

Occupations under fire:
The labor market in a complex emergency

by Jennifer Alix-Garcia^a and Anne Bartlett^b

^a Department of Agricultural and Applied Economics, University of Wisconsin, 429 Taylor Hall, Madison, WI, USA 53706, email: alixgarcia@wisc.edu

^b International Studies, Faculty of Arts and Social Sciences, University of New South Wales, Sydney NSW 2052 Australia

Occupations under fire: The labor market in a complex emergency

Abstract

This paper examines the impact of conflict-induced population displacement on urban labor markets. Data from over 900 working-age individuals in Sudan indicates that long-term urban residents in conflict areas have a higher probability of being employed in skilled sectors relative to similar individuals in a non-conflict city, and a lower likelihood of becoming unemployed. Recent arrivals to the conflict city, however, are much more likely to become unemployed. The data also show that young women entering the labor market during the conflict are less likely to be unemployed in the conflict city. This is consistent with a framework where war-induced population displacement from rural to urban areas generates demand for services provided by higher-skill workers, and increased competition for low-skill jobs. The data show that household wealth of long term residents decreases in conflict zones. Negative wealth effects are smaller for those more dependent upon skilled sectors.

JEL codes: O15, D74, J24

1 Introduction

War is widespread and persistent in developing countries, having affected one-third of all nations since 1991 (Blattman and Miguel, 2010). Whether they participate directly in conflicts or not, households in war zones suffer from changes in security leading to large scale disruptions of labor and product markets. Using the case of Darfur, Sudan, this paper analyses how civil conflict, the attendant population displacement, and the presence of humanitarian aid restructures labor markets. Because labor is the key resource owned by the poor, dissecting the impact of conflict on labor markets yields insight into its effect on vulnerable populations.

One of the most striking features of the Darfur conflict has been the scale of population displacement. While some of the displaced have fled from Darfur into neighboring countries, the overwhelming majority (2.5 million) now exist as internally displaced persons (IDPs) within Sudan (OCHA, 2014). Unable to return to their villages, they live in camps annexed to major cities and depend heavily on food aid. In many cases, the number of IDPs exceeds the initial population of these destination cities. Darfur is not alone in hosting large numbers of IDPs; global IDP populations have hovered near 20 million for most of the past 20 years, are currently almost twice as high as refugee populations, and show no sign of decreasing (iDMC, 2012).

Economic theory suggests that population displacements impact both labor market competition and product demand. The magnitude of these impacts depends upon the substitutability of new labor for existing workers as well as upon the products that they choose to consume (Borjas, 2003; Ottaviano and Peri, 2008; Borjas, 2013). Much of the empirical work in this area has been done in the United States (Card, 1990; Altonji and Card, 1991; LaLonde and Topel, 1991; Borjas, 2006), where well-functioning markets mitigate impacts. It is unclear whether these results hold in conflict settings within developing countries, where effects are localized and exacerbated by transport difficulties and large-scale production disruptions.

While there is a growing body of evidence on the broader consequences of conflict, including impacts on education (Baez, 2011; Shemyakina, 2011b; Buvinic et al., 2014), children (Blattman and Annan, 2010), health (Akresh

et al., 2009, 2011), long run economic indicators, (Davis and Weinstein, 2002; Brakman et al., 2004; Miguel and Roland, 2010), and food prices (Alix-Garcia and Saah, 2010), there are only a handful of studies that examine labor markets. Data restrictions mean that the majority of them focus narrowly on the likelihood of employment. In Tajikistan, women living in regions more affected by war were more likely to be employed than similar women living in less affected regions (Shemyakina, 2011a). Anecdotal evidence from Eritrea suggests higher employment of women in manufacturing due to conflict-induced labor scarcity (World Bank, 2002). In the Balkans, those displaced by conflict are less likely to be working in the post-conflict setting (Kondylis, 2010). Two papers most similar to ours document distributional impacts of conflict-induced population displacement on labor markets. Maystadt and Verwimp (2014) estimate negative outcomes for Tanzanian agricultural workers as a result of population displacement from Rwanda to Tanzania during the Rwandan genocide. In Colombia, Calderón and Ibáñez (2009) find that conflict-induced migration resulted in large negative impacts on wages and employment opportunities for workers in cities receiving migration inflows, particularly the low-skilled.

While these efforts shed light on employment in particular post-conflict and limited conflict settings, there remains a paucity of information regarding the dynamics of labor markets during conflict. This vacuum is particularly acute in the poorest countries, where conflict is most likely to emerge. In addition, existing work does not document changes in the structure of the employment market which are likely to have important distributional consequences.

In order to assess the impact of the Darfur crisis on urban workers, we employ data from 200 households and over 900 working-age individuals in two Sudanese cities. Although the data was collected in 2010, recall questions on household employment and migration choices allow us to examine variation over time. We compare occupation and wealth changes between 2000 and 2010 in a Darfurian city to outcomes among inhabitants of a similar city in the neighboring state of Kordofan, which did not suffer from conflict over the study period. The dataset also includes responses from IDP households in Darfur. While the data is limited by its small sample size, it gives insight into labor market dynamics in a setting where such data is rarely available.

Comparisons between long-term residents across both cities reveal a higher

probability of moving into skilled employment in Darfur relative to Kordofan. These individuals also have a lower probability of moving into unemployment over the study period. The data also show that young women entering the labor market over the study period are much less likely to be unemployed in Darfur than they would have been in Kordofan. Post-conflict arrivals to the Darfurian city tend to have abandoned all work in favor of unemployment, though a small number of them acquire higher-skill positions. A comparison of improvements in housing across the two cities indicates strong negative, but short-lived, wealth impacts which are considerably worse for households with high baseline unemployment or employment in manual labor. We conclude that while new migrants and IDPs may depress wages for low-skill workers through increased competition, they seem to increase demand for goods produced by the relatively higher skilled.

The paper begins by presenting a analytical framework to predict the potential impacts of displaced populations and conflict on urban workers. We then provide background on the Darfur conflict. Section 4 describes the data. Section 5 shows the empirical strategy and results for changes in occupation, and then an empirical strategy and results for the wealth analysis. The final section discusses policy implications, as well as directions for further research.

2 Conceptual framework

There are two large changes in urban Darfurian labor markets as a result of the most recent conflict: a large inflow of individuals and the collapse of the surrounding rural economy. The literature on labor market impacts of immigration has much to lend to discussion of the first effect. The internally displaced in Darfur are similar to low-skilled immigrants arriving in relatively wealthier countries. Their surrounding environment, however, differs. While many migrant-receiving countries are large open economies, the high transactions costs of trading in a war zone effectively close Darfur's economy, making prices and wages locally determined. There is ample evidence that in Darfur the war has induced large-scale abandonment of agricultural and pastoral production, thus eliminating previous linkages from urban to rural livelihoods (Buchanan-Smith and McElhinney, 2011; Alix-Garcia et al., 2013). An additional compli-

cation is large inflows of externally-produced food aid. We generally abstract away from this feature, except to note that the evidence suggests that these flows are not sufficient to compensate for decreases in local production (Young et al., 2005; Bartlett et al., 2012).

Since most of the IDPs are producers from rural areas, it is likely that they are substitutes for local farm labor and other low-skill jobs. In a closed economy, a low-skill labor influx lowers the wage of workers for whom it serves as a substitute, and creates a relative scarcity of high-skill workers. The magnitude of these impacts depends upon the extent to which IDPs can substitute for hosts, and the extent to which low and high-skilled labor serve as substitutes for each other. If low-skill labor can be easily substituted for high-skill labor, then the magnitude of wage effects diminishes. In the short run, returns to high-skill labor unambiguously increase. The present study does not directly measure returns to labor, but rather changes in individual occupations. If it is the case that returns to high-skilled labor increase, one would expect to observe high-skill individuals either working more hours or entering the labor market, and low-skill individuals working less and potentially exiting.

The ability of the urban economy to absorb new workers also depends upon initial unemployment rates. High initial unemployment will exacerbate negative wage effects. Conflict may also differentially affect particular sectors. Those occupations with linkages to rural areas – agricultural traders, for example – are likely to experience sharp decreases in labor demand. The elimination of agricultural production from rural areas creates a scarcity of locally produced food, partially filled by aid, that generates demand for food production in the urban periphery. Although there is anecdotal evidence that this has occurred in Darfur (Buchanan-Smith and McElhinney, 2011), the opportunities to engage in this type of production are limited by substantial decreases in security with distance to the city center (Young et al., 2005; Bartlett et al., 2012). It is therefore likely that low-skill workers will seek employment in non-farm sectors. The humanitarian sector may serve as both an employment source and a generator of demand in new, luxury markets. These forces could be beneficial for native workers with the skills and capital to serve the new sectors.

The displaced also constitute a new group of consumers. Their impact on local demand depends upon their income and preferences. The increase in

demand for goods and services may compound the wage-increasing effect on high-skill labor. The consequences for low-skill labor are ambiguous, since substitution and product demand effects move in opposite directions. The effect of immigration on the wage is negative in the case where there is “product market neutrality”, when new arrivals increase demand for products commensurately with their population size (Borjas, 2013). This need not be true, however, should they preferentially purchase goods produced primarily by low-skill labor. Increasing product demand may result in price inflation, especially in the short run. This exacerbates the wage reduction for low-skill workers and could erode gains to high-skill workers.

