Do refugee camps help or hurt hosts? The case of Kakuma, Kenya

Jennifer Alix-Garcia[*], Sarah Walker[†], Anne Bartlett[‡]

Harun Onder[§], Apurva Sanghi[¶]

September 13, 2017

Acknowledgements: We thank seminar participants at the University of New South Wales, as well as two anonymous referees, for their useful comments. We are immensely grateful to the residents of Kakuma camp for their generosity and to the Turkana people, who were very tolerant of our questions. We would also like to extend our gratitude to UNHCR officials in Kenya for facilitating the implementation of the household survey used in this paper. We thank participants of two stakeholder roundtables on Kakuma Refugee Camp in Lodwar, Kenya. We are also grateful to feedback we received during two KNOMAD workshops on measuring impacts of refugees and IDPs on host countries and host communities and measuring remittances sent to and from refugees and IDPs, both held in Washington, DC, and from attendees of the Sudan Studies Association meetings. In addition, we are indebted to the University of Cantabria, Spain, which provided support to Alix-Garcia during the development of this work. An earlier version of this paper was prepared as a background note for the report "'Yes' in my backyard? The economics of refugees and their social dynamics in Kakuma, Kenya" by the World Bank (Report #111303), which funded the data collection efforts upon which part of this paper is based.

[*]Department of Applied Economics, Oregon State University, jennifer.alix-garcia@oregonstate.edu

[†]School of Economics, UNSW Business School, University of New South Wales

[‡]School of Humanities & Languages, International Studies, & Centre for Refugee Research, University of New South Wales

[§]World Bank

[¶]World Bank

Abstract

We combine nighttime lights data, official statistics, and new household survey data from northern Kenya in order to assess the impact of long-term refugee camps on host populations. The nighttime lights estimates show that refugee inflows increase economic activity in areas very close to Kakuma refugee camp: the elasticity of the luminosity index to refugee population is 0.36 within a 10 km distance from the camp center. In addition, household consumption within the same proximity to the camp is 25% higher than in areas farther away. Price, household survey, and official statistics suggest that the mechanisms driving this positive effect are increased availability of new employment and price changes in agricultural and livestock markets that are favorable to local producers.

JEL codes: O12, O15, R23
Keywords: refugee impacts, forced migration impacts, household data, nighttime lights, price analysis

1 Introduction

Globally, the numbers of forcibly displaced people are at the highest level ever recorded. There are currently 65.6 million displaced people in the world, 22.5 million of whom are refugees, many having fled their homes and countries in the face of violence (UNHCR 2017). The number of refugees worldwide is set to increase substantially this year as people leave affected regions. Although media coverage and policy concerns often focus on refugee transit to Europe and the United States, 84 percent of these refugees are hosted in developing countries immediately adjacent to the ones they left. Host country populations are often as poor or poorer than those displaced, and resources to support new arrivals are limited. The debate surrounding hosting the displaced is dominated by fears of labor market competition and the costs of care on one side, and the potential benefits of stimulating demand, addressing labor market shortages, and innovation on the other. Empirical evidence on both sides of the discussion is sparse. Do refugees help or hurt the communities that receive them? Through what channels does their impact operate? We explore these questions in the context of Kakuma refugee camp in northwestern Kenya.

Kenya is a microcosm of the recent trends in displacement. Ongoing instability in Somalia and new rounds of displacement from South Sudan following political and ethnic unrest in 2013 have resulted in a growing refugee population in an area that has hosted refugees since 1991. Today

the refugees in Kakuma camp in the remote Turkana region of northern Kenya number 182,000. Camps of this size and duration are increasingly common, presenting challenges for refugees, hosts, and governments alike.[1] Information on the impacts of such refugee camps is rare, partially due to the remoteness of the sites and the lack of reliable data on the populations that host them.

In this paper we examine the impact of Kakuma camp on the economic welfare of the Turkana region. We begin by estimating average effects using nighttime lights data from 1993 to 2013. A model with spatial and temporal fixed effects shows that small increases in refugee presence have positive but very localized effects on luminosity – a 1 % increase in the refugee population is associated with a 0.36% increase in the nighttime lights index for villages within a 10 km distance from the camp. Using a census of household data collected in 2012, we estimate the correlation between lights and consumption. Back of the envelope calculations suggest that the marginal effect of refugee inflows on luminosity within a 10 km distance of the camp corresponds to a consumption increase of 5.5% for each 10% increase in the refugee population. We validate the panel estimates by examining cross-sectional consumption data and observe that within the same 10 km proximity of the camp household consumption is 25% higher than in areas farther away.

The second section of the paper merges a variety of data sources in order to delineate the channels through which this positive effect might occur. Specifically, we combine data from a recent household survey with price data, refugee, and food aid deliveries to examine changes in labor, livestock, and agricultural markets. Theoretically, refugees may generate both labor market competition and work opportunities for the local population. Empirically, the data show that proximity to the refugee camp is associated with more low skill jobs and wage labor, particularly for households with secondary education. In a traditionally pastoralist region like Turkana, these findings are meaningful. If there is labor market competition from refugees, its overall impacts are swamped by the job opportunities provided by the camp and the increased demand generated by refugees.

