After Janjaweed? Socioeconomic Impacts of the Conflict in Darfur

Ola Olsson

This article uses a unique database on 542 villages in southwestern Darfur to analyze patterns of land reallocation and population change that have emerged as a consequence of the recent conflict. The 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 previously lived. A key challenge for postconflict reconstruction will therefore be the restoration of rights to land. JEL codes: P16, O41

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 toward a future when Janjaweed attacks have ceased and postconflict reconstruction can be initiated.

This article uses data from 542 villages in southwestern Darfur, hosting a total population of about 786,000 people, to examine two critical issues for postconflict reconstruction: patterns of land redistribution and population changes that have emerged as a result of the conflict. A deeper understanding of these developments should facilitate effective policies for postconflict reconstruction. The analysis shows that whereas total population has decreased by

Ola Olsson (ola.olsson@economics.gu.se) is a professor in the Department of Economics at the University of Gothenburg. The findings, interpretations, and conclusions expressed in this article are entirely those of the author. Although data have been generously shared by some international organizations, the author's research has been fully independent at all stages. Eyerusalem Siba provided essential input throughout this project. Useful comments were also received from seminar participants at Lund University, the journal editor, and three anonymous referees.

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about a third, the civilian population from the three rebel tribes has decreased by 57 percent. Nonrebel groups, belonging to Arab and other African tribes, have instead increased their population in the region. The regression analysis further shows that widespread squatting by nonrebel groups has taken place mainly 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 have been collected by some international organizations operating in the area and has previously featured in only two other papers. Olsson and Siba (2009) analyze the political economy aspects of the conflict and investigate whether patterns of attacks by the combined Janjaweed and government forces are primarily 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. The long-run impact of climate deterioration for the political economy of land allocations in Darfur, has been studied in Olsson (forthcoming).

A few other papers have also exploited microdata 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 and others (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 article is related to a growing literature on the determinants and effects of mass violence on a micro level (see Blattman and Miguel 2010, for an overview). 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

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, Rymond-Richmond, and Palloni 2009). The main dependent variables in these studies are the use of racial epithets during attacks and the level of sexual victimization. Depoortere and others (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.

patterns and that traditional socioeconomic 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).

The study is unique in that the sample of villages actually makes up the universal population of villages in southwestern Darfur. The organizations that collected the data had an explicit aim of covering every rural village in the area. Hence, unlike Vanrooyen and others (2008) and many other micro studies, issues regarding sampling and representativity are less relevant for us. A second unique feature of the study is the number of villages covered—542 compared with three in Vanrooyen and others (2008)—and the detailed information regarding the ethnic composition of the village population before and after conflict.[2] Thirdly, this study 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 one, a brief background on the conflict in Darfur and the existing system of land property rights is provided. Section two presents the empirical analysis and discusses the data, descriptive statistics, individual village examples, and finally the regression exercises. Section three discusses the policy implications of the results. And section four concludes.

I. The Darfur Conflict

Darfur is Sudan's westernmost province, bordering Chad to the west. It is roughly 500,000 square kilometers (km) (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 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 had no known oil reservoirs.

It is estimated that Darfur hosts some 6.5 million people, divided up into the 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

2. A limitation of the study is, on the other hand, the lack of household or individual level data.
3. The name "Darfur" means literally "the land of the Fur."

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 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. 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.

The most recent major conflict in Darfur is usually described as having been initiated in February 2003 when two rebel groups, the Justice Equality Movement (JEM) and the Sudan Liberation Movement (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

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

5. Olsson (2010) 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.

6. The word "Janjaweed" is usually said to mean "evil horsemen."

were driven out into the desert or chased down and killed (Prunier 2007; Vanrooyen and others 2008). In this way, some 300,000 people are believed to have succumbed 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 was soon 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).

The relative importance for the recent conflict of local environmental stress versus a core-periphery struggle between an Arab government and marginalized African tribes, has been extensively debated among scholars and in international media. Since this is the main topic in two companion papers to the current one (Olsson and Siba 2009; Olsson forthcoming), the major arguments will be only briefly discussed. Undoubtedly, the general decrease in rainfall and the associated land stress since the 1970s contributed to a general worsening of relations between herders and farmers, as discussed above. However, as pointed out by Kevane and Gray (2008), there were no particular weather shocks around or before 2003 that would have motivated such a massive outbreak of violence. Rather it seems as if the joint Janjaweed/government campaign from summer 2003 should be seen as a counter-insurgency against the three oppositional tribes with the primary aim of finally securing Arab rule over a repeatedly insubordinate periphery. An important part of this strategy appears to have been the pursuit of ethnic cleansing. Certain elements among the nomadic Arab tribes in the area were more than willing to comply, although their own main goal was probably to improve their access to resources. Some observers have suggested that the combined Janjaweed/government campaign might be understood as a cheap way of fighting rebels that eventually went out of hand (Prunier 2007; Flint and de Waal 2008).

The key natural resource in Darfur is land, 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. (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 who is deemed to need it more. Similarly, newcomers

7. The paragraphs below draw heavily on mainly Abdul-Jalil (2006), but also O'Fahey and Tubiana (2009).

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]

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

FIGURE 1. Map of Southwestern Darfur (surveyed area) and its surroundings

Source: Google Earth.