Broadly speaking, theory gives only qualified predictions for the impact of conflict and displacement on urban labor markets. Supply side effects include increased competition on the local low-skill labor market, a situation intensified by higher baseline unemployment. When low- and high-skill workers are close substitutes, these effects will be smaller. Demand side effects are both positive and negative for local labor markets. On the positive side, there are increases in demand for all labor given consumption of goods by IDPs, and the creation of new, humanitarian-related sectors. Those initially employed in sectors linked to rural production, will find less employment opportunity. In the long run, as the economy adjusts and more high-skill workers enter the market, adverse effects of the population influx may be mitigated. In sum, the impact on the labor market of IDPs, conflict and humanitarian assistance is an empirical question.

3 The Darfur Conflict

Scholars disagree on the cause of the most recent Darfur conflict, which ran from 2003 until 2009. This is because there is no one cause, but rather a perfect storm of local environmental distress, a core-periphery struggle between the marginalized and the majority, and a customary land tenure system ill-suited to accommodate the southerly movement of nomadic tribes¹. Conflict in Darfur has long historical roots. Darfur’s relationship with Khartoum has been

¹Detailed accounts are presented by DeWaal and Flint (2005) and Prunier (2007), among others, and succinct descriptions interaction of land tenure with resource and ethnic divisions can be found in Olsson and Siba (2009) and Olsson (2011).

tenuous since its annexation to Sudan in 1916. Throughout the 1970s and 80s, rainfall declined in the Sahel region, and Darfur began to receive an inflow of nomadic herders from drier regions to the north. Tensions escalated between the sedentary farmers and nomadic herders (Olsson, 2011). In the 1980's and 1990's fights within the Islamist core in Khartoum resulted in Darfur being polarized along religious and tribal lines as factions fought about constructing an Arabized political identity on one hand and an "African" identity on the other (DeWaal and Flint, 2005).

The beginning of the present conflict dates from 2003, with the April attack on al Fasher air base by rebel groups within Darfur. At this time, significant numbers of IDPs began to be counted by the United Nations System Standing Committee on Nutrition. This data can be seen in figure 1, and is aggregated to the level of the three states in Darfur, labeled according to the state capitals: al Fasher in North Darfur, al Geneina in West Darfur, and Nyala in South Darfur. Throughout late 2004 and 2005, the conflict moved south from its original epicenter west of al Fasher towards Nyala, a spatial trajectory illustrated by figure 1.

To give a sense of the magnitude of these numbers, in 2000 the populations of al Fasher, al Geneina, and Nyala were 178,500, 200,000, and 315,000, respectively (Lahmeyer, 2011). The IDP numbers range from 400,000 to 800,000 per region over the period in question. Some camps are dispersed on the fringes of smaller towns, but the camps adjacent to the regional capitals are the largest. In October 2007, for example, the camps associated with al Fasher, al Geneina, and Nyala hosted 37, 48, and 49% of the total IDPs in their respective states (OCHA, 2007). These towns therefore support an IDP population that rivals that of the hosts. This imbalance of hosts to displaced population inflows is not uncommon; refugees from the Rwandan genocide dwarfed the populations of the host communities in Western Tanzania (Alix-Garcia and Saah, 2010). Mogadishu in Somalia and North Kivu in the Democratic Republic of Congo provide two examples of situations in which the displaced constitute a very large part of the total population (Buscher and Vlassenroot, 2010; iDMC, 2012).

As the Darfur conflict came to the world's attention, aid agencies arrived to protect the internally displaced. In 2004, the African Union sent forces to Al-Fasher, eventually reaching 26,000 troops in 2007. International NGOs flooded

the region. OCHA reported less than 100 total humanitarian staff in Darfur in April 2004. By January 2005, there were a total of 9,108 humanitarian workers in the state. Of the total number of 2005 employees, 3,700, were located in West Darfur, 2,900 in South Darfur, and 1,200 in North Darfur.

4 Data and summary statistics

There are two significant limitations of our data. The first is that surveys were conducted in only two cities of Sudan: Nyala, Darfur, and el Obeid, Kordofan. The second is potential measurement error associated with recall data. Sections 4.1 and 4.2 below discuss the representativeness and comparability of the two cities, section 4.3 sampling issues, and section 4.4 recall bias. Before proceeding, however, we would like to draw attention to the fact that this information was collected at all. The security situation in Sudan is extremely complicated, and though our study approaches the category of a case, we nonetheless feel that the data provides insight into a situation generally closed to researchers. The selection of the cities for surveying was determined by our ability to conduct fieldwork in Nyala, where we had sufficient connections to carry out the project. Once we identified Nyala as a survey site, we sought the closest comparison city in terms of economy, population, and ecology, with the intention of using the trends in the control city to net out changes over time unrelated to the conflict. El Obeid was the most qualified of the available options.

4.1 Baseline characteristics

Nyala is located in the southern part of Darfur state, which shares its western border with Chad and the Central African Republic. Kordofan, whose northern territory houses el Obeid, lies to the east (figure 2). The two regions are ecologically similar, with few discernible differences in basic land tenure structure and other organizational systems (Dishoni and el Din Mustafa, 1966). Some tribes inhabiting Kordofan overlap with those of Darfur, including the Birgid and the Baggara cattle herders (O’Fahey and Spaulding, 1974).

Since Kordofan was originally part of the Darfur Sultanate², Nyala and el

²The Darfur Sultanate functioned as an independent state until 1874.

Obeid share political history. The two cities are both regional trading centers. Founded in the 15th century, Nyala grew into a key marketplace for cross-border trade and an administrative center for the Anglo-Egyptian government following the 1916 fall of the Darfur Sultanate (Arkell, 1952; Thelwall, 1980). El Obeid, founded during the 1820 Turco-Egyptian invasion, also became an important crossroads for camel trains and pilgrims from West Africa traveling to Mecca (O’Fahey, 2008).

Data from the late 1980s indicate substantial similarities between the two states. Table 1 describes the subsample of urban households in Kordofan and Darfur from the Demographic and Health Survey (DHS), 1989-90. This data cannot be limited to the specific cities in our sample, but give a broad impression of urban populations within the two regions.

In 1994 both cities became state capitals. This transition had the effect of drawing new residents associated with governmental functions. During the educational reforms of the early 1990s new universities were built in both cities, and they became centers for the training of new teachers intended to staff a growing number of schools. 1993 Census estimates show a population of 227,200 in Nyala and 229,400 in el Obeid, with yearly growth rates between 1993 and 2000 of 5.5 and 5.9%, respectively (Lahmeyer, 2011).

In the summer of 2010 and beginning of 2011, we conducted household surveys in both cities.³ Because no sample frames were available, sampling was conducted spatially – each city was divided into ten districts in three concentric rings from the center. Random points within each zone were chosen using GIS software as starting points for surveying. Surveyors began sampling at the household nearest to a given mapped point. Once a household was surveyed, enumerators proceeded in a specific pattern away from the point until obtaining responses from 5 households. 100 households within each city were surveyed, and 100 households were also interviewed inside Nyalan IDP camps. The survey contains recall questions on household composition and occupations; the household roster collected information on all residents from 2000 forward, including dates of entry into and exit from the household. Occupations of current residents were collected for both the year 2000 and for 2010/11.

³Our data collection was completed before the breakout of war in South Kordofan, which occurred in June 2011.

Table 2 displays household characteristics from the 2010/11 surveys. The sample shown is limited to those individuals who were present in each city and of working age in 2000. Consistent with our framework, occupations are coded to reflect differing levels of training required. The categories are unemployed, student/housewife, manual labor, medium-skill, and high-skill. Manual labor includes the job descriptions of farmer, agricultural laborer, cattle herder, and day laborer. Medium-skill professions are trader, small business owner, wage laborer at airport, driver, nanny, military or police, mechanic, and “other skilled.” High-skill professions include teacher, lawyer, veterinarian, and doctor.

Looking across the two cities, the statistics do not show significant differences in household size, average age, property, or gold ownership. There are, however, differences in education and the structure of employment prior to the conflict upsurge. In particular, our sample shows higher levels of education in Nyala, and a greater proportion of the labor force in high-skill jobs. When we further break down these employment categories (Table 3), we observe that the bulk of the differential occurs in the higher-skill categories – the Nyala sample has a disproportionate number of teachers, as well as other “high-skill” workers compared to el Obeid. We also measure slightly lower unemployment in Nyala in 2000 (9.7%).

In order to more rigorously examine these differences, which could constitute an important violation of our identification strategy, we estimate the differences in employment in 2000 by limiting comparisons to be between individuals with similar characteristics using a matching estimator. The estimator first identifies households el Obeid which are most similar to those in Nyala along the dimensions of age, years of education, household size, and gender using the Mahalanobis metric (see Abadie and Imbens (2011)). The difference in mean employment across cities is then compared, yielding the “average treatment effect on the treated”. In no case is the difference large or significant: the estimates are 0.057 for proportion in high-skill jobs, -0.017 for proportion in medium-skill jobs, -0.04 for proportion in manual labor, and -0.017 for unemployed. None are statistically different from zero. This indicates that across cities, for individuals of similar age education, household size, and gender, employment outcomes do not differ.

Finally, it is important to characterize the population of internally displaced.