[1] In 2014 there were 7 camps worldwide with populations over 80,000 people, and a further 19 with populations between 40 and 80,000 (UNHCR 2015). Protracted displacement situations, in which 25,000 or more refugees of the same nationality have been in exile for five years or longer in a given asylum country, are increasingly common – there were 27 such situations in 1993, 38 in 2003, and 32 in 2015. The average length of such situations has increased from 9 to 27 years, and the current number of refugees in this category is 6.7 million, or 41 percent of all refugees (Sarzin 2017).

With regard to agricultural markets, in a context where food aid is externally provided, as it is in Kakuma[2], food prices may decrease for products in the aid package or increase in general due to the use of aid as income. Though adequate price data on agricultural products is not available, our results show that agriculture in the Turkana region occurs almost exclusively close to the refugee camp, suggesting that the camp presence incentivizes increases in, rather than depression of, agricultural production. Finally, livestock prices are positively correlated with high refugee and aid presence, and although absolute numbers of livestock are not higher closer to the camp, larger amounts of livestock sold in the immediate vicinity of the camp suggests that herding households benefit from the presence of the refugee market. Overall, the positive effect of refugees on the local economy seems to come through the availability of employment opportunities, and price changes in agricultural and livestock markets that encourage new production.

While there have been a number of useful descriptive studies of the interactions between refugees, the aid community, and hosts in the vicinity of Kakuma camp, they have not yet been able to provide estimates of the net benefits to locals of the refugee and aid presence (de Montclos & Kagwanja 2000, Jacobsen 2002, 2005, Aukot 2003, Crisp 2003, Oka 2011). One exception to this is recent work showing positive net impacts of refugee camps in a calibrated simulation of Congolese refugee camps in Rwanda (Taylor et al. 2016). There are a number of papers examining impacts of forced migration through agricultural prices. The findings of these range from marginally positive effects on local populations through increases in the prices of crops sold by locals (Alix-Garcia & Saah 2010), negative impacts resulting from increased price volatility, (Borton et al. 1996, Whitaker 1999), and zero price effects (Landau 2002). In contrast to our study, most of these papers examine situations in which the displaced integrate into local populations rather than being limited to camps.[3]

Our paper is also related to the literatures on food aid and migration. The former body of work has shown that the impacts of aid on local prices depends upon how it is procured and targeted. Well-targeted aid has been found to have little effect on local prices, while in situations with significant leakage, or if aid is locally procured, price effects can be detrimental[4]. On the

[2]There has recently been experimentation with cash transfers as a replacement for food aid in Kakuma, but direct food aid so far dwarfs the presence of such transfers.

[3]Further work examining refugee integration settings includes Polzer (2004) and Bakewell (2000), both of whom find positive impacts on host populations through increases in trade.

[4]Papers on this topic include Insenman & Singer (1977), Maxwell & Singer (1979), Singer et al. (1987),

migration side, there are a variety of studies finding small or zero impacts of refugees on well-functioning, integrated labor markets[5]. This work is particularly relevant to the current refugee flood into Europe, where labor markets are integrated, and refugee policy includes only temporary encampment. Evidence from developing countries is more scarce. Jacobsen (2005) provides a keen qualitative analysis, Maystadt & Verwimp (2014) show negative outcomes in Tanzania for agricultural workers competing with displaced Rwandans in the late 1990s, and Calderón & Ibánez (2009) find conflict displacement depresses wages in Colombia, particularly for the low skilled. These situations differ slightly from the one that we analyze here, where refugee employment in local markets is limited by strict regulation.

We begin the paper by providing necessary context. Section three estimates average effects over time using the nighttime lights data. Section four explores the various channels through which such effects occur using household survey data and price information. Section five describes a parallel case to Kakuma – Lokichoggio, the original site of the refugee camp – and examines what happens when refugees leave. Section six concludes with a discussion of policy implications and potential shortcomings.

2 Background

2.1 Turkana region

The Turkana region, located in northwestern Kenya (Figure A1), is home to semi-nomadic pastoralists known as the Turkana people. The region is sparsely inhabited, with population densities well under one person per kilometer in most areas, and has long been one of the poorest and most economically stagnant districts in Kenya. The 2005 Kenya Integrated Household Budget Survey (KIHBS) assessed poverty in the region at 94.3%, the worst out of Kenya's 69 districts. In addition, school attendance for primary school is 44% and less than 2% for secondary school, relative to the

Ruttan (1993), Anderson (1999), Barrett et al. (1999), Dercon & Krishnan (2004), Abdulai et al. (2005), Young (2007), Buchanan-Smith & McElhinney (2011), and Michelson et al. (2012).

[5]See Card (1990), Lach (2007), Cortes (2008) among others.

national rural averages of 78 and 16% (Table B1).[6] Economic livelihood in Turkana is significantly less dependent on agriculture and more reliant upon livestock than in Kenya on average (Table B1). Due to the arid conditions of the region, participation in farming tends to be very low, and households who do farm concentrate on drought-resistant sorghum, maize, and beans.

2.2 Kakuma camp

In 1991, 7,000 South Sudanese boys walked into Kenya, having first fled war in their own country and then refugee camps in Ethiopia (Veridame & Harrell-Bond 2005). These children, combined with a large inflow of Somali refugees into Eastern Kenya, caused a revolution in Kenyan refugee policy, which up until that point had allowed for the integration of arriving refugees into the Kenyan population. 1991 marked the beginning of the "encampment" strategy in Kenya and the hand over of the refugee screening process from the Kenyan government to the UNHCR (Verdirame 1999).

