in more peripherally located villages far from administrative centers. Using column 1, we can derive that a one standard deviation increase in distance to center (17.18 kms) is associated with roughly 9 percent lower growth rate of the village population.

Table 2 includes three other ethnic variables; *arabs_B, newAfr_B*, and *EF_B*. None of these are significant when included and neither are the geographical variables *latitude, longitude, altitude, d_elgen, d_elfash,* and *d_nyala*.

In column 4, we include *destroyed_2*, a binary dummy for whether the village was destroyed or abandoned as a result of the attack or not. Admittedly, this outcome variable is very closely related to population growth and presumably explained by similar processes.[19] Nevertheless, despite these problems, we choose to include the

[19] In Olsson and Siba (2009), this is the key dependent variable. However, our measure of population growth compares levels before the crisis to those when a certain time since the attack has

variable to check what happens when it is used. Not surprisingly, *destroyed_2* is strongly negative and significant. The coefficient for *rebel_B* shrinks to -0.237 but is still significant at the 10 percent-level. In other words, regardless of whether a village has been destroyed or not, population growth is lower among villages with larger rebel tribe populations.

In table 3, we then briefly analyze the change in the number of households instead of the proportional growth rate. When *popincrease* is thus used as the dependent variable, *rebels_B* is negative and significant again, except when we include *destroyed_2* in column 4. It is further interesting to note that while initial size of population is not significant, population density in the neighborhood is negative and significant throughout. The estimate in column 1 implies that a one standard deviation increase in pre-conflict neighborhood population density by 1,782 households (equivalent to about 15 households per sq km) is associated with a subsequent population decrease of 52 households in the individual village. It might be noted that levels of R^2 are quite low in these regressions.

In table 4, we use *squatted*, our proxy for land reallocation, as our dependent variable. Since squatted is a binary dummy, we now change our estimator to probit but retain the same basic set of explanatory variables. In general, more variables now have a statistically significant impact. In the first three columns, we see that *rebels_B* is positive and significant, implying that the fraction of rebel tribe population before conflict has a positive impact on the probability of being squatted. Table 5 shows the marginal effects of selected independent variables (based on results in column 1 of table 4) when they are held at their mean, when they are increased by one standard deviation around the mean, and when they are increased from their minimum to their maximum values, respectively. When all variables are held at their mean, the probability of squatting is quite small, only 12.9 percent. Increasing the proportion of rebels from 0 to 1 implies an increase in the probability if squatting by 34 percent.

From column 4 and onwards, we instead include the proportion of rebel tribes after the conflict (*rebels_A*) and the growth rate of the rebel tribe population (*rebelgrowth*) as explanatory variables. We recognize that this strategy introduces a problem of joint endogeneity since it might well be the case that squatting by hostile Arabs might have had a causal effect on changes and levels of rebel tribe populations. We should thus interpret the estimates for *rebels_A* and *rebelgrowth* as reflecting the strength of correlation rather than as the causal impact. Nevertheless, it is interesting to note that both the post-conflict levels and the growth of rebel tribe populations have a strong and robust negative correlation with squatting. The fact that *rebels_B* is not significant in column 5 when *rebelgrowth* is included suggests

elapsed. In this sense, the varible *destroyed_2* precedes the observed level of *popgrowth* in time.

that it is the change in the rebel tribe population that matters more than the initial level. Hence, it appears that land reallocation takes place mainly where current rebel tribe populations are low and where many rebel households have been displaced. In column 2, we see that the presence of Arab groups strongly discourages squatting but that the presence of new African groups before conflict has an independent positive effect (column 3).

Some of the geographical variables also reveal interesting patterns. Distance from a major wadi is negatively associated with squatting in all specifications. The economic significance is however not very large. A standard deviation increase in *d_wadi* (7.86 kms) around the mean (6.34) decreases the probability of squatting by a mere 4.2 percent. Higher temperatures and better soil qualities are also consistently associated with a larger risk of squatting. For instance, we can infer from table 5 that an increase from the lowest average temperature (23 degrees Celsius) to the highest (26.8 degrees) implies an almost 36 percent higher risk of squatting.