The data show that IDPs in camps have significantly lower schooling than the average working-age Nyalan – an average of around 4 years. Only about 45% of IDPs are employed, with the majority of that employment (76%) located in the camp. Ten percent of surveyed IDPs over the age of 15 are employed in the city. Although this percentage may seem small, recall that in 2005 there were approximately 400,000 IDPs in camps around Nyala. Many of these individuals are employed in sectors within which we observe no Nyalans employed – that of nanny or household servant (38%). The next most common source of employment is “unskilled wage labor” (34%). In general, these individuals are day laborers. Small numbers also work as farmers, traders in the market, drivers, and military employees. While the Sudanese Government’s official policy is that IDPs should be repatriated or resettled elsewhere, the reality of the situation is that most IDPs intend to remain in the camps and are hoping for official recognition. In Nyala, local authorities have included IDP communities in city planning processes (iDMC, 2010).

4.2 Parallel trends?

The identification strategy of this paper requires that Nyala and el Obeid be on parallel trends prior to 2003. In addition, it requires that the factors that determined why conflict spread around Nyala and not el Obeid be orthogonal to the outcome of interest: the labor market. With regards to the latter, as discussed above, the causes of Darfur’s conflict are a combination of environmental and historical factors. None of these are driven by changes in urban labor markets.

It would be ideal to be able to consider economic growth trends, but unfortunately this data is unavailable at the appropriate scale over the correct time period. As proxies, we consider the education, unemployment, and population trends. For education and employment, we use a very simple cohort analysis which compares individuals between the ages of 25 and 34 in 2000, with those of an older cohort – 35 to 44, in the same year. The idea is that the differences in outcomes for these two ten year cohorts capture trends in the pre-conflict era. Results are shown in table 5. They indicate that education levels in Nyala are higher, and that they are particularly high – more than 3 years more of

education – among the younger set of individuals living in the cities in 2000. There are no observable differences in the education trends between the two cities; the interaction term between Nyala and the younger age cohort is not significantly different from zero. In terms of unemployment, we also observe small and statistically insignificant differences in unemployment across cohorts and between cities.

As a final insight into trends, we count the number of children born within households in the different cities over two time periods: 1993-1997, and 1998-2002. By subtracting the former from the latter, we obtain an approximate pre-conflict fertility rate. For households living in Nyala before 2003, this number is 0.16, and for households in el Obeid, 0.06. The t-statistic for the difference of these two is 0.43, suggesting no significant difference in fertility rates between the two cities in the pre-conflict era.

4.3 Sampling issues

Because of the limited sample, it is important that Nyala not be a significant outlier in Darfur. It is similar in size to the other Darfurian state capitals. Figure 1 shows that it received similar levels of IDPs and humanitarians. Nyala is not particularly safe either. In a companion paper to this one, we analysed land use trends in 90 km radii around the three main cities of Darfur (Alix-Garcia et al., 2013). This worked mapped data from the US State Department’s Humanitarian Information Unit (HIU) recording damaged or destroyed villages from 2003-2010. Inspection of the presence of violent conflict in these buffer zones suggests that Nyala is not an outlier. 704 violent events were recorded in the Nyala buffer during this period, compared to 191 for al Fasher, and 689 for al Geneina.

In order to further assess the representativeness of our sample, we appeal to the IPUMS (Integrated Public Use Microdata Series, International) sample of the 2008 census data from Sudan. The sample is 17% of the total population, and includes the urban areas in the counties that house Nyala and el Obeid (Minnesota Population Center, 2013). We isolate our comparison to these places. There are two caveats to this data. First, this sample includes zones that are outside of the city boundaries, and hence are not exactly equiv-

alent to our sample. Second, and perhaps more importantly, the 2008 census encountered significant difficulties in Darfur, including resistance from rebel movements and undercounting of households in urban areas and IDP camps (Gailani, 2008; Sudan Tribune, 2008). An independent enumeration of households in Nyala, for example, revealed that only 25% of households sampled in the city confirmed that they had been counted, and no population assessment was carried out in any of the IDP camps surrounding the city (DRDC, 2010).

Nonetheless, the sampling within the cities of interest sheds some light on our own data (Table 4)⁴. Our sample contains proportionally more individuals with secondary education and proportionally fewer with less than primary or no schooling at all than in the Census. In addition, individuals in Nyala are more educated than those in el Obeid in our sample than they are in the Census data. Part of this may be due to the small sample size, and another part to surveyor tendencies to go to houses which they perceived to be safer in Nyala. We must therefore interpret any findings from our data in the context of these differences.

One final sampling issue is that we do not have information on entire households that migrate. There is, however, information on individuals who have left the households in our sample – the dataset shows their occupation at the time of leaving, their age, gender, and the time of year (first or second half) that they migrated. There are 591 individuals in the total sample who were older than 15 in 2000. Of these, 54 left el Obeid before 2010, and 147 left Nyala. None of the individuals who migrated out of Darfur during the period went to el Obeid, and none of those listed as arriving in el Obeid after 2003 came from Darfur. We use the timing of their migration to conduct a non-parametric survival analysis to obtain qualitative information both on the differential migration rates across the two cities, but also the differential migration rates across occupations.

Specifically, we apply the Kaplan-Meier estimator (Kaplan and Meier, 1958), which is often used in epidemiological studies to estimate the proportion of a sample having “survived” to the next period, and adjusts for censoring at either end of the data. We estimate the likelihood of migrating in a given period, given migration in previous periods, and graph out the cumulative probability

⁴We observe similar correlations when considering the 2000 UN Multiple Indicator Cluster Survey (MICS) (UNICEF, 2000).

of migration at any given time period. We group time periods into six month intervals beginning in 2000 and ending during the second half of 2010. Figure 3 shows two different Kaplan-Meier “failure” curves, one for each city. Since there are no migrants prior to 2001, there are no confidence intervals until that time. The figure substantiates our previous assertion: that there is no significant difference in migration between the two cities until after late 2003. In fact, the confidence intervals for the two curves overlap until 2006, though there is a clear increase in Nyala before then.

Figure 4 estimates differential migration across occupational classes in Nyala. The confidence intervals overlap in this estimation, so interpretations of differences must be taken with caution. However, the biggest qualitative increase in migration is driven by the category “student/housewife” leaving Nyala, followed by the unemployed. Our findings below will be interpreted in light of these trends.

4.4 Recall

A final concern with the data is that measures of key outcome variables, occupation, employment, migration, and housing improvements, are constructed from recall data. There are two difficulties with the use of retrospective data: idiosyncratic inaccuracies in recall and differential inaccuracies across the two cities. There is a literature exploring the extent of recall error in the measurement of earnings, transfer program income, savings, hours worked, and the length of unemployment. This work is reviewed in Bound et al. (2001). The evidence on recall bias as it relates to our outcomes is thin, although the review suggests that accuracy for occupational reporting is much higher at the “industry” rather than the “occupational” level. Our labor market outcomes are aggregated up to quite broad occupational levels, so we expect this type of misreporting to be limited.

Migration histories, used in the previous section, are commonly reported as recall data, as in the Family Life Surveys in Mexico and Malaysia, among others. This type of data is commonly used in the literature (see Richter et al. (2007), McKenzie and Rapoport (2007), and Taylor and Lopez-Feldman (2010)). Comparing retrospective data in two waves of the Malaysian Family

Life Survey (Smith and Thomas, 2003) find that individuals tend to have more trouble remembering moves of short duration or local moves. In our data this problem is minimized by only counting as out migration moves which were outside of the regions, and were longer than three months in duration.

Finally, we analyse recall data on major housing improvements, a methodology also used by McIntosh et al. (2011). These authors note that the observability of housing to the enumerator aids in the recall process, as improved features can be verified visibly, and enumerators need only aid participants in ascertaining the timing of the improvement. If the bias in recall of the outcome variables is distributed idiosyncratically across the sample, then it will simply inflate the variance and work attenuate results.

Differential recall across sampling sites is much more problematic, since our parameter of interest is the difference between outcomes across time and sites. Much of the literature on the impact of differential recall finds its roots in epidemiology (Thomas et al., 1993; Armstrong, 1998; White, 2003), where it has been found that differential recall bias across exposure to a disease, for example, depends upon whether the outcomes of interest are over- or under-reported by the exposed group. We will return to this possibility in section 6.

5 Labor market impacts

The next two sections present our empirical inquiry into the urban labor market in Darfur. This section examines impacts on occupational choice, and the following impacts on wealth.

5.1 Empirical strategy

We examine occupational change using two approaches. The first simply compares employment transition matrices in the two towns for different subsets of individuals. We consider both the temporal changes in employment in Nyala, and their comparison with changes in el Obeid. This analysis is descriptive in nature. The second approaches serves to more rigorously quantify changes. The estimation strategy is to compare changes in occupation and employment

across individuals with similar characteristics in the two towns. In order to accomplish this, we employ the matching estimator suggested by Abadie and Imbens (2011).

We estimate the average treatment effect on the treated, which compares observed outcomes among the individuals in Nyala ($Y_i(1)$) with an outcome from an individual in el Obeid with similar characteristics ($\hat{Y}_i(0)$). The outcomes are *changes* in employment from 2000 to 2010, so the final estimation is akin to a matched difference-in-difference. We include eight categories of possible outcomes separated for eight estimations: become employed, become high-skill, become medium-skill, become manual laborer, become unemployed, abandon manual labor, abandon medium-skilled, and abandon high-skilled. Estimations are conducted on subpopulations determined in 2000 – for example, the estimation of “become employed” uses as its base population only those individuals who were categorized as unemployed in 2000; the subsample “become medium-skilled” includes only individuals who were not medium-skill laborers in 2000, etc.