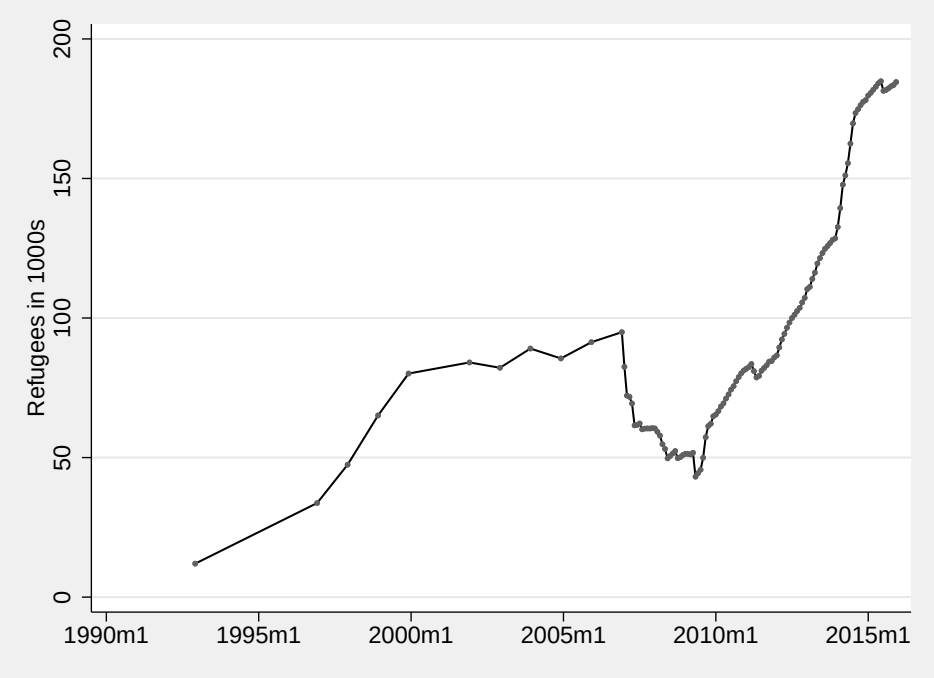
The Sudanese "Lost Boys" initially lived in a temporary camp located closer to the Sudanese border, in the town of Lokichoggio. In June of 1992, the camp was relocated farther south to Kakuma town, where it has remained since. The camp's population has ebbed and flowed over the years with the fortunes of the neighboring countries, but has never disappeared. In October of 1993, the camp held 35,000 people (Ohta 2005). Today, it is home to over 180,000 individuals. Figure 1 shows changes in the camp population over time.

Due to Kenya's encampment policy, the economy of Kakuma refugee camp is almost entirely dependent upon food aid, external transfers, and jobs within the camp. There is a significant internal economy of goods and services produced within the camp, as well as public services provided by international organizations. Markets for the trade of goods and services are much better developed within the camp than in Kakuma town, such that many town residents prefer to go to market in the camp (Grindheim 2013).[7] In addition, the demand generated by the camp is substantial. Oka (2014) estimates that refugees purchase between US$350,000 and US$400,000 worth of goods on a monthly basis and that remittance transfers into the camp total around US$200,000 per month.

[6] We encourage the reader to interpret these statistics with caution, given the recent evidence that most household surveys are not structured to accurately reveal either the wealth or the livelihoods of pastoral people (Kratli & Swift 2014).

[7] We also observe this in our household data, presented in section 4.

Figure 1: Kakuma camp population over time



Data source: UNHCR provided monthly refugee counts for Kakuma camp starting in 2007. We extracted totals for the month of December for the years 1992 to 2007 from official UNHCR reports.

There is also an extensive barter economy within the camp whose size is difficult to quantify.

How might the presence of this nearly-urban settlement affect the host population? Would Kakuma residents have been better off had the camp never existed? Would they be more fortunate if the camp were to disappear? This paper approaches an answer to these questions. The next section initiates this query by asking if the presence of the camp has increased economic activity in the areas near it.

3 Average effects

In this section, we use a combination of nighttime lights and survey data to understand the average effects of the refugee camp on consumption across the region. Section four then examines the potential mechanisms underlying these results.

3.1 Data for measuring average effects

Northern Kenya is a data-scarce environment: the national censuses are too far apart, and with too few indicators to analyze over the period of interest, the DHS datasets contain few or no observations in Turkana, and no other panel data is available for the region over the years from 1990 to the present. For this reason, we exploit "nighttime lights" data, which measure the strength of light emitted at night captured by satellites. The satellites detect luminosity from outdoor and indoor use of light, fires, gas flares, and the aurora.[8] The annual composite data disregards images with high cloud cover or solar glare, and removes temporary light, such as fire or lightening. Therefore, the data reflect luminosity in human settlements and are considered a good proxy for economic activity, especially in places where spatially-disaggregated data is scarce and/or economic statistics are unreliable, such as Sub-Saharan Africa (Storeygard 2016, Henderson et al. 2015, Michalopoulos & Papaioannou 2014, Henderson et al. 2012, Alesina et al. 2012).