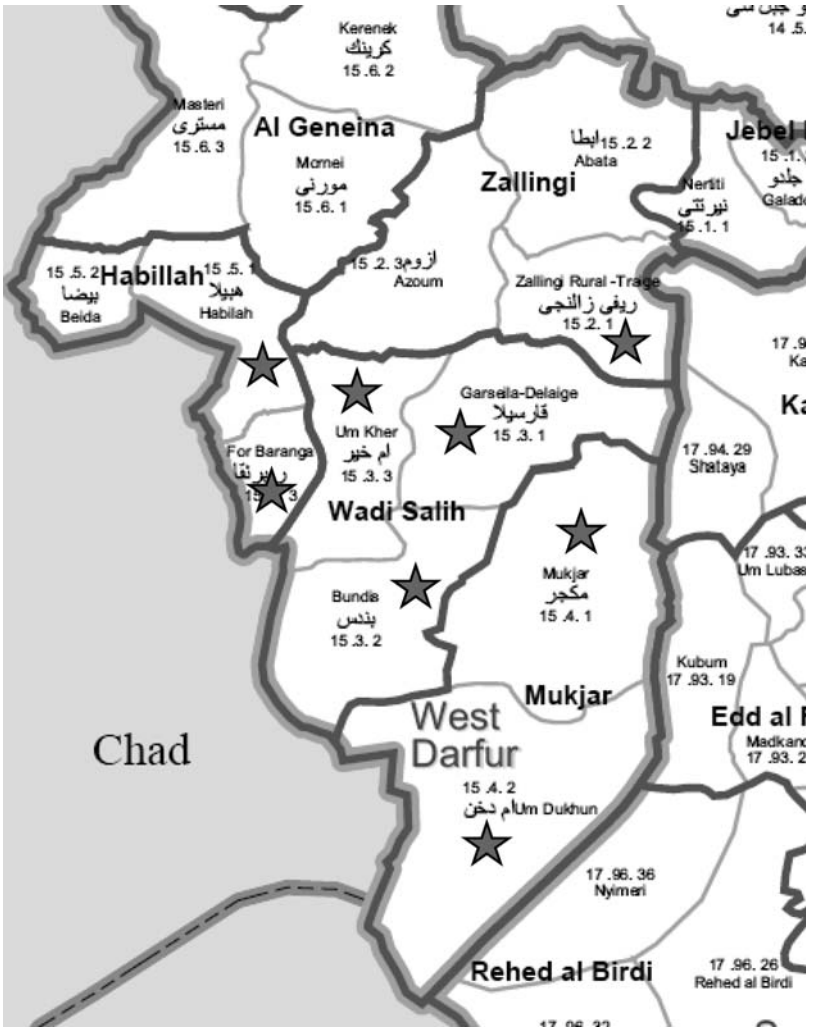
II. EMPIRICAL ANALYSIS

The data used in this study were collected by some international organizations 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. Data collection covered eight administrative units (figure 2) with a total size of about 25,000 square 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 towns. Some larger towns were however excluded from the analysis.[10]

9. Until the situation in the area improves, more details about the data will only be communicated through personal correspondence with the author.

10. The reason for this exclusion was probably that large towns would be exceedingly difficult to survey and that such settlements typically are less vulnerable than small villages.

FIGURE 2. Eight administrative units in Southwestern Darfur



Note: The map shows the eight administrative units (marked by a star) covered in the study. The administrative units are Habila (Habilah on map), Forobaranga (For Baranga), Um-Kher (Um Kher), Garsila (Garseila-Delaige), Bindisi (Bundis), Mukjar (Mukjar), Um-Dukhun (Un Dukhun), and Zalingei (Zallingi Rural-Traige).

Source: Relief Web 2009.

For each village, data on the ethnic composition of the population before and after the onset of the crisis in 2003 were collected as well as the number of people fleeing. Data concerning the situation before the crisis were obtained by retrospection through interviews with traditional and administrative authorities as well as with ordinary villagers. The teams also gathered information about which villages had been squatted since the conflict—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.[11] After the crisis, this number had decreased to about 525,000, a fall of about a third.

The data above unfortunately did not include any useful proxies for land quality or access to natural resources. Using satellite images in Google Earth, each village was identified and the distance in kilometers from the village to the nearest major wadi was calculated (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, altitude data were also obtained for each village in the sample. From FAO (1998), further information was extracted on average annual rainfall, temperature, vegetation cover and inherent soil quality.[12]

Descriptive Statistics

The variables used in the empirical analysis are shown in table 1. The analysis has two dependent variables. The first one is *squatted*, a binary dummy for whether the village has been squatted by newcomers or not. 125 villages have been squatted, almost a fourth of all villages. All of these had previously been destroyed or abandoned. Figure 3 plots squatted and nonsquatted villages in a map over the sampled area whereas figure 4 shows the distribution of squatted villages over the eight administrative units. Note that no village has been squatted in Zalingei in the northeast.

The second dependent variable is *popgrowth*, measuring population growth in percent from before the crisis to the latest available observation.[13] 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.[14] Figure 5 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 (a negative population growth of 100 percent). Zalingei

11. 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 Depoortere and others (200).

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

13. 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.

14. 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).