Distance from administrative centers, *d_admin*, has a positive effect on squatting. A standard deviation increase of 17.2 kms further from the center increases the risk of squatting by 5.7 percent. This appears to be well in line with the result in table 2 that population have declined the most in peripheral villages. Also, it is evident from the regressions that squatting is more likely on higher altitudes.

A concern at this stage might be that the included variables in table 4 to some extent might pick up the probability that a village gets destroyed or abandoned. As mentioned above, we know that all squatted villages (125 in total) had previously been either destroyed or abandoned (i.e. had a score of *destroyed_2*=1). As a robustness check for the squatting results, we therefore restrict our sample in table 6 to the 327 destroyed or abandoned villages.

The estimates largely confirm the previous results; it appears that the current level of rebel tribe households (*rebel_A*) and the growth rate (*rebelgrowth*) both have a strong negative correlation with squatting, whereas initial levels of rebel households does not seem to have an impact other than through the risk of attacks. As before, *d_wadi* has a negative association with squatting whereas *d_admin* and *altitude* again have a positive impact.

The results in tables 4-6 thus suggest some very clear patterns regarding land reallocation in this part of Darfur. Squatting is most likely in villages where few rebel tribe households currently live but where many such households have fled. It is also more likely in villages relatively close to major wadis and where soils are of good quality. Everything else equal, squatters further appear to prefer peripheral places located far from administrative centers and on high altitudes.

4 Discussion

The findings in the empirical section have potentially important implications for post-conflict reconstruction. As discussed above, customary land tenure institutions, as well as the government act from 1970 (ULA), both stipulate that effective occupation of a piece of land implies that the occupant is ensured usufructuary rights to that land. In general, land that has been unoccupied for maybe 2-3 years is considered uncultivated and can thereby be claimed by newcomers.[20]

Our study shows that nearly 300,000 rebel tribe individuals (about 40 percent of initial total population) have been displaced from our sampled villages whereas total population has decreased by about a third. If we believe that our region is representative for the rest of Darfur, it would imply a displacement of some 2.6 million rebel tribe individuals throughout Darfur, a number which comes fairly close to the official estimate of 3 million displacements in total (2.7 million refugees plus 300,000 killed).[21] If total settled population has decreased by only about a third (i.e. by 2.165 million to 4.335 million), it implies a net inflow of non-rebel tribe individuals of about 435,000.[22] Furthermore, if squatting has occurred in one fourth of all villages as in our sample, the projection would be about 1,200 squatted villages in all of Darfur.[23]

Needless to say, the implications in terms of destroyed livelihoods and land reallocations that arise from these figures are daunting. For instance, it would not seem altogether unreasonable for Arab groups, without dars of their own and with no part in any hostilities, to claim land in abandoned villages which they effectively might have occupied for years. In Baya, the destroyed Fur village referred to above, we know that 10 Meseriya households had settled already in the fall of 2006. Should these households still live there today, more than three years later, it seems likely that they have erected new buildings, planted new crops, maybe even invested in planting new trees. In that case, even customary land tenure institutions would give them rights to their new land.

On the other hand, the 2.7 million displaced persons, scattered in numerous camps in Darfur and Chad, have been illegally removed from their homes and will most likely want to return to their villages once peace has been secured. It appears

[20] A potential institutional constraint to such a development is the jurisdiction of dar-owning tribes who might claim that such squatting has happened without their authorization and hence is illegal. Whether such an objection would hold in practice is very unclear.

[21] Calculated as 40 percent of a total population of 6.5 million.

[22] Calculated as 4.335 (estimated current population, in millions) + 2.6 (estimated displacements) - 6.5 (total population before crisis) = 0.435 million.

[23] This assumes an average village size of 263 households, equivalent to 1,315 individuals, and the existence of just below 5,000 villages in all of Darfur. A recent survey of satellite data from USHMM (2009) proposes that some 3,300 villages have been damaged or completely destroyed in Darfur as a whole.

that any successful reconstruction of Darfur inevitably would have to involve land reforms that all major groups somehow can be made to agree upon. Those that stand the greatest chance of reaching general success are probably land institutions that build upon the inclusive character of the dar-system that used to allow old and new agricultural groups to share land with nomadic herders in relative harmony.