The data were downloaded from the United States Air Force Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS). DMSP-OLS Satellites capture time-stable

[8]Henderson et al. (2012) provide a detailed description of the technical aspects of the data. Before analysis, one should correct for gas flares; however, no gas flares were detected in our sample region over the study time period.

images of the Earth each day between 8:30 and 10:00 pm. The images are processed by the National Oceanic and Atmospheric Administrations (NOAA) National Geophysical Data Center (NGDC) as composite annual data, which is publicly archived from 1992. The data is measured at a 30-second area pixel grid (roughly 0.86 square km at the equator) and interpreted on a 0 to 63 index of light intensity.[9] We construct a panel dataset from 1993 to 2013 of 648 villages in Turkana county by overlaying the latitude and longitude coordinates for each village (i.e., a point) onto the DMSP-OLS grid and assigning an indexed value of light intensity to each village in every year.[10] Note that no villages are located inside of the camp, therefore ruling out the possibility that lights in the camp drive our results.

A key source of information on the entire Turkana region is the registration census conducted by the Hunger Safety Net Programme (HSNP 2015). This program is one of a variety of cash transfer programs operated by the Kenyan government. HSNP specifically supports the poorest households of Turkana, Mandera, Wajir, and Marsabit counties, with the objective of reducing extreme hunger and vulnerability. Over 140,000 households were registered in the Turkana region, and about 40,000 eventually received support from the program (Fitzgibbon 2014). The registration dataset censused all households in the four counties between October 2012 and June 2013. The survey did not sample individuals living in the refugee camp.

The data includes a variety of household covariates, including age, gender, education, and occupation of the household head, as well as of other family members, livestock holdings, and a predicted consumption variable, which HSNP calls a "proxy means test." The methodology used to create the proxy means test is a simplified poverty mapping exercise. Each household interviewed responded to 40 questions on household and household member characteristics. These characteristics were used to predict adult per capita consumption as measured in the Kenya Integrated Household Budget Survey (KIHBS) 2005-06 (Pinney 2013). We use this data both as a source for analysis as well as a sample frame for our own household survey.

[9]One may be concerned with top-coding, but it is not an issue in this part of the world. The maximum light intensity observed in our sub-sample for Turkana county is 14 out of an index maximum of 63.

[10]The 648 villages were identified from a census conducted by the Hunger Safety Net Programme, a cash transfer program operated by the Kenyan government (HSNP 2015).

3.2 Estimation strategy

Our main approach to estimating average effects of the camp on the surrounding population is to exploit spatial and intertemporal variation in the intensity of nighttime lights. The existence of high transport costs in the region (ACTED 2014, Watson & van Binsbergen 2008) suggests that the effect of the camp is likely to be locally concentrated. Therefore, we seek to assess whether or not we observe a localized impact that is coincident with the timing of the refugee inflows. We complement this with correlations from the HSNP data in order to generate back-of-the-envelope calculations of the impact of refugee inflows on consumption. The basic estimation strategy uses the following specification:

$$Lights_{vlt} = \alpha + \sum_{d} \beta_d Refugees_t * f_d(\text{km to Kakuma}_{lv}) + \gamma Road_{vlt} + \theta_v + \mu_t + \varepsilon_{lt} \qquad (1)$$

where $Lights_{vlt}$ is the inverse hyperbolic sine of the DMSP-OLS luminosity index for village v, in location l, in year t, $Refugees_t$ is the inverse hyperbolic sine of refugee population in the camp in year t, and $Road_{vlt}$ is the inverse hyperbolic sine of the distance of each village to the nearest road interacted with a year fixed effect. We control for time-invariant unobserved heterogeneity at the village level with village fixed effects, θ_v. In addition, since the luminosity data is not intercalibrated across time or satellites, we follow Storeygard (2016), Baskaran et al. (2015), Henderson et al. (2012), and Chen & Nordhaus (2011) and control for year fixed effects (μ_t). Standard errors, ε_{lt}, are clustered at the location level, where location is a broad geographic region encompassing a variety of sublocations, which generally include several villages. It is also the level at which chiefs (local administrators appointed by the office of the president) oversee political and economic activity.

To identify the effect of the camp on economic activity, we use both parametric and semi-parametric measurements of distance, $f_d(\text{km to Kakuma}_{lv})$, which we interact with refugee population in each year. The two parametric specifications use the inverse hyperbolic sine of distance to Kakuma (a measure of decreasing marginal returns to distance) and the inverse distance (a measure of proximity), where the subscript d is equal to 1. The semi-parametric specification has $d = 1, ..., 6$,

where each integer represents a distance bandwidth. We construct the following bandwidths: 0-9 km, 10-29 km, 30-74 km, 75-109 km, 110-149 km, and >150 km.[11] In this case, $f()$ is a series of dummy variables for each distance band, such that only one of the six dummies corresponding to each village's distance to Kakuma is equal to 1. The fixed effects control for all factors that are either time or space-invariant. The interaction of time-varying refugee population with distance to Kakuma is identified, though the individual components are not, and can be interpreted as causal under the assumption that there are no omitted factors that cause economic activity to change differentially with distance to Kakuma as the refugee population grows.

We run a series of robustness checks in order to account for the fact that many villages never have a positive value for the nighttime lights index.[12] In one specification, we use a Tobit model with a lower bound of zero. We also change the dependent variable to a binary measurement for whether or not any nighttime lights data is observed and run a linear probability model. Further, we restrict our sample in two ways. First, we estimate equation (1) on a sample of villages in locations that had a population of 5,000 or more in 1989, before the arrival of refugees. Kakuma's population in 1989 was approximately 5,900, so this subsample provides counterfactuals more similar to Kakuma. In addition, we further restrict the sample to only those villages that record any positive nighttime lights index between 1993 and 2013 (i.e., we exclude all villages that never register luminosity).