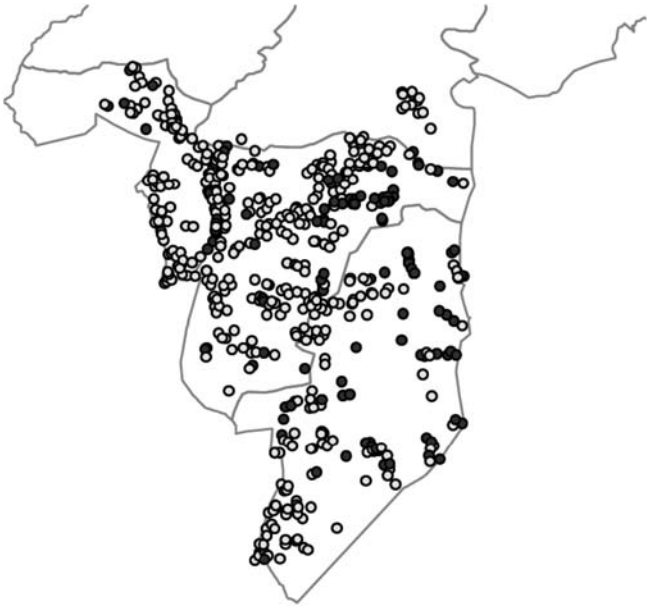
TABLE 1. Descriptive statistics

Variable	Description	Mean	Standard deviation	Minimum	Maximum
Dependent					
squatted	Binary dummy for village squatted	0.2306	0.4216	0	1
popgrowth[a]	Population growth rate (100 percentage units)	−0.3376	0.8885	−1	8
Independent					
rebels	Proportion of Fur, Masalit, and Zaghawa households before conflict in village	0.6016	0.4582	0	1
arabs	Proportion of households from Arab tribes before conflict in village	0.2060	.3962	0	1
newAfr	Proportion of households from new African tribes before conflict in village	0.1560	0.3108	0	1
destroyed	Binary dummy for village destroyed or abandoned	0.6033	0.4897	0	1
EF	Ethnic fractionalization index before conflict	0.1867	0.2895	0	1
d_wadi	Distance from village to nearest major wadi (kilometers)	6.34	7.86	0.01	39.17
rainfall	Average annual rainfall in mms in village's climate zone	704.83	63.09	500	730
temperature	Annual mean temperature in Celsius degrees in village's climate zone	25.33	0.5526	23	26.8
vegetation	Average annual Normalized Difference Vegetation Index in village's climate zone	0.1745	0.0146	0.14	0.19
soilquality	Inherent soil quality in village's climate zone where low = 1 and low-medium-high = 4	3.57	0.9425	1	4
d_admin	Distance from village to administrative center (kilometers)	26.54	17.19	0	80.12
popsize	Number of households before conflict in village	263.66	531.85	0	7,200
n_popsize	Total no. of households before conflict in 10 kilometer by 10 kilometer neighborhood (grid cell)	1,501.71	1,782.23	0	8,917
latitude	Latitude degree	12.09	0.5004	10.87	12.95
longitude	Longitude degree	23.02	0.3581	22.24	23.75
altitude	Altitude above sea level (meters)	699.61	129.78	502	1290
d_elgen	Distance from village to El Geneina (kilometers)	167.43	56.07	55.35	291.40
d_elfash	Distance from village to El Fasher (kilometers)	310.07	40.96	213.54	408.41
d_nyala	Distance from village to Nyala (kilometers)	211.08	38.83	123.96	300.08
	Binary dummies for seven administrative units			0	1

a. Calculations based on 530 observations; all other variables based on 542.

Source: Author's analysis based on data collected by international organizations in the area except *d_wadi* and *altitude, which* were derived from Google Earth, and *rainfall, vegetation, temperature*, and *soilquality, which* 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 dummy variables for administrative units excludes the reference category Zalingei.

FIGURE 3. Squatted and nonsquatted villages in the sampled area

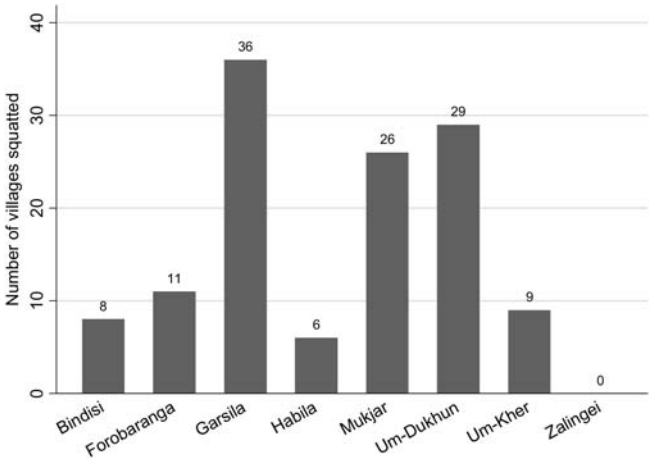


Note: Dark circles indicate squatted villages; light circles indicate nonsquatted villages.
Source: See table 1.

has the highest median (−0.097) whereas Habila has a few villages that have grown at an exceptional rate.

If we consider the actual numbers behind the percentage figures, some interesting patterns emerge. On average, about 88 households have left the sample villages. The extreme values are very large; the village 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 6 shows the distribution of this population decline among rebel tribe and nonrebel populations across the eight administrative units. The figure documents one of the key findings of this article: the negative population growth in the region can be more or less completely attributed to displacements of Fur and Masalit households (people 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 nonrebel 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 nonrebel tribe households. Visual inspection of figures 4–6 together strongly suggests that squatting has mainly occurred in areas where large numbers of rebel households have been displaced.

FIGURE 4. Total number of squatted villages in eight administrative units.



Source: See table 1.