Western organizations such as USHMM and aid organizations on the ground have by now developed an impressive mapping of towns and villages in Darfur, based on modern satellite intelligence and information collected by relief organizations on the ground. This accumulated pool of knowledge could potentially be an important aid in the process of agreeing on borders and migratory routes and for monitoring developments on the ground. The road back to normalcy in Darfur is however without doubt going to be very long.

5 Conclusions

The intensity of fighting in Darfur has decreased in recent times to such an extent that some observers even claim that the war should be regarded as being over. The aim of this study is to analyze patterns of population growth and land reallocation in Darfur as a result of the recent conflict. In doing so, we have used a unique database on 542 villages and small towns in southwestern Darfur with detailed information about ethnic composition before and after the conflict. Our data also contains information regarding number of people being displaced and whether villages have been squatted by newcomers.

Our results indicate that some 300,000 households belonging to the rebellious Fur, Masalit, and Zaghawa ethnic groups have been displaced from their villages of origin whereas Arabs and other African groups have increased their presence in the region. About a fourth of all villages have further been squatted by newcomers. Our regression analysis shows that squatting is more likely in villages where many rebel tribe households have fled and few now reside. Squatting is also more likely in relatively peripheral villages that are close to wadis and where soils are of good quality.

The patterns of land reallocation documented in this study will most likely have serious consequences for post-conflict reconstruction efforts. When the 2.7 million refugees in camps throughout Darfur and Chad eventually return to their villages, they will often find that their abandoned fields have been taken over by other groups, who in turn can claim to have support for rights to land in customary as well as in more recent land tenure rules.

It seems inevitable that any successful peace deal will have to address the issue of land reforms and to find mechanisms for cooperation between farmers and

herders. Given the last years of ethnic hatred, failing rains, and an inflow of foreigners from other parts of Sahel, such a renewed social contract seems very distant at the moment. Cooperation has, on the other hand, always been the only way that communities have been able to survive in this harsh and neglected corner of the earth. And Rwanda has shown that a cooperative peace is possible even in the wake of unbelievable atrocities.

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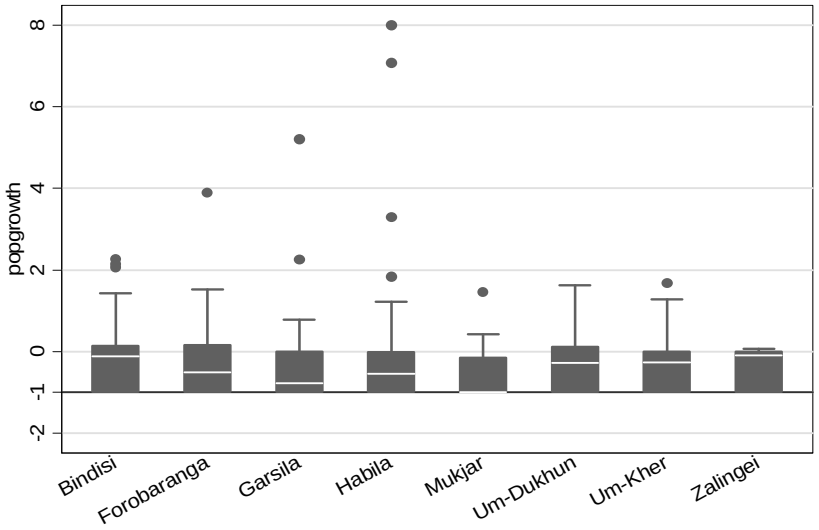
Figure 1: Map of Southwestern Darfur (surveyed area) and its surroundings

Figure 2: Distribution of population growth among villages in eight administrative units.



Note: On the vertical axis, 8 implies 800 percent whereas -1 implies -100 percent. -100 percent is the lower bound. The height of the boxes reflect the interquartile range whereas the white line inside the box indicates the median.

Figure 3: Total population increase by ethnic category in eight administrative units.