The matching covariates include subsets of: gender, age, years of education, if the individual arrived in the city after 2003, household size in 2000, and if the household owned property in 2000. Matching is exact on gender in cases where both genders are included in an estimation together⁵. The impact of living in Nyala on occupational change, $\hat{\tau}$, is estimated by:

$$\hat{\tau} = \frac{1}{N_1} \sum_{N_1} (Y_i(1) - \hat{Y}_i(0)), \quad (1)$$

where N_1 varies with the subsample. The identifying assumption is that, in the absence of conflict-induced dynamics, the trends in employment for individuals of similar education, age, gender, etc. in Nyala would have been the same as those in el Obeid. We conduct estimations on subsamples of pre- (before May 2003) and post (after May 2003) conflict arrivals, and by gender for the “early” group. We also apply the regression bias-adjustment suggested by Abadie and Imbens (2011), whose implementation details can be found in Abadie et al. (2004). While matching helps remove bias induced by systematic differences

⁵Although matching is conducted at the level of the individual, results are robust to doing matching with only household level covariates as well.

in covariates used for matching across cities, the regression adjustment helps reduce the remaining differences in outcomes related to direct effects of education, gender, age, arrival time, household size, property ownership status, and schooling on occupational choice.

Because the estimation measures changes in employment, individuals who have migrated out of the sample are not included, since we do not have observations on their 2010 profession. In an attempt to draw conclusions relevant to a larger population, we conduct both weighted and unweighted estimates, where weights are the probability of observing an individual of in a particular age, gender, and education class in Nyala in the 2008 Census. We weight according to the Nyalan population because we conduct estimates of average treatment effect on the treated – that is, the difference in outcomes between an individual in Nyala and an individual with the same characteristics in el Obeid.

5.2 Results

5.2.1 Transition matrices

Table 2 shows that on average there are fewer long-term residents employed in manual labor in Nyala in 2010 than in 2000, while this sector increases in el Obeid. We also observe growth in medium-skill employment in Nyala and decreases in el Obeid. Unemployment increases in both cities, with a larger change in el Obeid.

Table 6 shows employment transition matrices for residents of each town, where the top panel shows individuals living in the town before 2003, and the bottom those arriving after 2003. Each row sums to 100, and the object of interest is the percent of individuals employed in a given sector in 2000 who remain in or move from that sector. The sample is restricted to include only those of employment age both time periods.

For long term residents of Nyala there is little movement among those who were unemployed in 2000, or those who were employed in medium- or high-skill jobs. The sector experiencing the most dramatic change is manual labor – only 55% of those originally employed in manual labor in 2000 remain there in 2010. The majority of these move into unemployment, with some acquiring medium-skill jobs and others returning to school. It bears mentioning that

if one analyses just agriculturally related work (farmers, herders, and farm laborers), there are virtually no such individuals in 2010 in Nyala, whereas in 2000 they constitute 5.7% of the workers. Although the sample of this sector is quite small, such a result is consistent with the assertion that IDPs serve as substitutes for low-skill labor

Post-conflict arrivals transition out of all forms of employment into unemployment. This pattern likely reflects the fact that these migrants move to the city in search of safety, rather than superior work opportunities, although there is also some movement from unemployment or manual labor into medium-skill jobs in Nyala.

Comparison of the Nyalan matrices with those from el Obeid underscores these points. Nyalan pre-conflict residents are slightly more likely to remain in the skilled sector, and significantly more likely to remain in medium-skill jobs. Manual laborers in el Obeid are 24 percentage points more likely to remain in manual labor than the same type of workers in Nyala. The (somewhat low) probability of transitioning into the skilled labor sector from any other sector is also higher in Nyala than in el Obeid, especially for those who were students in 2000. There seems to be more movement from all sectors into both medium and high-skilled jobs in Nyala than in el Obeid, a pattern consistent with growth in the skilled sector. For new arrivals there is a greater likelihood of remaining unemployed in Nyala from 2000 to 2010 than in el Obeid.

5.2.2 Matching

The matching process significantly improves the overlap of covariates across populations. We illustrate this for the continuous covariates of schooling and education in Figure 5. The left panel shows the distributions of these variables for the unmatched sample, while the right panel shows these distributions post-matching. Although the overlap is not perfect, it is significantly improved. This is confirmed in the normalized differences between covariates after matching, all of which are less than 0.25 (Table 7).

Table 8 shows the main results for occupational change. On average, individuals who were living in Nyala prior to the conflict were significantly more likely to acquire high-skill jobs, and much less likely to abandon medium-skill work. When we consider men separately (panel c), the results show acquisition

of high- and medium-skill work, and differential retention of medium-skill jobs. In addition, long-term male residents are less likely to become unemployed between 2000 and 2010. There were not sufficient numbers of male long term residents who were unemployed in 2000 in both cities to estimate the likelihood of moving out of unemployment. Similarly, the subsample of women over 25 who were employed in 2000 is only 40 individuals, so we are not able to conduct separate estimations for them.

Among those who arrived in the city after 2003, workers are more likely to abandon a job in any sector and become unemployed. The results are larger and consistently statistically significant for the weighted estimations. These individuals are also less likely to become employed. The only category in which there are positive outcomes is for the small proportion of workers who arrive in the city after 2003 and acquire high-skill jobs.

Last, we consider the possibility that young men and women leaving school age (between 15 and 24 years) during the time period of interest are able to find jobs. We estimate difference in the probability of being unemployed in 2010 using the same matching estimator. Table 9 shows these estimates for the entire population and for men and women separately. The average effect is negative but insignificant without weighting and negative and significant with weighting. The separate effects for men and women, however, are opposite – young men in Nyala have the same probability of unemployment as they do in el Obeid, while the probability of 2010 unemployment of young women entering labor market age is much lower in Nyala. This effect may be partly driven by the fact many of the unemployed in 2000 emigrated. However, this does not explain the differential effect by gender. One possible explanation is that our Nyala sample is quite educated, and perhaps has greater bargaining power than that of el Obeid. In order to assess this possibility, we create a variable that measures the difference between the education of the individual in our “young” subsample and the household head. Including this covariate in the matching process reduces the size of the estimated coefficient for young women⁶, but does not eliminate the effect (Table 9).

One interpretation of these results is that the situation in Nyala has improved for those individuals able to access jobs that require more training –

⁶This interesting possibility was suggested by an anonymous referee.

medium- and high-skill work. The decrease in probability of becoming employed in heavy labor sectors supports the prediction that IDP increase competition in this sector. The fact that most new arrivals move into unemployment suggests that the economy is not well-positioned to absorb new labor, and that long-term residents have advantages not available to others. The migration estimates shown in Figure 4 suggest that this is not driven by higher outmigration of medium- and high-skill workers. It is important to note that our baseline statistics suggest that Nyala may have been a more vibrant economy than el Obeid during the pre-conflict period. If this is the case, then the results here should understate the actual impact of the conflict, since Nyala should have more easily been able to absorb surplus labor.

6 Wealth impacts

6.1 Empirical strategy

The survey does not contain wage or detailed asset information⁷, but does have data on housing investment – increases in the number of rooms in a house and improvements in the quality of roof and floor during the past 11 years. The survey reports the year in which the investment was made. Given that housing is a key asset, one might take improvements in this housing as evidence of wealth increases. The main limitation of this approach is that it restricts our sample to only those households who own their home, which in Nyala is 56% and in el Obeid 70%. Information on assets in 2000 suggests that these two populations are similar – there are no statistically significant differences across home ownership status in cattle, gold, flour mills, machinery or farmland.

The data generates a panel for homeowners, with indicators for improvements the year in which they occur across a period of eleven years. Households that purchase houses during this time enter the dataset. We wish to estimate the probability of observing a housing improvement for household h in city c in year t (I_{hct}). We take two approaches. First we use a before and after comparison across cities, with $after_t = 1$ starting in 2004, and $Nyala_c = 1$ for

⁷The Institutional Review Board at the University of Wisconsin felt that this information was too delicate to be collected within a conflict zone.

households in Nyala:

$$I_{hct} = \beta_0 + \beta_1 after_t + \beta_2 Nyalacxafter_t + \gamma t + u_h + \mu_{ht}, \quad (2)$$

where the equation includes household fixed effects u_h and a time trend t .

Our second approach is to interact each year effect (d_t) with being in Nyala, thus generating a treatment effect for each year.

$$I_{hct} = \alpha_0 + \sum_{t=2}^{11} (\alpha_t d_t + \beta_t d_t x Nyalac) + u_h + \epsilon_{ht} \quad (3)$$

Standard errors are clustered at the household level for both estimations, allowing for a flexible form of serial autocorrelation. Both equations are estimated using a linear probability model.

6.2 Results

The results of the estimation are shown in Table 10. The first two columns show simple “treatment effects” – from equation 2. Column (1) includes no additional covariates and column (2) a time trend. In both cases, on average, there are significantly fewer housing improvements in Nyala than in el Obeid after the initiation of the conflict. The point estimate of -.10 indicates a 10 percentage point difference in housing investment in Nyala relative to el Obeid after 2003. Given the average probability of improvement in el Obeid of .20, this implies a 50% decrease in such investment.