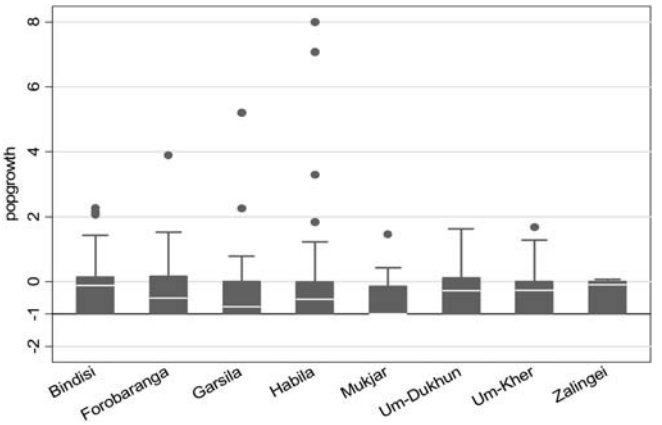
Moving on to the independent variables, the measures of the population's ethnic composition are central. The variable *rebels* measures the share of Fur, Masalit, and Zaghawa households among the total population of villages before the conflict. The vast majority of these households are civilian since 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 the sample, 327 villages (60.3 percent of total) were either destroyed or abandoned (*destroyed*). On average, villages had a 21 percent Arab population (*arabs*) and a 15.6 percent population of new African groups before the conflict (*newAfr*). After the conflict, the data show that these shares had changed to 29 and 13 percent respectively—a large Arab expansion (not shown in table 1). One last ethnic indicator is *EF*, measuring the ethnic fractionalization index for each village before conflict. 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.

The 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* is about 705 mms and average *temperature* 25.3 degrees Celsius. Two indicators for *vegetation* and *soilquality* are also included as controls. Since the

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

16. See for instance Alesina and others (2003).

FIGURE 5. Distribution of population growth among villages in eight administrative units



Note: The lower bound is −100 percent. The height of the boxes reflect the interquartile range; the white lines inside the boxes indicate the median.

Source: See table 1.

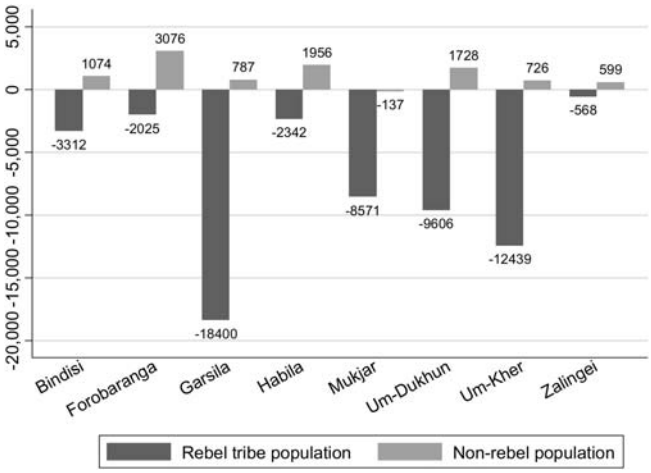
area studied is rather small, local variations in these climatic variables are also relatively small. *d_admin* shows the distance in kms from the village to the administrative center in each administrative unit. Likewise, *d_elgen*, *d_elfash*, and *d_nyala* measure the distance from each village to Darfur's three capitals El Geneina (West Darfur), El Fasher (North Darfur) and Nyala (South Darfur).

Average population before conflict (*popsize*) is 264 households, whereas the median (not shown) is only 123. The largest unit in the sample is Tanako with a population of 7,200 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. The sample contains 151 populated such cells and *n_popsize* should thus be thought of as population density.

Village Examples

To get a stronger sense of the situation in the sample villages, a few examples will be presented. 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

FIGURE 6. Population changes in eight administrative units, by rebel tribe status



Source: See table 1.

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 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 local road from one village to the next and destroyed every village on the western

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

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, perhaps thanks to the lack of a road that the Janjaweed could use.

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 the sample (8,917 households distributed over about 120 square 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 the sample region, in Zalingei administrative unit and at an altitude of 949 meters, lays 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 ($EF = 0.674$). 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 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.

Correlates of Patterns of Land Allocation and Population Changes

In this section, a series of regression analyses are conducted to increase understanding of the pattern of population change and land reallocation. Although the main aim is not to test a specific hypothesis or to try to establish causalities, the descriptive statistics clearly suggested that the proportion 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 nonrebel African tribe.

preconflict rebel tribe populations appeared to be a key explanatory factor for both squatting and population growth. This section analyzes whether this tendency remains when controlling for a large number of additional independent variables in formal regressions.

In table 2, *squatted*, a proxy for land reallocation, is used as the dependent variable. Since *squatted* is a binary dummy, a standard probit estimator is employed. The main variable of interest is *rebels* whereas the set of additional explanatory variables consistently include the natural resource and climate variables *d_wadi, rainfall, temperature, vegetation*, and *soilquality*. In the first six columns, *rebels* 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 3 shows the marginal effects of selected independent variables (based on results in column 1 of table 2) 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.

In the last three columns, the samples are changed to check the robustness of these results. In column 6, the sample is made up of 421 villages without any Arab households and with only people of either rebel tribe or new African origin. The positive and significant estimate implies that squatting typically does not happen where the share of new African households is substantial.[19]

A concern at this stage might be that the included variables in table 2 to some extent might pick up the probability that a village gets destroyed or abandoned. Indeed, one of the key results in Olsson and Siba (2009) was that the share of rebel households was a very strong determinant of risk of attacks. As mentioned above, all squatted villages (125 in total) had previously been either destroyed or abandoned (had a score of *destroyed* = 1). Therefore, the sample is restricted in columns 7 and 8 to the 327 destroyed or abandoned villages. As suspected, the estimates for *rebels* are not significant in this subsample. This issue is discussed further below.