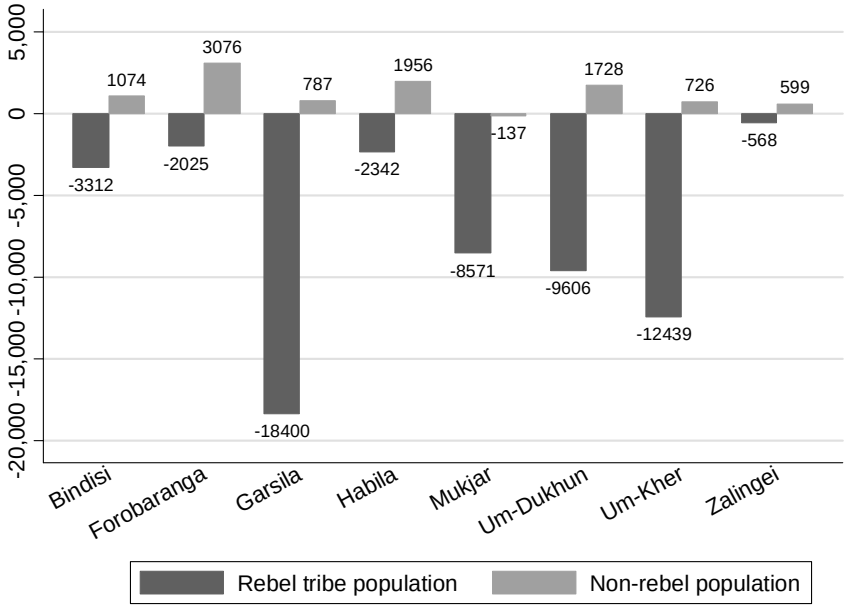


Figure 4: Total number of squatted villages in eight administrative units.

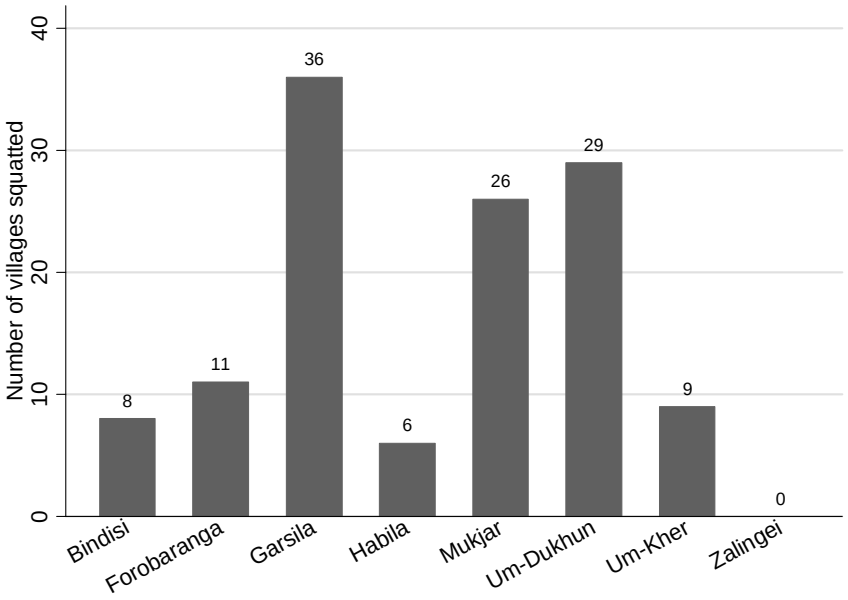
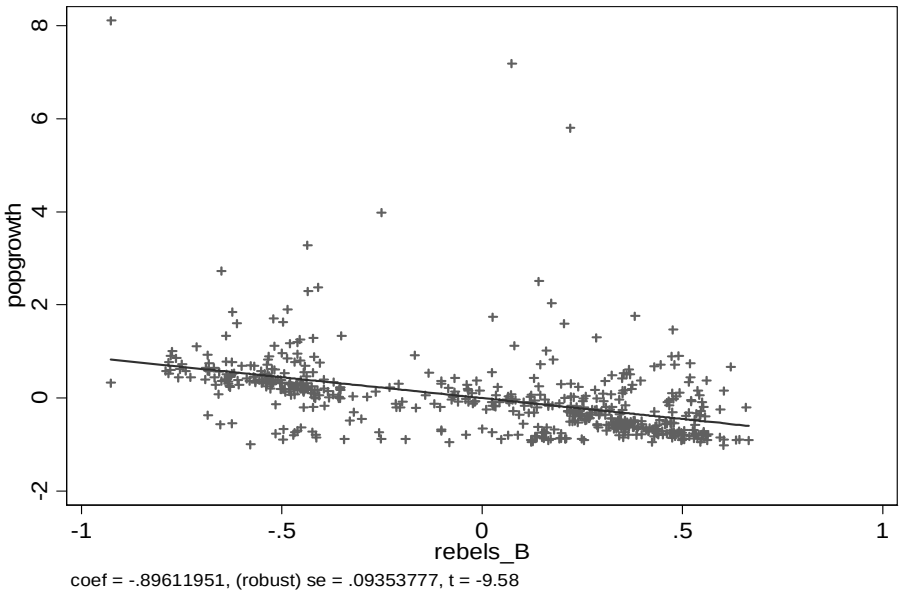