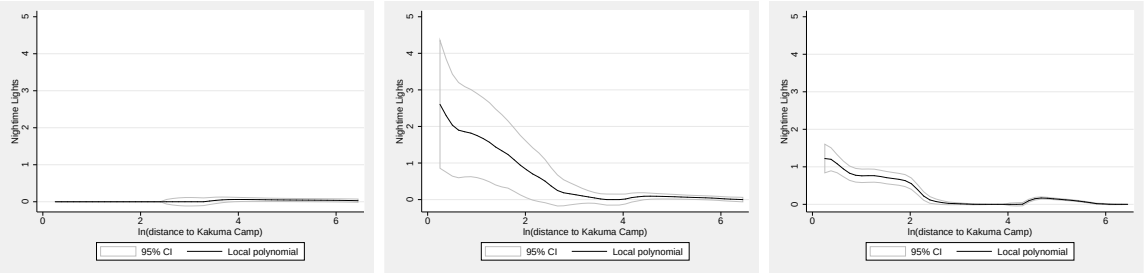
3.3 Summary Statistics

Figure 2 contains summary graphs. The first shows the correlation between distance to Kakuma and nighttime lights in 1993 using a smoothed local polynomial regression. The second shows this relationship in 2013, and the third illustrates the trend over the entire study period. In 1993, there is virtually no correlation between luminosity and distance to Kakuma. However, by 2013, the relationship is highly localized around the camp, suggesting that refugee inflows stimulated local economic activity. We test this relationship formally in the next section.

[11] The maximum distance to Kakuma in our sample is 316 km.

[12] Only 28 villages out of 648 register a positive nighttime lights index in any year between 1993 and 2013.

Figure 2: Nighttime Lights by Distance to Kakuma



(a) 1993 (b) 2013 (c) 1993-2013

3.4 Results

Table 1 shows results from estimating equation (1). Our basic distance specifications (columns (1) and (4)) estimate that economic activity is increasing in proximity to Kakuma and refugee population; we observe statistically significant and intuitively signed coefficients on the interaction of the two variables. The table contains a variety of specifications with alternative estimation strategies and subsamples in order to gauge the robustness of the results.

In Panel A we run a linear specification and examine the elasticity of the nighttime lights index with respect to the interaction of refugee inflows and distance to Kakuma. In column (1) we use the full sample of 648 villages over 21 years and find that a 1% increase in the distance to Kakuma ($\sim$ 1.2 km) at the mean level of refugee inflows ($\sim$ 69,000 refugees) results in a 1.8% reduction in the nighttime lights index. To account for the lack of nighttime lights observations for many of the villages in our sample, we run alternative specifications in columns (2) and (3) on our restricted samples. Column (2) shows that a 1% increase in the distance to Kakuma ($\sim$ 1.0 km) at the mean level of refugee inflows is associated with a 2.3% reduction in the nighttime lights index for the sample of villages that were in locations with a population of 5,000 or more in 1989. Column (3) shows an estimate of 5.8% for the sample of villages with non-zero lights.[13] The estimates are robust to the proximity specification for distance (columns (4)-(6)), with the exception of column (6), which is likely due to the substantially reduced sample size.

The Tobit model in Panel B and binary dependent variable model in Panel C show similar results to Panel A. In particular, a 10% increase in distance from Kakuma (12 km) at the average

[13]Note that the mean distance to Kakuma in this sub-sample is 33 km.

population of refugees corresponds to a 3.3 to 4.2 percentage point reduction in the probability of observing any nighttime lights (columns (1) and (2), Panel C). The effect is even stronger in column (3) for the sample of villages who ever observe nighttime lights: a 10% increase in the distance to Kakuma at the average population of refugees corresponds to a 10 percentage point reduction in the probability of observing any night lights. These estimates are also robust to the proximity specification of distance, with the exception of the non-zero sample in column (6).

It is possible that this relationship is not smooth; to assess this, we explore a semi-parametric specification. In Figure 2 we plot coefficients from our estimation of equation (1) with distance bin dummies. The table corresponding to these coefficients is presented the appendix (Table B2). Panel (a) shows that the effects are localized within a 10 km distance to the camp. A coefficient of 0.36 implies that a 10% increase in refugee population (6,900 additional refugees) corresponds to a 3.6% increase in the nighttime lights index within a 10 km distance from the camp. Since the point estimates for the coefficients at farther distance bands are close to zero and statistically insignificant, we conclude that the effects of refugee inflows are highly localized around Kakuma town.

A potential concern with our identification strategy is that the increased luminosity observed around the refugee camp could be caused by aid worker activity. We believe that this is not an issue for two reasons. First, we observe our nighttime lights data at the village level. That is, we identify each village as a latitude/longitude point and then assign the value of the nighttime lights index in a given year to that point using GIS software. Since there are no villages located inside of the camp, it is unlikely that lights from the camp itself drive the results. Further, while it is true that aid workers may increase economic activity in these places, it is unlikely that they drive the luminosity results, since the majority of aid workers are not housed in these villages, but rather in an isolated compound on the southwest edge of the camp. Figure A3 displays the lights index in 2013 overlaid by the village locations around the camp.