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, an increase from the lowest average temperature (23 degrees Celsius) to the highest (26.8 degrees) implies an almost 36 percent higher risk of

19. Therefore, the positive and significant estimate of *newAfr* in column 3 is an artifact of making *arabs* the reference category.

TABLE 2. Probability of a village being squatted

Variable	(1) Full sample	(2) Full sample	(3) Full sample	(4) Full sample	(5) Full sample	(6) No Arabs	(7) Only destroyed or abandoned	(8) Only destroyed or abandoned
rebels	1.893***	1.320***	2.991***	1.946***	2.169***	1.285***	0.599	0.636
	(0.278)	(0.318)	(0.462)	(0.295)	(0.253)	(0.315)	(0.415)	(0.425)
arabs		−1.763***						
		(0.589)						
newAfr			1.834***					
			(0.580)					
d_wadi	−0.0253**	−0.0271**	−0.0262**	−0.0138	−0.0300**	−0.0251**	−0.0313**	−0.0177
	(0.0120)	(0.0122)	(0.0124)	(0.0113)	(0.0118)	(0.0121)	(0.0136)	(0.0132)
rainfall	−0.00613	−0.00708*	−0.00735**	−0.00782**	−0.0166***	−0.00743**	−0.00855**	−0.0105***
	(0.00390)	(0.00371)	(0.00363)	(0.00392)	(0.00444)	(0.00371)	(0.00361)	(0.00356)
temperature	0.539***	0.753***	0.696***	0.239	0.153	0.690***	0.423*	0.103
	(0.199)	(0.216)	(0.231)	(0.286)	(0.329)	(0.204)	(0.246)	(0.374)
vegetation	10.21	10.69	12.80	15.32	44.88**	11.89	22.92	29.71*
	(19.35)	(18.13)	(17.68)	(20.08)	(21.18)	(18.02)	(17.58)	(18.05)
soilquality	0.484***	0.448**	0.476***	0.417**	0.618***	0.466***	0.555***	0.507***
	(0.177)	(0.178)	(0.179)	(0.175)	(0.201)	(0.176)	(0.187)	(0.182)
d_admin	0.0158***	0.0170***	0.0165***	0.0225***	0.0211***	0.0181***	0.0188***	0.0264***
	(0.00575)	(0.00596)	(0.00599)	(0.00681)	(0.00548)	(0.00612)	(0.00677)	(0.00823)
popsize	−0.000527**	−0.000592**	−0.000609**	−0.000488**	−0.000419*	−0.000593**	−0.000408	−0.000371
	(0.000247)	(0.000264)	(0.000268)	(0.000241)	(0.000241)	(0.000267)	(0.000269)	(0.000262)
n_popsize	4.53e-05	4.77e-05	4.94e-05	4.31e-05	2.21e-06	4.48e-05	4.19e-05	3.94e-05
	(3.79e-05)	(3.84e-05)	(3.85e-05)	(3.89e-05)	(3.92e-05)	(3.84e-05)	(3.85e-05)	(3.93e-05)
altitude	0.00376***	0.00403***	0.00412***			0.00348**	0.00398***	
	(0.00128)	(0.00141)	(0.00141)			(0.00141)	(0.00148)	
Controls for latitude and longitude	Yes	Yes	Yes	No	No	Yes	Yes	No
Controls for distance to province capitals	No	No	No	Yes	No	No	No	Yes
Controls for seven administrative units	No	No	No	No	Yes	No	No	No
Observations	542	542	542	542	542	421	327	327

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

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 are in parentheses. Controls for distance to province capitals includes *d_elgen, d_elfash*, and *d_nyala*. Controls for seven administrative regions excludes the reference category Zalingei. Full sample is used in all columns except for column 6, where only villages without any Arab inhabitants are included, and in columns 7 and 8, where only destroyed or abandoned villages are included.

Source: See table 1.

TABLE 3. Marginal effects from probability of squatting

Variable	MargEfct	- + sd/2	min- > max
rebels	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	−0.0001**	−0.0589	−0.1600
altitude	0.0008***	0.1027	0.8313

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Note: The dependent variable is *squatted*, the estimator is probit, and the calculation is based on specification 1 in table 2 with all other variables held at their mean. The *MargEfct* column shows the partial derivative of the variables at their means. The *- + sd/2* column shows the change in predicted probability of *squatted* when the variables increase from one-half standard deviation below their mean to one-half standard deviation above their mean. The *min- > max* column shows the changes in predicted probability of *squatted* when the variables increase from their minimum to maximum value.

Source: See table 1.

squatting (see table 3). When only destroyed or abandoned villages are included in columns 7 and 8, at least *soilquality* retains its strongly significant estimate.

Distance from administrative centers, *d_admin*, has a positive and consistently significant effect on squatting. A standard deviation increase of 17.2 kms further from the center increases the risk of squatting by 5.7 percent. A potential interpretation is that squatters feel that it is less risky to take over other people's lands in peripheral villages far from local authorities. Also, it is evident from the regressions that squatting is more likely on higher altitudes and in villages that were small before the conflict.