Figure 5: Partial relationship between population growth (*popgrowth*) and proportion of rebel tribe households in village before conflict (*rebels_B*).



Note: The figure shows the conditional correlation based upon specification 1 in table 2.

Table 1: Descriptive statistics

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
Dependent variables						
popgrowth	Population growth rate (in 100 percentage units)	530	-.3376	.8885	-1	8
popincrease	Population increase (in number of households)	542	-87.55	582.72	-7200	6581
squatted	Binary dummy for village squatted	542	.2306	.4216	0	1
Independent variables						
rebels_B	Proportion of Fur, Masalit, and Zaghawa households before conflict in village	542	.6016	.4582	0	1
arabs_B	Proportion of households from Arab tribes before conflict in village	542	.2060	.3962	0	1
newAfr_B	Proportion of households from new African tribes before conflict in village	542	.1560	.3108	0	1
destroyed_2	Binary dummy for village destroyed or abandoned	542	.6033	.4897	0	1
rebels_A	Proportion of Fur, Masalit, and Zaghawa households after conflict in village	542	.1969	.3741	0	1
rebelgrowth	Population growth (in 100 percent) among Fur, Zaghawa, and Masalit households	542	-.4570	.7050	-1	7.08
EF_B	Ethnic fractionalization Gini	542	.1867	.2895	0	1
d_wadi	Distance from village to nearest major wadi (in kms)	542	6.34	7.86	.01	39.17
rainfall	Average annual rainfall in mms in village's climate zone	542	704.83	63.09	500	730
temperature	Annual mean temperature in Celsius degrees in village's climate zone	542	25.33	.5526	23	26.8
vegetation	Average annual NDVI in village's climate zone	542	.1745	.0146	.14	.19
soilquality	Inherent soil quality in village's climate zone where low = 1 and low-medium-high = 4	542	3.57	.9425	1	4
d_admin	Distance from village to administrative center (in kms)	542	26.54	17.19	0	80.12
popsize_B	No. of households before conflict in village	542	263.66	531.85	0	7200
n_popsize_B	Total no. of households before conflict in 10 km by 10 km neighbourhood (grid cell)	542	1501.71	1782.23	0	8917
latitude	Latitude degree	542	12.09	.5004	10.87	12.95
longitude	Longitude degree	542	23.02	.3581	22.24	23.75
altitude	Altitude above sea level (in meters)	542	699.61	129.78	502	1290
d_elgen	Distance from village to El Geneina (in kms)	542	167.43	56.07	55.35	291.40
d_elfash	Distance from village to El Fasher (in kms)	542	310.07	40.96	213.54	408.41
d_nyala	Distance from village to Nyala (in kms)	542	211.08	38.83	123.96	300.08
	Binary dummies for 6 administrative units	542			0	1

Sources: All variables are taken or constructed from data collected by international organizations in the area except *d_wadi* and *altitude* that were derived from Google Earth, and *rainfall*, *vegetation*, *temperature*, and *soilquality* that were taken from FAO (1998). The geographical distances from each village to their relevant administrative center *d_admin*, to El Geneina *d_elgen*, and to El Fasher *d_elfash*, were calculated using latitude and longitude coordinates in the great circle formula. The set of dummies for administrative units excludes the reference category Zalingei.