As a further robustness check, we run placebo tests in panels (b) and (c) of Figure 3 supposing that the refugee camp was placed in Lokichar or Lokichoggio – the former being one of our "control" locations from the household surveys discussed in Section 4.1 and the latter being the initial location of the camp. The intuition behind this experiment is that we should not observe any effect of refugee

Table 1: Effect of Refugees on Economic Activity

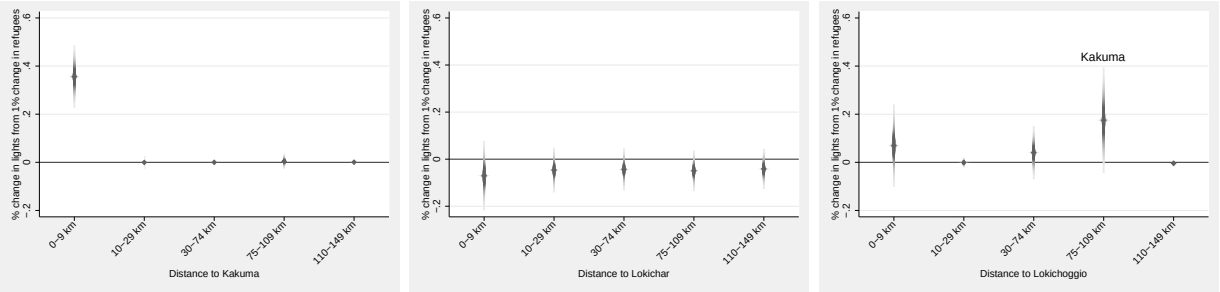
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Linear Model of IHS(Nighttime Lights Index)						
IHS(Refugee pop) x IHS(km to Kakuma)	-0.165***	-0.205***	-0.524***			
	(0.053)	(0.047)	(0.171)			
IHS(Refugee pop) x 1/(km to Kakuma)				0.815***	0.804***	0.621
				(0.035)	(0.279)	(0.441)
Panel B: Tobit of Nighttime Lights Index						
IHS(Refugee pop) x IHS(km to Kakuma)	-2.616***	-2.742***	-2.616***			
	(0.000)	(0.000)	(0.458)			
IHS(Refugee pop) x 1/(km to Kakuma)				5.394***	5.407***	5.394***
				(0.002)	(0.002)	(2.053)
Panel C: Linear Probability Model of Any Lights (0/1)						
IHS(Refugee pop) x IHS(km to Kakuma)	-0.030***	-0.038***	-0.092***			
	(0.009)	(0.007)	(0.022)			
IHS(Refugee pop) x 1/(km to Kakuma)				0.147***	0.144***	0.099
				(0.010)	(0.042)	(0.062)
Sample	Full	Restricted	Non-zero	Full	Restricted	Non-zero
Mean Lights Index	0.10	0.22	2.26	0.10	0.22	2.26
Mean Any Lights (0/1)	0.02	0.04	0.38	0.02	0.04	0.38
Village FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Cluster level	Location	Village	Village	Location	Village	Village
No. Clusters	56	262	28	56	262	28
Observations	13608	5502	588	13608	5502	588

* p< 0.10, ** p<0.05, *** p < 0.01. Observation at the village level for the years 1993 to 2013. Clustered standard errors in parentheses. "Full" sample is all villages in Turkana county (648 villages). The "restricted" sample is all villages in Locations that had a population of 5,000 or greater in 1989 (262 villages). "Non-zero" sample is all villages that have a positive nighttime lights index at some point between 1992 and 2013 (28 villages). All regressions control for IHS(distance to road) by year interactions. IHS is the inverse hyperbolic sine.

inflows in the distance bands around the placebo camps. Moreover, if we do observe effects at farther distance bands, they should correspond to Kakuma's distance from the placebo camp (175 km from Lokichar and 85 km from Lokichoggio). Indeed, in both panels we observe no evidence of effects within 10 km of the placebo camps. Further, in panel (c) we find positive and statistically significant effects in the distance band that corresponds to Kakuma. Note that we do not observe

similar effects in panel (b) because Kakuma's distance to Lokichar corresponds to the excluded category in this regression.

Figure 3: Effect of Refugees on Economic Activity by Distance



(a) Kakuma (b) Lokichar (c) Lokichoggio

Figure shows coefficients from distance bin impacts from Table B2, columns (1), (3), and (4).

To the extent that luminosity is a proxy for economic well-being, these results have important implications for regional economic welfare. We run a simple OLS regression to explore the correlation between the inverse hyperbolic sine of the HSNP consumption index in the year 2012 and the inverse hyperbolic sine of the nighttime lights index (results presented in Table B3 of the appendix). In these estimates, a 10% increase in the luminosity index is associated with a 1.5% increase in the consumption index in the restricted sample (i.e., villages in locations with a population of 5,000 or greater in 1989). If we extrapolate this correlation to the effect of refugees on consumption, we find that since a 10% increase in refugee population is associated with a 3.7% increase in the luminosity index within 10 km of the camp, the equivalent effect on consumption is approximately (0.015 x $0.037) * 100 = 5.5\%$. Refugee inflows have a significant and positive impact on the consumption of Turkana residents around the camp.