Since columns 7 and 8 in table 2 suggested that *rebels* was mainly affecting the probability of squatting through the probability of a village being destroyed or abandoned, this issue is explored further in table 4. Used in these regressions are a probit estimation with sample selection into *destroyed* = 1 in the selection equation and *squatted*, as before, being the dependent variable in the main probit regression. The results in table 2 indicated that not only *rebels* but also *popsize* were mainly affecting the squatting decision via the probability of destruction.[20] Columns 1a and 2a show the results for selection into *destroyed* = 1. The "instrumental variables" *rebels* and *popsize* are significant in both specifications. The proportion of rebel tribes in the population increases the probability of attacks whereas village size decreases that probability. In the squatting-regressions in 1b and 2b, *rainfall, soilquality* and

20. The variable *popsize* is negative and significant in all columns of table 2 except in 7 and 8. There are also seemingly good reasons for why the size of the population before conflict should not matter for squatting after conflict since all the villages in question had been abandoned by that time.

TABLE 4. Probability of a village being squatted in a sample selection model

Variable	(1a) destroyed (selection equation)	(1b) squatted	(2a) destroyed (selection equation)	(2b) squatted
First-stage instruments				
rebels	2.830***		2.824***	
	(0.198)		(0.197)	
popsize	−0.000500***		−0.000496***	
	(0.000152)		(0.000152)	
Control variables				
d_wadi	−0.0202*	−0.0288**	−0.0206*	−0.0154
	(0.0111)	(0.0129)	(0.0110)	(0.0123)
rainfall	0.000999	−0.00857**	0.00104	−0.0104***
	(0.00357)	(0.00358)	(0.00354)	(0.00356)
temperature	0.775***	0.274	0.914***	−0.0735
	(0.262)	(0.318)	(0.324)	(0.379)
vegetation	−23.53	25.88	−27.54*	33.61*
	(15.06)	(17.14)	(15.22)	(17.56)
soilquality	−0.00188	0.554***	−0.0249	0.511***
	(0.182)	(0.200)	(0.181)	(0.197)
d_admin	0.00856	0.0178***	0.00531	0.0257***
	(0.00658)	(0.00677)	(0.00726)	(0.00777)
n_popsize	6.79e-05	2.03e-05	5.38e-05	2.28e-05
	(6.80e-05)	(3.84e-05)	(6.87e-05)	(4.02e-05)
altitude	0.000630	0.00374**		
	(0.00167)	(0.00152)		
Controls for latitude and longitude	Yes	Yes	No	No
Controls for distance to province capitals	No	No	Yes	Yes
Villages destroyed	327		327	
Villages squatted		125		125
Observations	542	542	542	542

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Note: The estimator is binomial probit with sample selection and maximum likelihood estimation (*heckprob* in stata). The dependent variable is *destroyed* in the selection equation and *squatted* in the main regression. Excludable variables used in the selection equation are *rebels* and *popsize*. A constant with unreported coefficients is included in each specification. Standard errors are in parentheses. Controls for distance to province capitals includes *d_elgen, d_elfash*, and *d_nyala*. Controls for seven administrative regions excludes the reference category Zalingei. Full sample is used in all columns.

Source: See table 1.

d_admin are the strongest determinants of squatting. Also *altitude* is significant when included in 1b and *d_wadi* is also significant in 1b.

The results in tables 2–4 thus suggest some very clear patterns regarding land reallocation in this part of Darfur. If the full sample is used, squatting is most likely in villages that previously held large shares of rebel tribe populations and in villages with relatively small populations. These results mainly emerge because *rebels* and *popsize* affect what villages are attacked and subsequently abandoned. Squatting 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.

Table 5 shows the results when the population growth rate is used as the dependent variable in OLS regressions. The key tendency is immediately clear; regardless of what control variables are included, the estimate for *rebels* 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 7 shows the conditional correlation based on this specification.

None of the geographic and climatic variables seem to have had any important impact on population growth 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. Always included also are *d_admin, popsize*, 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. For column 1, 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 5 includes three other ethnic variables; *arabs, newAfr*, and *EF*. 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, *destroyed* is included as an explanatory variable. As discussed above, this outcome variable is very closely related to population growth and presumably explained by similar processes.[21] Nevertheless, despite these problems, the variable is included to check what happens when it is used. Not surprisingly, *destroyed* is strongly negative and significant. The coefficient for *rebels* shrinks to −0.237 but is still significant at the 10 percent level. In other

21. In Olsson and Siba (2009), this is the key dependent variable. However, the measure of population growth for this study compares levels before the crisis with those after a certain time since the attack has elapsed. In this sense, the variable *destroyed* precedes the observed level of *popgrowth* in time.