Table 2: Determinants of population growth

VARIABLES	(1) popgrowth	(2) popgrowth	(3) popgrowth	(4) popgrowth	(5) popgrowth	(6) popgrowth	(7) popgrowth
rebels_B	-0.896***	-0.878***	-0.913***	-0.237*	-0.822***	-0.887***	-0.996***
	(0.0935)	(0.187)	(0.0634)	(0.139)	(0.215)	(0.187)	(0.181)
arabs_B		0.0280			0.0415	0.0161	-0.0633
		(0.161)			(0.167)	(0.165)	(0.156)
newAfr_B			-0.0556				
			(0.172)				
destroyed_2				-0.841***			
				(0.140)			
EF_B					0.188		
					(0.165)		
d_wadi	0.000470	0.000297	0.000186	-0.00369	0.000365	-0.000303	-0.00184
	(0.00397)	(0.00387)	(0.00387)	(0.00380)	(0.00382)	(0.00382)	(0.00429)
rainfall	-0.000877	-0.000862	-0.000844	-0.000435	-0.000788	-0.000680	-0.000740
	(0.00207)	(0.00211)	(0.00211)	(0.00196)	(0.00213)	(0.00211)	(0.00206)
temperature	-0.0474	-0.0480	-0.0477	0.0660	-0.0244	-0.0109	-0.276**
	(0.0608)	(0.0609)	(0.0605)	(0.0496)	(0.0618)	(0.135)	(0.113)
vegetation	-2.118	-2.161	-2.249	-6.868	-2.547	-2.414	2.578
	(6.665)	(6.667)	(6.670)	(6.143)	(6.645)	(6.924)	(7.355)
soilquality	-0.117*	-0.116*	-0.116*	-0.128**	-0.127**	-0.106*	0.0652
	(0.0635)	(0.0643)	(0.0639)	(0.0613)	(0.0626)	(0.0628)	(0.0799)
d_admin	-0.00533*	-0.00527*	-0.00522*	-0.00420	-0.00545*	-0.00613	-0.00334
	(0.00290)	(0.00301)	(0.00300)	(0.00265)	(0.00295)	(0.00386)	(0.00262)
popsize_B	0.000100	0.000101	0.000101	3.09e-05	8.13e-05	9.90e-05	0.000116
	(7.90e-05)	(7.96e-05)	(7.97e-05)	(5.49e-05)	(7.41e-05)	(7.89e-05)	(7.98e-05)
n_popsize_B	-1.84e-05	-1.85e-05	-1.85e-05	-1.30e-05	-1.66e-05	-1.90e-05	-3.34e-05*
	(1.32e-05)	(1.33e-05)	(1.34e-05)	(1.27e-05)	(1.26e-05)	(1.48e-05)	(1.71e-05)
Controls for latitude, longitude, and altitude	yes	yes	yes	yes	yes	no	no
Controls for distance to province capitals	no	no	no	no	no	yes	no
Controls for 6 administrative units	no	no	no	no	no	no	yes
Constant	8.617*	8.791*	8.926*	6.757	8.168*	0.954	6.363***
	(4.937)	(5.088)	(5.077)	(4.958)	(4.920)	(2.677)	(2.417)

(*Table 3, con'd*)

Observations	530	530	530	530	530	530	530
R-squared	0.250	0.250	0.250	0.337	0.252	0.249	0.259

Note: The dependent variable is *popgrowth* and the estimator is OLS. Robust standard errors in parentheses in all specifications. *** p<0.01, ** p<0.05, * p<0.1. Controls for distance to province capitals includes *d_elgen*, *d_elfash*, and *d_nyala*. Controls for 6 administrative regions excludes the reference category Zalingei.