3.5 Cross-sectional evidence

The HSNP dataset by itself verifies the highly localized positive impact of the refugee camp on hosts. Table B4 shows a variety of specifications measuring the cross-sectional patterns in the household consumption aggregate. The dependent variable is the inverse hyperbolic sine of household level consumption per capita, and the key covariates are various parameterizations of

Figure 4: Correlation between distance to Kakuma and consumption

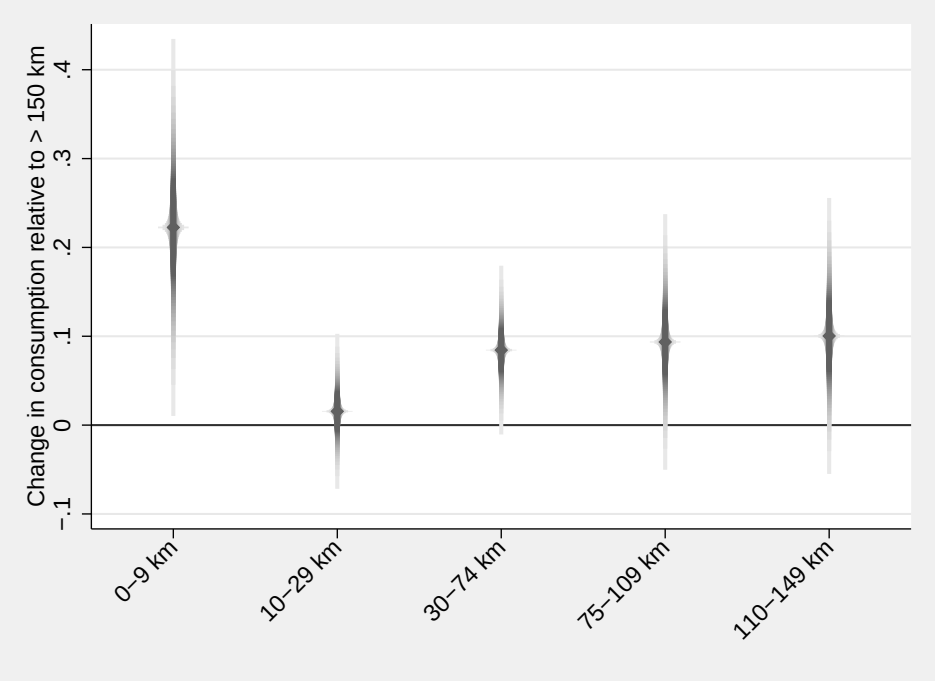


Figure shows coefficients from distance bin impacts from Table B4, column (4).

distance from Kakuma: the natural log (columns (1) and (2)), the inverse of distance (column (3)), and a semi-parametric specification with the omitting category being those households farther than 150 kilometers from the camp. Standard errors are clustered at the location level. An additional control for proximity to Lodwar – the market epicenter of Turkana District, is also included.

All parameterizations illustrate that per capita consumption near the camp is higher than consumption farther away. The coefficients from the semi-parametric figure are shown below, and highlight the major differences in impact in the narrow band around Kakuma. In particular, the point estimate of 0.22 on the coefficient for less than 10 kilometers to the camp suggests that consumption is 25% higher[14] within this band than within the omitted category (> 150 kilometers from the camp). This is very likely an overestimate of differences in consumption resulting from the camp – we also observe positive and statistically significant point estimates on other coefficients in the estimation. However, these coefficients are significantly smaller than in the band closest to the camp, thus providing descriptive support to the nighttime lights finding.

[14]The marginal effect for the dummy variable is $exp(0.22) - 1 = 0.246 * 100$.

Our consumption measure is a predicted value, which generates three possible concerns. First, one might worry that the prediction process generates endogeneity by including some proxy of distance to Kakuma. Although we are not privy to the actual equation used for prediction, technical materials detailing the process state that the consumption proxy is created using household level variables collected in both the HSNP survey and the 2005/2006 KIHBS, neither of which contain distance measurements.

The second worry is that the prediction removes important real variation in consumption, and that the use of such a prediction may lead to incorrect inference if prediction error is not taken into account. We first note that classical measurement error in the dependent variable should not bias estimates, although it may increase variance. To further address this concern, we also examine three other proxies for wealth: having a non-grass roof on the home, having non-grass walls, and the number of children under 15. We expect the first two to increase with consumption and the last to decrease. Regressions of these variables on proximity to Kakuma are shown in table B4. They show that the probability of having non-grass roof and walls increases with proximity to Kakuma, and that number of children under 15 decreases. These correlations are consistent with the consumption aggregate results.

4 Mechanisms

There are two main shocks to markets near refugee camps: an inflow of population, and a subsequent inflow of aid. The population shock constitutes both an important source of demand for local products and a potential pool of labor. In Kakuma, as is the case with many large camps, labor activities are very restricted for refugees – there is no legal employment outside of the camps. For this reason, their livelihoods often depend upon a combination of food aid, remittances, and businesses that operate inside the camp. They trade their monetary income and surplus food aid to acquire other goods, thus generating an important increase in demand for all of the products that they consume. How might these shocks interact to drive the consumption increase that we observe in the nighttime lights data?

In this section, we empirically elucidate the potential mechanisms driving our results, focusing

on the markets for which we have data – labor, agricultural, and livestock markets. We begin by describing the additional sources of data that are used in this section, and then proceed to examine the different channels of possible impact.