Column (3) shows interaction terms with the proportion of household members over 25 employed as manual laborers or medium/high-skilled workers in 2000. The intention is to examine whether or not there are differential impacts on households depending upon the main income source prior to the conflict. The interaction terms suggest that there are. In particular, households in Nyala without any workers in either the manual, medium, or high-skill categories in 2000 experience a decrease in the likelihood of housing improvements of 23 percentage points. Having an average proportion of household adults employed in medium or high-skilled sectors in 2000 reduces this impact to -.15, and having all household adults in the higher skill sectors yields a point estimate of 0.35 (se 0.16). For those households with an average proportion of workers employed in

the manual sector, the marginal impact of being in Nyala after the conflict is negative and not statistically different from having everyone unemployed: -0.21 (se 0.07). These results verify the prediction that low-skill workers suffer from labor competition while higher skill workers benefit from increases in demand stemming from the population inflow.

Finally, column (4) shows partial results from the specification given in equation 3. The results here show that the coefficients on the year/city interaction terms begins to become negative in 2004, the year after the arrival of the first IDPs, become increasingly negative and significant in 2005. These effects are then small and insignificant for 2006/2007, and become large and statistically significant in 2008, and remain negative but smaller and insignificant in subsequent years. One possible explanation for this pattern is that the investment is responding to the relatively larger increases of IDPs between 2003 and 2004, and again between 2007 and 2008 (see figure 1). Interpreted in light of the analytical framework, this provides suggestive evidence that the local economy adjusts once the inflow stabilizes.

As was mentioned above, this analysis is subject to the criticism that the situation in Darfur has induced differentially biased recall. It is unclear whether Nyalans would under or over-report housing improvements as a result of the conflict. If they report more because they are able to pin down time points more accurately, then our results understate the true impact of the conflict on housing investment.

We have presented this finding as a wealth effect. However, it is also possible that the estimated impact reflects other changes in labor and housing markets. First, the conflict could change the costs of construction, both through reduced costs of labor and increases in materials cost. The latter effect suggests that our results understate the true impact of conflict on wealth, and the former the opposite. We cannot rule out that the cost of construction materials drives some of the result, but note that labor costs are by far the largest part of remodeling expenses. It is also plausible that fear of losing investment may decrease the propensity to invest in housing in Nyala. However, this is inconsistent with expansion of the city boundaries and construction of luxury housing occurring throughout Nyala in recent years (Bartlett et al., 2012).

7 Concluding discussion

This paper has considered the effects of conflict and population displacement on urban labor markets. Both the IDPs and the migrants absorbed into existing urban households constitute large labor supply shocks. On the demand side, rural activities largely collapsed as a result of the conflict, so demand for labor in backward linked sectors decreased significantly, while the large population increase generated increased demand for goods consumed by the new IDPs and the humanitarian workers who followed in their wake.

Data from Sudan from 2000 to 2010, the most intensive period of the Darfur conflict, show significant changes in employment and household wealth. The methodology we employ uses observations on households in a conflict city and a similar town in a nearby non-conflict zone, first by matching similar individuals and subsequently estimating the propensity to move between sectors. We observe abandonment of agriculturally-related activities and manual labor by long term residents, and abandonment of all job types in favor of unemployment by recent migrants into host households. Long term residents of Darfur have a higher likelihood of maintaining employment in the high- and medium-skill sectors, and a lower probability of falling into unemployment. They do not, however, have a differential probability of moving out of unemployment. Young women entering the labor market during the conflict show a much lower probability of unemployment. This suggests that the economy was not able to easily absorb the influx of low-skilled individuals. Although the displaced population generates demand for goods and services, it is not sufficient to compensate for the increase in labor market competition at low-skill levels, but favorable for higher-skill workers.

We measure wealth impacts using changes in the probability of making improvements to owner-occupied housing. Using variation in this probability from year to year in conflict versus non-conflict areas, the data show that, the likelihood of housing improvements decreases substantially in the immediate aftermath of IDP inflows, but that this decrease seems to dissipate over time. Disaggregating this effect by baseline sector of employment, the largest negative impacts occur for households with more members unemployed or in manual labor sectors. Households dependent upon the high- or medium-skill labor

market experience increases in the likelihood of housing improvements. This is consistent with an increase in wages for medium- and high-skill labor and an erosion of the real wage for low-skill workers. The lower level of migration of medium- and high-skill workers in Nyala is another indicator of the relative improvement in their position in Nyala, while the unemployed, who are likely to have been more hurt by the changes in the labor market, show a greater migration probability after 2004.

That young women are less like to be unemployed in Nyala parallels findings from developed countries, where women's labor market participation has increased during conflict as men integrate into the military (Goldin, 1991; Acemoglu et al., 2004). The wealth results echo results of Miguel and Roland (2010) in Vietnam, Brakman et al. (2004) in Germany and Davis and Weinstein (2002) in Japan, all of whom find no long term effects of conflict when analyzing within-country variation in outcomes. The findings here also corroborate earlier work on displaced populations in Tanzania, where welfare effects varied by livelihood (Alix-Garcia and Saah, 2010; Maystadt and Verwimp, 2014). Furthermore, our results substantiate qualitative assessments of urban Darfur during the conflict, which conclude that Nyala has potentially experienced growth during the conflict, but that it has favored the wealthy (Buchanan-Smith and McElhinney, 2011). They highlight the emergence of peri-urban agriculture, although the study is unable to assess the total employment in this sector. Our own work suggests it is not large enough to create opportunities for the majority of the displaced.

Clearly, even if the measured wealth impacts are short term, this does not imply unchanged well-being for individuals in conflict zones. Interviews with individuals in Darfur indicate that the most important changes are psychological – the stress of insecurity and the crowding of households as relatives move from the countryside into urban areas. Our data also do not allow us to measure what informants also describe as important changes in the structure of the economy as it transforms from a nexus of regional trade to a center serving the population of humanitarian workers.

The evidence taken together documents important labor market changes resulting from conflict. The results imply that policies targeting low-skill laborers and the unemployed might go a significant distance to buffering impacts of the

emergency on the most vulnerable. Such policies could take the form of preferential employment for these groups, both inside and out of the IDP camps. Another possibility would be to invest more heavily in securing the periphery of cities, which would allow for more agricultural production to take place within these regions, potentially offering a source of employment for low-skill workers, as well as helping to mitigate food shortages. Given the differentially larger suffering of IDPs, of course, such policies would only be a complement, rather than a substitute for, existing humanitarian intervention.

Acknowledgements: We thank Caroline Coleman, Angela Lucia and Diane Royal for excellent research assistance. Fatima Abdulruhman and Rehab Karar were essential in conducting the field work for this project. We are also very grateful to Adeeb Yousif Abdelalla for his hard work, responsiveness and wonderful disposition during the data-gathering phase of the project. We are very grateful for comments on this work from Jean-Francois Maystadt, Laura Schechter, Helena Schweiger, the Development Workshop at the University of Wisconsin, Madison, and many active participants at the 9th Midwest International Economic Development Conference. The authors take responsibility for any errors in this paper.

Funding:

Jesuit Foundation, University of San Francisco; Faculty Development Fund, University of San Francisco; University of Wisconsin Graduate School.

References

- Abadie, A., Drukker, D., Herr, J. L., and Imbens, G. W. (2004). Implementing matchng estimators for average treatment effects in Stata. *The Stata Journal*, 4:290–311.
- Abadie, A. and Imbens, G. (2011). Bias-Corrected Matching Estimators for Average Treatment Effects. *Journal of Business and Economic Statistics*, 29:1–11.
- Acemoglu, D., Autor, D., and Lyle, D. (2004). Women, War, and Wages: The Effect of Female Labor Supply on the Wage Structure at Midcentury. *Journal of Political Economy*, 112:497–551.
- Akresh, R., Verwimp, P., and Bundervoet, T. (2009). Health and Civil War in Rural Burundi. *Journal of Human Resources*, 44:536–563.

- Akresh, R., Verwimp, P., and Bundervoet, T. (2011). Civil War, Crop Failure, and Child Stunting in Rwanda. *Economic Development and Cultural Change*, 59:777–810.
- Alix-Garcia, J., Bartlett, A., and Saah, D. (2013). The Landscape of Conflict: IDPs, Aid, and Land Use Change in Darfur. *Journal of Economic Geography*, 13:589–617.
- Alix-Garcia, J. and Saah, D. (2010). The Effect of Refugee Inflows on Host Communities: Evidence from Tanzania. *World Bank Economic Review*, 24:148–170.
- Altonji, J. and Card, D. (1991). The Effects of Immigration on the Labor Market Outcomes of Less-Skilled Natives. In Abowd, J. and Freeman, R. B., editors, *Immigration, Trade, and Labor*. University of Chicago Press, Chicago.
- Arkell, A. J. (1952). The History of Darfur: A.D. 1200-1700, Part III. *Sudan Notes and Records, SNR*, 33:129–155.
- Armstrong, B. (1998). Effect of measurement error on epidemiological studies of environmental and occupational exposures. *Occupational and Environmental Medicine*, 55:651–656.
- Baez, J. (2011). Civil wars beyond their borders: The human capital and health consequences of hosting refugees. *Journal of Development Economics*, 96:391–408.
- Bartlett, A., Alix-Garcia, J., and Saah, D. (2012). City Growth Under Conflict Conditions: The View from Nyala, Darfur. *City and Community*, 11:151–170.
- Blattman, C. and Annan, J. (2010). The Consequences of Child Soldiering. *The Review of Economics and Statistics*, 92:882–898.
- Blattman, C. and Miguel, E. (2010). Civil War. *Journal of Economic Literature*, 48:3–57.
- Borjas, G. (2003). The Labor Demand Curve *is* Downward Sloping: Reexamining the Impact of Immigration on the Labor Market. *The Quarterly Journal of Economics*, 118:1335–1374.
- Borjas, G. (2006). Native Internal Migration and the Labor Market Impact of Immigration. *The Journal of Human Resources*, 41:221–258.
- Borjas, G. (2013). The analytics of the wage effect of immigration. *IZA Journal of Migration*, 2:1–25.