Table 3: Determinants of population increase

VARIABLES	(1) popincrease	(2) popincrease	(3) popincrease	(4) popincrease
rebels_B	-165.0***	-172.7***	-166.2***	191.1
	(48.69)	(53.40)	(54.27)	(142.5)
arabs_B		-12.78		
		(36.76)		
newAfr_B			-4.299	
			(50.94)	
destroyed_2				-450.9***
				(148.7)
d_wadi	-0.759	-0.682	-0.781	-2.990
	(2.502)	(2.519)	(2.579)	(2.703)
rainfall	-1.325	-1.327	-1.322	-1.081
	(1.083)	(1.086)	(1.107)	(1.008)
temperature	-71.84**	-70.62**	-71.79**	-16.16
	(30.07)	(30.28)	(30.04)	(36.64)
vegetation	7187	7188	7175	4682
	(5206)	(5212)	(5273)	(4784)
soilquality	2.330	1.622	2.330	-2.141
	(44.00)	(43.81)	(44.05)	(42.40)
d_admin	-2.366	-2.392	-2.358	-1.676
	(2.067)	(2.111)	(2.127)	(1.909)
popsize_B	-0.208	-0.208	-0.208	-0.244
	(0.338)	(0.339)	(0.339)	(0.333)
n_popsize_B	-0.0292**	-0.0292**	-0.0292**	-0.0266*
	(0.0147)	(0.0148)	(0.0148)	(0.0142)
Controls for latitude, longitude, and altitude	yes	yes	yes	yes
Constant	5709*	5626*	5733*	4779
	(3431)	(3390)	(3417)	(3518)
Observations	542	542	542	542
R-squared	0.107	0.107	0.107	0.164

Note: The dependent variable is *popincrease* and the estimator is OLS. Robust standard errors in parentheses in all specifications. *** p<0.01, ** p<0.05, * p<0.

Table 4: Probability of a village being squatted

VARIABLES	(1) squatted	(2) squatted	(3) squatted	(4) Squatted	(5) squatted	(6) squatted	(7) squatted	(8) squatted
rebels_B	1.893***	1.320***	2.991***		-0.0537			
	(0.278)	(0.318)	(0.462)		(0.369)			
arabs_B		-1.763***						
		(0.589)						
newAfr_B			1.834***					
			(0.580)					
rebels_A				-1.924***		-1.652***	-1.773***	-1.813***
				(0.522)		(0.477)	(0.519)	(0.471)
rebelgrowth					-2.696***	-2.457***	-2.450***	-2.634***
					(0.552)	(0.396)	(0.395)	(0.328)
d_wadi	-0.0253**	-0.0271**	-0.0262**	-0.0275**	-0.0313**	-0.0330**	-0.0168	-0.0401***
	(0.0120)	(0.0122)	(0.0124)	(0.0124)	(0.0137)	(0.0143)	(0.0127)	(0.0133)
rainfall	-0.00613	-0.00708*	-0.00735**	-0.00832**	-0.00810*	-0.00755*	-0.00848**	-0.0177***
	(0.00390)	(0.00371)	(0.00363)	(0.00329)	(0.00429)	(0.00407)	(0.00415)	(0.00490)
temperature	0.539***	0.753***	0.696***	0.349**	0.541**	0.403*	0.0678	-0.310
	(0.199)	(0.216)	(0.231)	(0.164)	(0.247)	(0.234)	(0.324)	(0.380)
vegetation	10.21	10.69	12.80	13.43	30.08	29.73	35.00	67.97***
	(19.35)	(18.13)	(17.68)	(15.20)	(21.81)	(20.54)	(21.45)	(24.16)
soilquality	0.484***	0.448**	0.476***	0.426**	0.435**	0.375*	0.296	0.685***
	(0.177)	(0.178)	(0.179)	(0.182)	(0.205)	(0.207)	(0.205)	(0.244)
d_admin	0.0158***	0.0170***	0.0165***	0.00906	0.0181***	0.0166**	0.0226***	0.0230***
	(0.00575)	(0.00596)	(0.00599)	(0.00571)	(0.00647)	(0.00662)	(0.00755)	(0.00633)
popsize_B	-0.000527**	-0.000592**	-0.000609**	-2.82e-05	-0.000561**	-0.000253	-0.000211	-0.000171
	(0.000247)	(0.000264)	(0.000268)	(0.000107)	(0.000268)	(0.000233)	(0.000197)	(0.000288)
n_popsize_B	4.53e-05	4.77e-05	4.94e-05	0.000102***	3.58e-05	3.19e-05	3.39e-05	-2.63e-05
	(3.79e-05)	(3.84e-05)	(3.85e-05)	(3.59e-05)	(3.86e-05)	(3.86e-05)	(3.96e-05)	(4.46e-05)
altitude	0.00376***	0.00403***	0.00412***	0.00381***	0.00401***	0.00352**		
	(0.00128)	(0.00141)	(0.00141)	(0.00129)	(0.00140)	(0.00139)		
Controls for latitude and longitude	yes	yes	yes	Yes	yes	yes	no	no
Controls for distance to province capitals	no	no	no	No	no	no	yes	no
Controls for 6 administrative units	no	no	no	No	no	no	no	yes