TABLE 5. Determinants of population growth

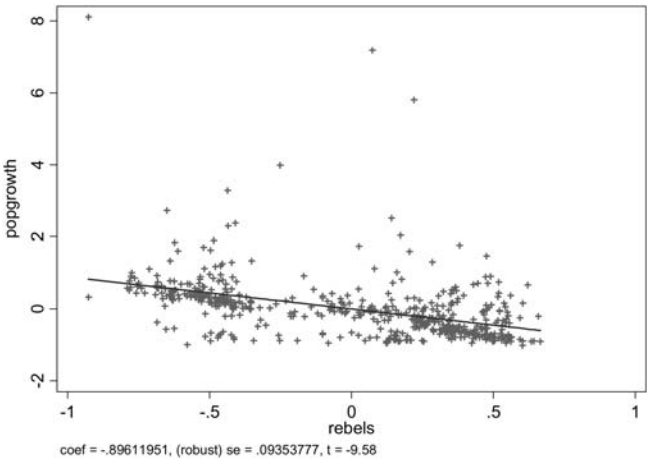
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
rebels	−0.896***	−0.878***	−0.913***	−0.237*	−0.822***	−0.887***	−0.996***
	(0.0935)	(0.187)	(0.0634)	(0.139)	(0.215)	(0.187)	(0.181)
arabs		0.0280			0.0415	0.0161	−0.0633
		(0.161)			(0.167)	(0.165)	(0.156)
newAfr			−0.0556				
			(0.172)				
destroyed				−0.841***			
				(0.140)			
EF					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	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	−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 seven 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)
Observations	530	530	530	530	530	530	530
R-squared	0.250	0.250	0.250	0.337	0.252	0.249	0.259

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Note: The dependent variable is *popgrowth* and the estimator is ordinary least squares regression. Robust standard errors are in parentheses for all specifications. Controls for distance to province capitals include *d_elgen, d_elfash*, and *d_nyala*. Controls for seven administrative regions exclude the reference category Zalingei.

Source: See table 1.

FIGURE 7. Partial relationship between population growth (*popgrowth*) and proportion of rebel tribe households in village before conflict (*rebels*) in 530 villages



Note: The figure shows the conditional correlation based on specification 1 in table 5; coefficient = −.89611951 (robust); standard error = .09353777; t-statistic = −9.58.

Source: See table 1.

words, regardless of whether a village has been destroyed or not, population growth is lower among villages with larger initial rebel tribe populations.

In summary, the results of the study suggest the following story: The Janjaweed/government forces attacked and forcibly removed people from villages that were dominated by rebel tribes. Many of these destroyed villages were subsequently squatted by local populations, but the squatting decision was more based on resource-related factors than on the original ethnic composition of the village.

III. DISCUSSION

The findings above have potentially important implications for postconflict reconstruction policy. 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.[22]

The study shows that nearly 300,000 rebel tribe individuals (about 40 percent of the initial population) have been displaced from the sample villages,

22. 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.

and total population has decreased by about a third. If the sample region is representative of the rest of Darfur, then simple calculations using the same proportions would suggest 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).[23] If total settled population has decreased by only about a third (by 2.165 million to 4.335 million), it implies a net inflow of nonrebel tribe individuals of about 435,000.[24] Furthermore, if squatting has occurred in one fourth of all villages, as in the sample, the projection would be about 1,200 squatted villages in all of Darfur.[25]

Needless to say, the implications in terms of destroyed livelihoods and land reallocations that arise from these figures are daunting. A key issue for postconflict recovery will of course be how to handle the return of some 2.7 million displaced persons who have been illegally removed from their homes and who are currently scattered in numerous camps in Darfur and Chad.

Some international initiatives have come up with concrete proposals for postconflict policy in Darfur. The most comprehensive such effort is probably the Darfur Joint Assessment Mission (D-JAM), created as part of the Darfur Peace Agreement in 2006. This initiative was intended to include all the major stakeholders in the area and was supported by the UN and the World Bank. The aim was to identify and agree on the most immediate needs for recovery and development (D-JAM 2010). Within the project, proposals were for instance advanced concerning the general improvement of agricultural practices (Fadlalla 2006) and how modern GIS mapping can be exploited in order to clarify borders and migratory routes and to improve assessments of environmental degradation (D-JAM 2006). However, since the peace agreement from 2006 soon became irrelevant due to renewed fighting, the current status of the D-JAM process is somewhat uncertain.[26]

Most observers seem to agree that any successful reconstruction of Darfur inevitably will have to involve land reforms. 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. These institutions have a long history and a fairly high degree of acceptance among local populations. Reforms will however have to accommodate the needs of nomadic populations without dars of their own, to a greater extent

23. Calculated as 40 percent of a total population of 6.5 million.

24. Calculated as 4.335 (estimated current population, in millions) + 2.6 (estimated displacements) – 6.5 (total population before crisis) = 0.435 million.

25. 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.

26. See also University of Peace (2004) and the contributions therein.

than before. A recurring idea is that a land commission should be established and work out a new local land regime once peace has been secured in the area. Such an inclusive process of reconciliation between Darfur's many different groups is still far away.

A critical issue for all of Sudan will further be the referendum in 2011 about a possible secession of the south. If a secession actually materializes, this will undoubtedly have consequences also for Darfur, although it is very hard to guess what these are going to be. A reasonably certain prediction regarding Darfur is that millions of refugees will remain in camps in years to come and that the regime in Khartoum will continue to neglect the non-Arab population in the area. If a peace is eventually secured, large investments in basic infrastructure will be necessary if Darfur is going to develop economically. Darfur is going to be heavily reliant on efforts from the international community for the foreseeable future.

IV. 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 land reallocation and population growth in Darfur as a result of the recent conflict. An improved understanding of such patterns should facilitate effective policies for postconflict reconstruction. The database includes 542 villages and small towns in southwestern Darfur with detailed information about ethnic composition before and after the conflict. The data also contain information regarding number of people being displaced and whether villages have been squatted by newcomers.

The 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. The regression analysis shows that population displacements and squatting are more likely in villages with a large proportion of rebel tribe households. 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 postconflict 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 potentially 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.

References

Abdul-Jalil, M.A. 2006. "The Dynamics of Customary Land Tenure and Natural Resource Management in Darfur." *Journal of Land Reform, Land Settlement and Cooperatives* 2006/2: 9–23.