- Bound, J., Brown, C., and Mathiowetz, N. (2001). Measurement error in survey data. *Handbook of Econometrics*, 5:3705–3843.
- Brakman, S., Garretsen, H., and Schramm, M. (2004). The Strategic Bombing of Cities in Germany in World War II and its Impact on City Growth. *Journal of Economic Geography*, 4:1–18.
- Buchanan-Smith, M. and McElhinney, H. (2011). City limits: urbanisation and vulnerability in Sudan. Nyala case study. *Overseas Development Institute: Humanitarian Policy Group, London*.
- Buscher, K. and Vlassenroot, K. (2010). Humanitarian presence and urban development: new opportunities and contrasts in Goma, DRC. *Disasters*, 34:S256–S273.
- Buvinic, M., Gupta, M. D., and Shemyakina, O. (2014). Armed Conflict, Gender and Schooling. *World Bank Economic Review*, 28:311–319.
- Calderón, V. and Ibáñez, A. M. (2009). Labor Market Effects of Migration-Related Supply Shocks: Evidence from internally displaced populations in Colombia. MICROCON Research Working Paper 14, http://www.microconflict.eu/publications/RWP14_VC_AMI.pdf, accessed 4/2/12.
- Card, D. (1990). The Impact of the Mariel Boatlift on the Miami Labor Market. *Industrial and Labor Relations Review*, 43:245–257.
- Davis, D. and Weinstein, D. (2002). Bones, Bombs, and Break Points: The Geography of Economic Activity. *American Economic Review*, 92:1269–1289.
- DeWaal, A. and Flint, J. (2005). *Darfur: A Short History of a Long War*. Zed Books, London.
- Dishoni, S. and el Din Mustafa, N. (1966). *Statistics on Crop Production & Land Use in the Sudan, 1955/56-1965/66*. Department of Agriculture, Khartoum, Sudan, Agricultural Economics Division.
- DRDC (2010). 5th Population and Housing Census in Sudan – An Incomplete Exercise. Darfur Relief and Documentation Centre Report, Geneva, Switzerland.
- Gailani, A. B. (2008). Republic of the Sudan 5th National Population and Housing Census Monitoring and Observation Committee. Presentation of Enumeration Phase Monitoring Report, November 5, PARIS21 Steering Committee Meeting, Paris, France.

- Goldin, C. (1991). The Role of World War II in the Rise of Women's Employment. *American Economic Review*, 81:741–756.
- iDMC (2010). Sudan: Durable solutions elusive as southern IDPs return and Darfur remains tense. Internal Displacement Monitoring Centre, www.internal-displacement.org, accessed 12/23/12.
- iDMC (2012). Global IDP Estimates, 1990-2011. Internal Displacement Monitoring Centre, www.internal-displacement.org, accessed 12/23/12.
- Kaplan, E. L. and Meier, P. (1958). Nonparametric estimation from incomplete observations. *Journal of the American Statistical Association*, 53:457–481.
- Kondylis, F. (2010). Conflict displacement and labor market outcomes in post-war Bosnia and Herzegovina. *Journal of Development Economics*, 93:235–248.
- Lahmeyer, J. (2011). Population Statistics. <http://www.populstat.info/populhome.html>, accessed 12/23/12.
- LaLonde, R. and Topel, R. (1991). Labor Market Adjustments to Increased Immigration. In John Abowd and Richard Freeman, eds, *Immigration, Trade, and Labor*. Chicago, Chicago University Press.
- Maystadt, J.-F. and Verwimp, P. (2014). Winners and Losers among a Refugee-Hosting Population. *Economic Development and Cultural Change*, 62:769–809.
- McIntosh, C., Villaran, G., and Wydick, B. (2011). Microfinance and Home Improvement: Using Retrospective Panel Data to Measure Program Effects on Fundamental Events. *World Development*, 39:922–937.
- Mckenzie, D. and Rapoport, H. (2007). Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico. *Journal of Development Economics*, 84:1–14.
- Miguel, E. and Roland, G. (2010). The long-run impact of bombing Vietnam. *Journal of Development Economics*, 96:1–15.
- Minnesota Population Center (2013). *Integrated Public Use Microdata Series, International: Version 6.2*. Minneapolis: University of Minnesota.
- OCHA (2007). Darfur humanitarian profile no. 29. UN Darfur Coordination and Information Cell, Office for the Coordination of Humanitarian Affairs (OCHA) - Khartoum.

- OCHA (2014). Sudan: Humanitarian snapshot, october 31. UN Darfur Coordination and Information Cell, Office for the Coordination of Humanitarian Affairs (OCHA) - Khartoum.
- O’Fahey, R. S. (2008). *The Darfur Sultanate: A History*. Columbia University Press, New York City.
- O’Fahey, R. S. and Spaulding, J. L. (1974). *Kingdoms of the Sudan, Vol. 9*. Methuen, London.
- Olsson, O. (2011). After the Janjaweed? Socioeconomic Impacts of the Conflict in Darfur. *World Bank Economic Review*, 24:386–411.
- Olsson, O. and Siba, E. (2009). Ethnic Cleansing or Resource Struggle in Darfur? An Empirical Analysis. Working Papers in Economics 417, University of Gothenburg, Gothenburg, Sweden.
- Ottaviano, G. I. and Peri, G. (2008). Immigration and National Wages: Clarifying the Theory and the Empirics. NBER Working Paper 14188, Cambridge, MA.
- Prunier, G. (2007). *Darfur: The Ambiguous Genocide (Revised and Updated)*. New York: Cornell University Press.
- Richter, S., Taylor, E., and Yunez-Naude, A. (2007). Impacts of Policy Reforms on Labor Migration from Rural Mexico to the United States. In Borjas, G., editor, *Mexican Immigration to the United States*. University of Chicago Press.
- Shemyakina, O. (2011a). Labor Market, Education and Armed Conflict in Tajikistan. World Bank Policy Research Working Paper 5738, Washington, D.C.
- Shemyakina, O. (2011b). The Effect of Armed Conflict on Accumulation of Schooling: Results from Tajikistan. *Journal of Development Economics*, 96:186–200.
- Smith, J. and Thomas, D. (2003). Remembrances of things past: test-retest reliability of retrospective migration histories. *Journal of the Royal Statistical Society A*, 166:23–49.
- Sudan Tribune (2008). Darfur Displaced reject Sudan Census. *Sudan Tribune*, March 31. Retrieved from www.sudantribune.com, 12/23/12.

- Taylor, E. and Lopez-Feldman, A. (2010). Does Migration Make Rural Households More Productive? Evidence from Mexico. *Journal of Development Studies*, 46:68–90.
- Thelwall, R. (1980). *Linguistic studies in honour of Paul Christophersen*. University of Ulster Press, Coleraine, Northern Ireland.
- Thomas, D., Stram, D., and Dwyer, J. (1993). Exposure Measurement Error: Influence on Exposure-Disease Relationships and Methods of Correction. *Annual Review of Public Health*, 14:69–93.
- UNICEF (2000). Sudan multiple indicator cluster survey 2000. United Nations Children’s Fund (UNICEF). New York, United States.
- White, E. (2003). Design and Interpretation of studies of Differential Exposure Measurement Error. *American Journal of Epidemiology*, 157:380–387.
- World Bank (2002). Conflict and Labor Markets in Manufacturing: The Case of Eritrea. Conflict Prevention and Reconstruction Unit, Social Development Department, World Bank, Dissemination Note Number 7, Washington, D.C.
- Young, H., Osman, A. M., Aklilu, Y., and Dale, R. (2005). Darfur 2005: Livelihoods under Siege, Final Report. Report by the Feinstein International Famine Center, Medford, MA and Ahfad University for Women, Omdurman, Sudan, funded by USAID/OFDA.