(*Table 4, con'd*)

Observations	542	542	542	542	542	542	542	542

Note: The estimator is binomial probit in all specifications and the dependent variable is *squatted*. A constant with unreported coefficients has been included in each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Controls for distance to province capitals includes *d_elgen*, *d_elfash*, and *d_nyala*. Controls for 6 administrative regions excludes the reference category Zalingei.

Table 5: Marginal effects from probability of squatting

	MargEfct	-+sd/2	min->max
rebels_B	0.3972***	0.1834	0.3407
d_wadi	-0.0053**	-0.0417	-0.1403
rainfall	-0.0013	-0.0812	-0.4493
temperature	0.1132***	0.0626	0.3587
soilquality	0.1015***	0.0959	0.1682
d_admin	0.0033***	0.0570	0.3266
popsize_B	-0.0001**	-0.0589	-0.1600
altitude	0.0008***	0.1027	0.8313

Note: The dependent variable is *squatted*, the estimator is probit, and the calculation is based upon specification 1 in table 4 with all other variables held at their mean. *** p<0.01, ** p<0.05, * p<0.1. The column with the *MargEfct* shows the partial derivative of the listed variables at their means. The column *min->max* displays the changes in predicted probability of *squatted* when the listed variables increases from their minimum value to their maximum value. *-+st dev/2* shows the change in predicted probability of *squatted* when the listed variables increases from ½ standard deviation below their mean to ½ standard deviation above the mean.

Table 6: Probability of a village being squatted conditional on having been either destroyed or abandoned.

VARIABLES	(1) squatted	(2) squatted	(3) squatted	(4) squatted
rebels_B	0.599			
	(0.415)			
rebels_A		-1.927***	-2.070***	-2.114***
		(0.501)	(0.562)	(0.509)
rebelgrowth		-1.121**	-1.007*	-1.439***
		(0.534)	(0.533)	(0.493)
d_wadi	-0.0313**	-0.0354**	-0.0151	-0.0440***
	(0.0136)	(0.0160)	(0.0147)	(0.0143)
rainfall	-0.00855**	-0.00826**	-0.00946**	-0.0181***
	(0.00361)	(0.00391)	(0.00388)	(0.00460)
temperature	0.423*	0.301	-0.130	-0.611
	(0.246)	(0.266)	(0.378)	(0.424)
vegetation	22.92	31.39	38.85**	69.02***
	(17.58)	(19.28)	(19.51)	(21.90)
soilquality	0.555***	0.391*	0.346	0.834***
	(0.187)	(0.218)	(0.211)	(0.258)
d_admin	0.0188***	0.0195***	0.0272***	0.0278***
	(0.00677)	(0.00744)	(0.00838)	(0.00738)
popsize_B	-0.000408	-0.000143	-0.000121	-6.39e-08
	(0.000269)	(0.000173)	(0.000161)	(0.000178)
n_popsize	4.19e-05	3.64e-05	4.11e-05	-4.02e-05
	(3.85e-05)	(3.96e-05)	(4.09e-05)	(4.76e-05)
latitude	-0.245	-0.465		
	(0.399)	(0.441)		
longitude	0.390	0.139		
	(0.508)	(0.530)		
altitude	0.00398***	0.00364**		
	(0.00148)	(0.00156)		
Controls for latitude and longitude	yes	yes	no	no
Controls for distance to province capitals	no	no	yes	no
Controls for 6 administrative units	no	no	no	yes
Observations	327	327	327	327

Note: The estimator is binomial probit in all specifications and the dependent variable is *squatted*. The sample is now all 327 villages that have been either destroyed or abandoned (i.e. where *destroyed_2*=1). A constant with unreported coefficients has been included in each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Controls for distance to province capitals includes *d_elgen*, *d_elfash*, and *d_nyala*. Controls for 6 administrative regions excludes the reference category Zalingei.