Alesina, A., A. Devleeschauwer, W. Easterly, S. Kurlat, and R. Wacziarg. 2003. "Fractionalization." *Journal of Economic Growth* 8: 155–94.

André, C., and J.-P. Platteau. 1998. "Land Relations Under Unbearable Stress: Rwanda Caught in the Malthusian Trap." *Journal of Economic Behavior and Organization* 34: 1–47.

Blattman, C., and E. Miguel. 2010. "Civil War." *Journal of Economic Literature* 48 (1): 3–57.

Collier, P., and A. Hoeffler. 2004. "Aid, Policy, and Growth in Post-Conflict Societies." *European Economic Review* 48 (5): 1125–45.

Czaika, M., and K. Kis-Katos. 2009. "Civil Conflict and Displacement: Village-Level Determinants of Forced Migration in Aceh." *Journal of Peace Research* 46 (3): 399–418.

D-JAM (Darfur Joint Assessment Mission). 2006. "Status of Natural Resources and the Environment." http://darfurjam.unsudanig.org/trackII/index.php.

———. 2010. http://darfurjam.unsudanig.org/index.php?fid=intro.

Depoortere, E., F. Checchi, F. Broillet, S. Gerstl, A. Minetti, O. Gayraud, V. Briet, J. Pahl, I. Defourny, M. Tatay, and V. Brown. 2004. "Violence and Mortality in West Darfur, Sudan (2004): Epidemiological Evidence from Four Surveys." *Lancet* 364: 1315–20.

Do, Q.T., and L. Iyer. 2007. "Poverty, Social Divisions and Conflict in Nepal." Policy Research Working Paper 4228, World Bank, Washington, DC.

Fadlalla, B. 2006. "A Vision and Priority Programme for Post Conflict Development in Darfur." http://darfurjam.unsudanig.org/trackII/index.php.

FAO (Food and Agriculture Organization). 1998. "The Soil and Terrain Database for Northeastern Africa: Crop Production System Zones of the IGAD Subregion." Land and Water Digital Media Series, No. 2, ISBN 92-5-104078-8.

Flint, J., and A. de Waal. 2008. *Darfur: A New History of a Long War* (Revised and Updated). New York: Zed Books.

Hagan, J., and W. Rymond-Richmond. 2008. "The Collective Dynamics of Racial Dehumanization and Genocidal Victimization in Darfur." *American Sociological Review* 73: 875–902.

Hagan, J., W. Rymond-Richmond, and A. Palloni. 2009. "Racial Targeting of Sexual Violence in Darfur." *American Journal of Public Health* 99 (8): 1386–92.

Howden, D. 2009. "War in Darfur is Finished, Claims UN Commander." *The Independent*, August 28. http://www.independent.co.uk/news/world/africa/war-in-darfur-is-finished-claims-un-commander-1778401.html.

ICC (International Criminal Court). 2009. "The Prosecutor v. Omar Hassan Ahmad Al Bashir." ICC 02/05-01/09, 4 March 2009. http://www.icc-cpi.int/iccdocs/doc/doc639078.pdf.

Kevane, M., and L. Gray. 2008. "Darfur: Rainfall and Conflict." *Environmental Research Letters* 3: 1–10.

Murshed, S.M., and S. Gates. 2005. "Spatial-Horizontal Inequality and the Maoist Insurgency in Nepal." *Review of Development Economics* 9 (1): 121–34.

O'Fahey, R.S., and J. Tubiana. 2009. "Darfur: Historical and Contemporary Aspects." http://www.smi.uib.no/darfur/A%20DARFUR%20WHOS%20WHO3.pdf.

Olsson, O. 2010. Forthcoming. "Market Collapse in Vulnerable Environments: A Model Applied to Darfur." University of Gothenburg.

Olsson, O., and E. Siba. 2009. "Ethnic Cleansing or Resource Struggle in Darfur? An Empirical Analysis." Working Papers in Economics 417, University of Gothenburg, Gothenburg, Sweden.

Olsson, O., and M. Valsecchi. 2010. "Quantifying Ethnic Cleansing: An Application to Darfur." Working Papers in Economics 479, University of Gothenburg, Gothenburg, Sweden.

Prunier, G. 2007. *Darfur: The Ambiguous Genocide* (Revised and Updated). New York: Cornell University Press.

Reeves, E. 2009. "Redefining Darfur's Agony: A Shameless Betrayal." http://www.sudanreeves.org/Article250.html.

USHMM (United States Holocaust Memorial Museum). 2009. "Crisis in Darfur—2009 Update." http://www.ushmm.org/maps/projects/darfur/.

University for Peace. 2004. "Environmental Degradation as a Cause of Conflict in Darfur Conference Proceedings, Khartoum, December 2004." http://www.upeace.org/library/documents/darfur_cp.pdf.

Vanrooyen, M., J. Leaning, K. Johnson, K. Hirschfeld, D. Tuller, A. Levine, and J. Hefferman. 2008. "Employment of a Livelihood Analysis to Define Genocide in the Darfur Region of Sudan." *Journal of Genocide Research* 10 (3): 343–58.

Verwimp, P. 2005. "An Economic Profile of Peasant Perpetrators of Genocide: Micro-level Evidence from Rwanda." *Journal of Development Economics* 77: 297–323.

World Bank. 2010. World Development Indicators. http://data.worldbank.org/.