8 Figures

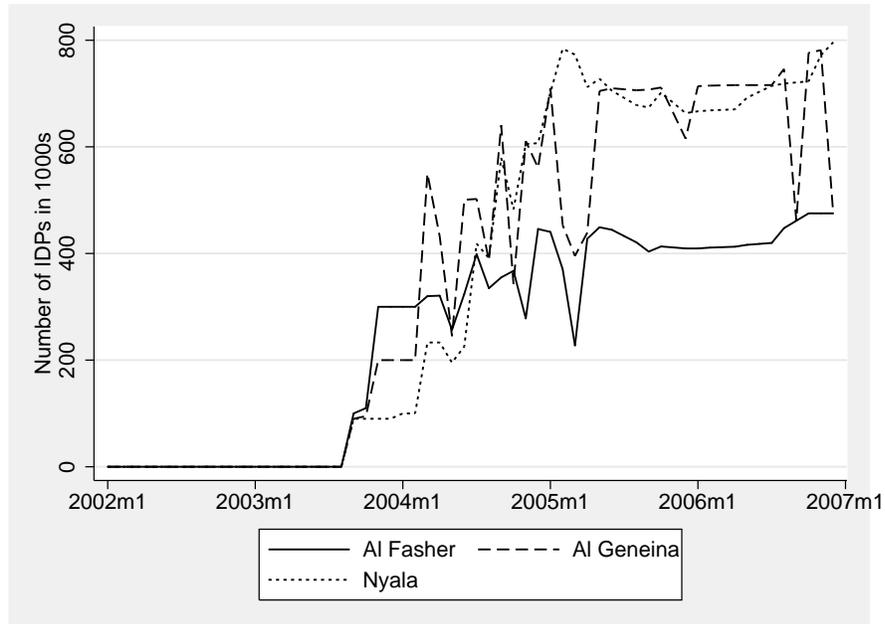


Figure 1: IDP totals

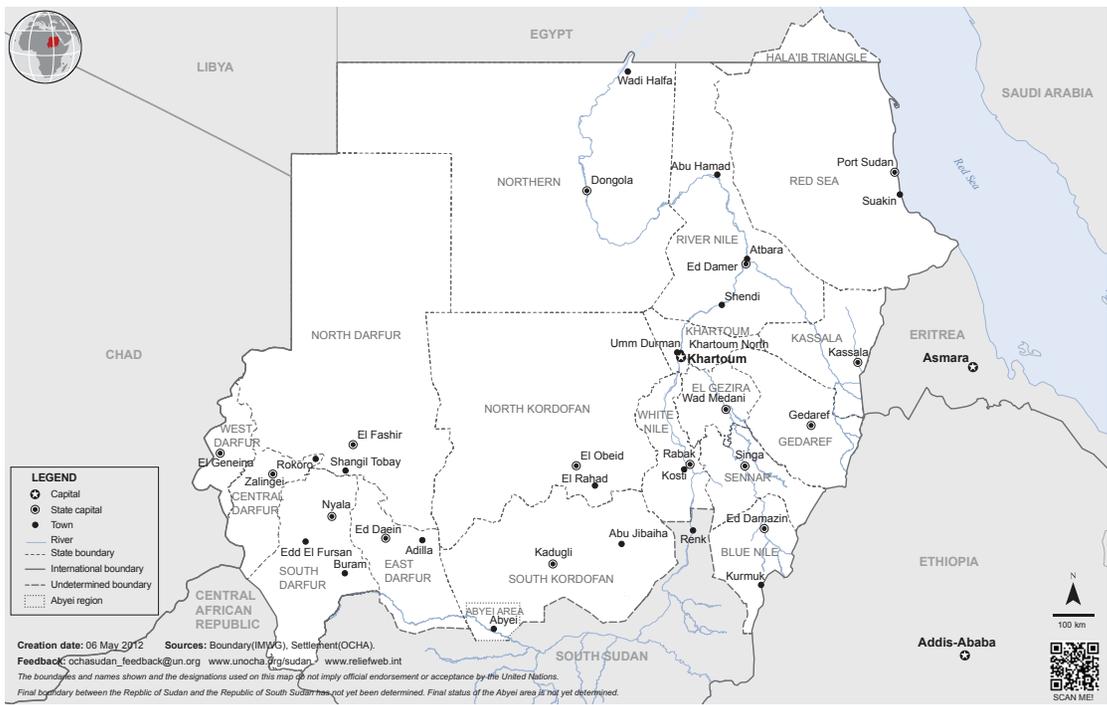


Figure 2: Sudan
 source: www.unocha.org

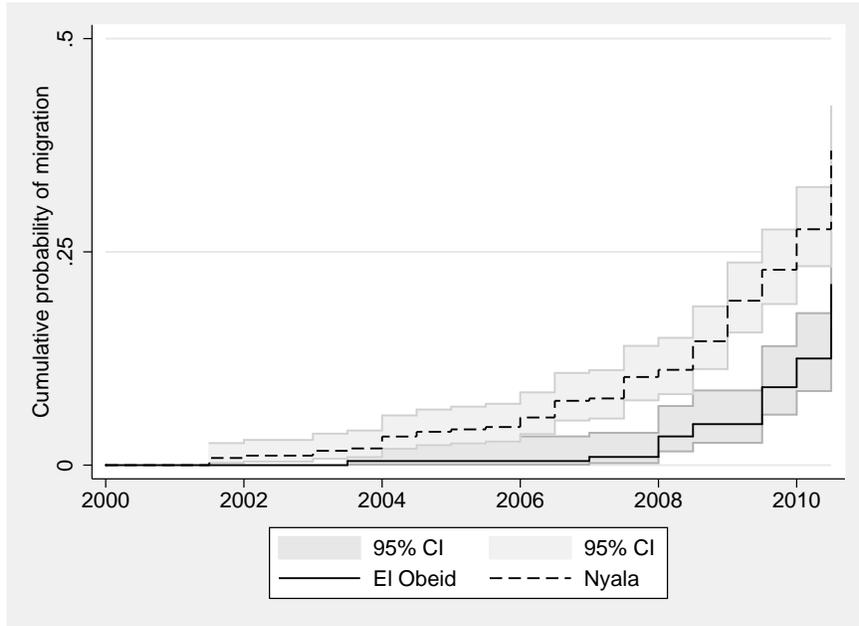


Figure 3: Cumulative migration rates by city

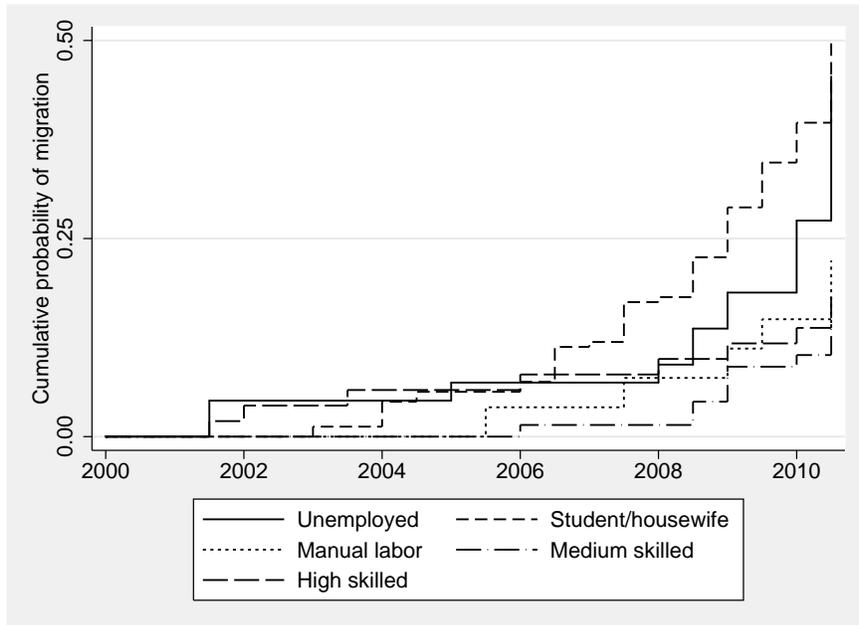


Figure 4: Differential migration across occupations in Nyala

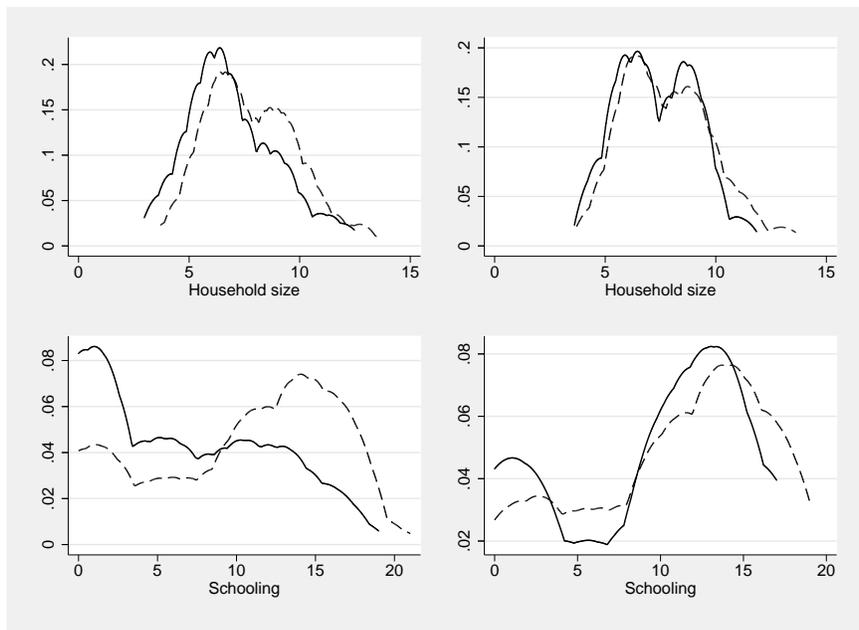


Figure 5: Improvement in covariate overlap (matched subsample, right panel)

9 Tables

Table 1: Women 15-49 in Urban Darfur and Kordofan, DHS 1989-1990

	Darfur	Kordofan	T-stat
Years education	2.9	3.0	0.25
Husband's years education	4.8	3.9	1.55
House has electricity	0.28	0.34	0.93
Household with radio	0.67	0.64	0.675
Household with refrigerator	0.09	0.12	0.77
Household with bike	0.15	0.20	1.13
Household with dirt floor	0.79	0.85	1.27
Number of households	123	151	

Demographic and Health Survey subsample from urban areas of Darfur and Kordofan.

Table 2: Household and individual characteristics from 2010/11 survey

Household characteristics				
	Nyala		el Obeid	t-statistic
Household size, 2000	7.5		6.7	1.29
Proportion households with migration, pre-2003	0.034		0.016	0.68
Own gold, 2000	0.13		0.16	0.38
Number of households	88		63	
Pre-2003 education and occupations				
Years schooling	10		7	5.51
Age	46		45	0.56
	2000	2010	2000	2010
Unemployed	0.097	0.165	0.168	0.271
Student or housewife	0.357	0.227	0.401	0.278
Manual labor	0.102	0.068	0.142	0.160
Medium-skill labor	0.272	0.358	0.265	0.247
High-skill labor	0.170	0.182	.031	0.043
Observations	162		176	

The subsample in the bottom panel includes all households and household members who were present in each city before 2003, and would have been 15 years of age by 2000.

Table 3: Detailed employment by sector for individuals living in cities in 2000

Occupation	Obeid	Nyala
Farmer or farm worker	4.3	5.7
Trader or small business	8.6	5.1
Other unskilled	9.9	4.5
NGO, airport worker, or driver	4.9	4.5
Doctor, lawyer, teacher, veterinarian	0.0	4.0
Teacher	3.1	13.1
Police or military	5.6	2.3
Mechanic or health worker	1.2	6.3
Other skilled	6.2	9.1
Unemployed	16.0	9.7
Student	14.8	18.8
Housewife	25.3	17.0

Subsample of individuals older than 15 years in 2000.

Table 4: Comparison between survey sample and 2008 census data

	Survey sample		
	El Obeid	Nyala	Normalized difference
No schooling	0.320	0.168	0.250
Less than primary	0.337	0.194	0.223
Primary complete	0.210	0.291	0.134
Secondary complete	0.120	0.302	0.306
University complete	0.012	0.044	0.134
Observations	909		
	IPUMs 2008		
No schooling	0.441	0.419	0.030
Less than primary	0.164	0.139	0.051
Primary complete	0.113	0.117	0.008
Secondary complete	0.151	0.138	0.026
University complete	0.101	0.083	0.042
Observations	24861		

IPUMS sample from urban areas in counties containing the cities of Nyala and el Obeid.

Table 5: Cohort analysis – individuals aged 25-54 in 2000

	Years schooling	Outcome		
		High/medium-skilled in 2000	Manual labor in 2000	Unemployed in 2000
	(1)	(2)	(3)	(4)
Nyala	5.980*** (1.291)	-0.001 (0.117)	0.098 (0.103)	-0.050 (0.078)
Age 25-34 in 2000	3.433*** (1.129)	-0.091 (0.117)	-0.010 (0.099)	0.109 (0.101)
Nyala x Age 25-34 in 2000	-2.353 (1.586)	0.112 (0.156)	-0.094 (0.120)	-0.071 (0.110)
N	167	167	167	167

All regressions contain a constant and a gender dummy variable. Columns (2)-(4) also include years of schooling as an additional control. The omitted cohort is the group of individuals aged 35-44 in 2000. Standard errors are robust and clustered at the household level.

Table 6: Employment transition matrices for current residents

Residents before April 2003										
	Obeid					Nyala				
	2010					2010				
2000	Unemployed	Student	Manual	Medium	High	Unemployed	Student	Manual	Medium	High
Unemployed	80.00	7.69	3.85	7.69	0.00	94.12	0.00	0.00	5.88	0.00
Student	12.31	63.08	7.69	12.31	4.62	9.52	60.32	0.00	20.63	9.52
Manual	16.67	4.17	79.17	0.00	0.00	22.22	5.56	55.56	11.11	5.56
Medium	23.26	2.33	4.65	69.77	0.00	4.17	0.00	4.17	91.67	0.00
High	20.00	0.00	0.00	0.00	80.00	3.33	3.33	0.00	10.00	83.33
observations	163					176				
Residents arriving after April 2003										
	Obeid					Nyala				
	2010					2010				
2000	Unemployed	Student	Manual	Medium	High	Unemployed	Student	Manual	Medium	High
Unemployed	31.25	56.25	0.00	12.50	0.00	75.00	0.00	0.00	25.00	0.00
Student	10.64	63.83	0.00	23.40	2.13	18.18	58.18	0.00	12.73	10.91
Manual	15.79	2.63	78.95	2.63	0.00	51.43	2.86	20.00	25.71	0.00
Medium	2.50	5.00	7.50	82.50	2.50	0.00	6.67	6.67	80.00	6.67
High	0.00	0.00	0.00	25.00	75.00	5.00	0.00	0.00	10.00	85.00
observations	145					133				

Cells contain percentages of population and sum to 100% across rows.

Table 7: Improvement in normalized differences of covariates through matching

Variable	Before matching	After matching
Age	0.075	0.083
Schooling	0.453	0.159
Household size	0.187	0.176
Gender	0.080	0.000
Own property	0.269	0.000

These are normalized differences in means on matching covariates before and after matching for the sample that is used to estimate baseline differences in employment by sector in 2000. Improvements in covariate balance are similar for all samples used in estimation. Because matching is exact on gender and property ownership, there are no differences in the matched subset.

Table 8: Impact of being in Nyala on occupation change, individuals ≥ 15 years old in 2000

	Become employed	Become high-skill	Become medium-skill	Become manual	Become unemployed	Abandon manual	Abandon medium-skill	Abandon high-skill
(a) Arrived in city before 2003								
Average treatment effect	-0.059	0.048*	0.078	-0.063*	-0.113	0.222	-0.313***	0.033
Unweighted	(0.083)	(0.027)	(0.068)	(0.037)	(0.074)	(0.239)	(0.085)	(0.349)
Weighted	-0.058	0.024**	0.052	-0.030	-0.110	0.017	-0.472***	0.124
	(0.050)	(0.011)	(0.058)	(0.035)	(0.070)	(0.118)	(0.097)	(0.255)
N	43.000	303.000	247.000	297.000	295.000	41.000	91.000	35.000
(b) Arrived in city after 2003								
Unweighted	-0.375	0.062***	0.059	-0.092	0.136***	0.314	0.133	0.150*
	(0.459)	(0.018)	(0.083)	(0.073)	(0.046)	(0.292)	(0.115)	(0.079)
Weighted	-0.846**	0.028***	0.045	-0.011	0.359***	0.541***	0.123*	0.233***
	(0.366)	(0.006)	(0.101)	(0.012)	(0.042)	(0.128)	(0.074)	(0.062)
N	24.000	254.000	223.000	205.000	254.000	73.000	55.000	24.000
(c) Men: pre-2003 residents								
Unweighted		0.041	0.160**	-0.024	-0.115	0.111	-0.171	-0.222
		(0.029)	(0.081)	(0.064)	(0.100)	(0.248)	(0.113)	(0.511)
Weighted		0.023*	0.183***	0.010	-0.186*	-0.082	-0.317**	-0.189
		(0.013)	(0.052)	(0.019)	(0.105)	(0.134)	(0.124)	(0.324)
N		145.000	85.000	140.000	154.000	25.000	80.000	20.000

Cells show average treatment effects on the treated, where treatment is presence in Nyala. Weights are derived from the Nyalan sample of the 2008 census. Matching covariates include age, gender, years schooling, household size in 2000, and if household owned property in 2000. All estimates are bias-adjusting on all matching covariates. Robust standard errors in parentheses. *, **, *** indicate significance at 10, 5 and 1% levels, respectively.

Table 9: Impact of being in Nyala on unemployment of individuals 15-24, 2010

	Full Sample	Men	Women
Unweighted	-0.081 (0.056)	0.045 (0.059)	-0.200** (0.088)
Weighted	-0.109** (0.043)	0.051 (0.039)	-0.249*** (0.074)
Weighted and matched on education differential	-0.113** (0.045)	-0.067 (0.060)	-0.155** (0.063)
N	282.000	141.000	141.000

Cells show average treatment effects on the treated, where treatment is presence in Nyala. Weights are derived from the Nyalan sample of the 2008 census. Matching covariates include age, years schooling, household size in 2000, and if household owned property in 2000. All estimates are bias-adjusting on all matching covariates. Robust standard errors in parentheses. *, **, *** indicate significance at 10, 5 and 1% levels, respectively.

Table 10: Housing improvements

	Outcome: any housing improvement			
	(1)	(2)	(3)	(4)
After 2003	0.162*** (0.023)	0.067 (0.041)	0.117** (0.058)	
Nyala x after 2003	-0.101*** (0.038)	-0.101*** (0.038)	-0.232*** (0.086)	
After 2003 x proportion manual			-0.101 (0.295)	
After 2003 x proportion medium/high			-0.298* (0.153)	
Nyala x after 2003 x proportion manual			0.276 (0.365)	
Nyala x after 2003 x proportion medium/high			0.592** (0.233)	
Nyala x 2001				0.097* (0.056)
Nyala x 2002				0.096* (0.054)
Nyala x 2003				0.022 (0.061)
Nyala x 2004				-0.004 (0.068)
Nyala x 2005				-0.146* (0.076)
Nyala x 2006				0.081 (0.084)
Nyala x 2007				-0.017 (0.075)
Nyala x 2008				-0.157* (0.081)
Nyala x 2009				-0.040 (0.084)
Nyala x 2010				-0.048
N	1001.000	1001.000	1001.000	1001.000
Yearly fixed effects	no	no	no	yes
Time trend	no	yes	yes	no

These are partial results. Full estimations include all relevant interactions and fixed effects at the household level. Robust standard errors in parentheses, clustered at household level. *, **, *** indicate significance at 10, 5 and 1% levels, respectively.