4.1 Additional data for measuring mechanisms

Household surveys were conducted among both refugees in Kakuma camp and local Turkana households near and far from the camp. We focus on summary statistics from the Turkana households outside of the camp (World Bank 2015). The survey included household demographic, cash income, and perception modules. Information on consumption was also collected, albeit in a very limited fashion and structured to detect changes in purchases of indicator goods over the short term. It bears mentioning that the Turkana household survey is dominated by members of the Turkana tribe – no households admitted to housing refugees – though there are certainly households that intermarry with other tribes in the region.

We sought to sample enough households around Kakuma and in the vicinity of two similar towns in order to be able to detect a 0.2 standard deviation change in income. We used two criteria to define counterfactual sites: 1) similar population to Kakuma in 1989 (pop 5887), and 2) situated on the Kitale-Juba (A1) highway. Our final sample included villages around two counterfactual towns, as well as Kakuma. Additional description of the choice of towns is available in the Appendix. We also included the town of Lokichoggio as a potential comparison city, but one that offers a slightly different comparison than the two other towns. This is because Lokichoggio was the original site of what is now the Kakuma refugee camp. In addition, from 1989 until 2011 it was home to the substantial infrastructure supporting Operation Lifeline Sudan (Akol 2005). It is, therefore, a study in what happens when "aid leaves," which is one of a variety of future scenarios for Kakuma. We do not use the data from Lokichoggio as part of the general counterfactual, but rather analyze the comparison between Kakuma and Lokichoggio separately in section five.

Sampling was stratified by distance from the center of each city. Distance rings included less than 2 kilometers from center, 2-8 kilometers from center, and 8-10 kilometers from center. It was deemed too costly and unsafe to sample villages farther than 10 km from the city center. Two villages were randomly sampled in each distance ring, and households randomly sampled from

within these. In cases where villages were too small to provide sufficient numbers of households, additional villages were added. This commonly occurred in the more distant villages, which tended to be composed of very few households. At final count, the sample was collected in 19 villages around Kakuma, Lokichar, Lorugum, and Lokichoggio. The total number of households in each subsample is shown in Table 2.

Table 2: Sample and geographic covariates, Turkana household survey

Subsample	Number of households	Water access (km)	Precipitation (mm/yr)	Elevation (m)	Pop 1989
Kakuma	111	5-10	318	720	5887
Lokichar	116	5-10	300	800	4887
Lorugum	103	5-10	227	609	3153
Lokichoggio	118	5-10	433	890	2197
Total	448				

Water access: German Technical Corporation (1996), Distance to Water Points in km. United Nations Environment Programme (UNEP)/ GRID -Nairobi. Precipitation and elevation grids from World Resources Institute: `http://www.wri.org/resources/data-sets/kenya-gis-data#landcover`.

We also include in Table 2 some geographic covariates that serve to underscore that the four towns share similar distances to watering holes for animals, yearly precipitation, elevation, and pre-camp population in 1989. While similarity in baseline geographic characteristics does not guarantee a believable counterfactual, it does suggest that differences across these towns is not driven by variation in geographic endowments.

Data on prices comes from two sources. The Famine Early Warning System (FEWSNET) provided monthly price data on agricultural goods from 2000 onwards for 11 markets throughout Kenya. Unfortunately, we could only use this data descriptively, since the Turkana markets had significant numbers of missing observations. Livestock prices from 37 markets between 2004 to 2013 came from the Livestock Information Network Knowledge System, a collaboration between the Government of Kenya, USAID, and the UC Davis GLCRSP group (LEWS 2015). This data averages transactions for different breeds and types of livestock undertaken on market day in each market location approximately twice per month. We focus on female goats, as this was the most complete series. A map of all markets is located in the appendix figure A2, and those markets with

sufficient data for us to use are shown with black triangles on the map. Finally, monthly food aid deliveries to Kakuma were provided by the World Food Programme (WFP) for 2007 onwards.

4.2 Labor markets and small businesses

In the labor market, the inflow of refugees may increase the supply of available workers, potentially depressing wages. The magnitude of wage-depression depends upon the substitutability of new labor for existing workers as well as upon the products that they choose to consume (Borjas 2003, Ottaviano & Peri 2008, Borjas 2013). It is somewhat unclear how substitutable the refugee and host populations are. As was previously mentioned, refugees are not officially allowed to work outside of the camp without special permits. Our own observations show that various refugees work as translators for the UN and other NGOs, as well as other positions within the camp structure. Refugees tend to have higher levels of education than the Turkana – in our household surveys, on average 73% of Turkana household heads have no education, compared to 46% for refugees. However, to the extent that local workers might be employed by relief organizations, the refugees may create labor market competition, a complaint that has been voiced by the Turkana people (Aukot 2003).

The inflow of humanitarian workers into the market may represent a unique labor demand shock, as the expatriate population might require household help not normally consumed in Turkana, and the aid agencies themselves constitute a new source of labor market demand, particularly for skilled and semi-skilled individuals. If we observe increases in wages or increased employment for host households, this may serve as part of the explanation for the consumption effect identified above.

We begin by examining the distribution of occupations and small enterprises. Table 3 displays information from the HSNP dataset described in section 3.1. The table shows averages of household characteristics in the Kakuma location compared to other locations within the Turkana region. The third column measures the differences across covariates in terms of standard deviations (normalized differences). The largest difference between Kakuma and other Turkana regions is the significantly lower number of livestock owned in Kakuma – an indication that Turkana households around the camp are substituting semi-nomadic pastoralism with other economic activities.

Figure 5 shows the non-parametric relationship between the occupations classed by skill level

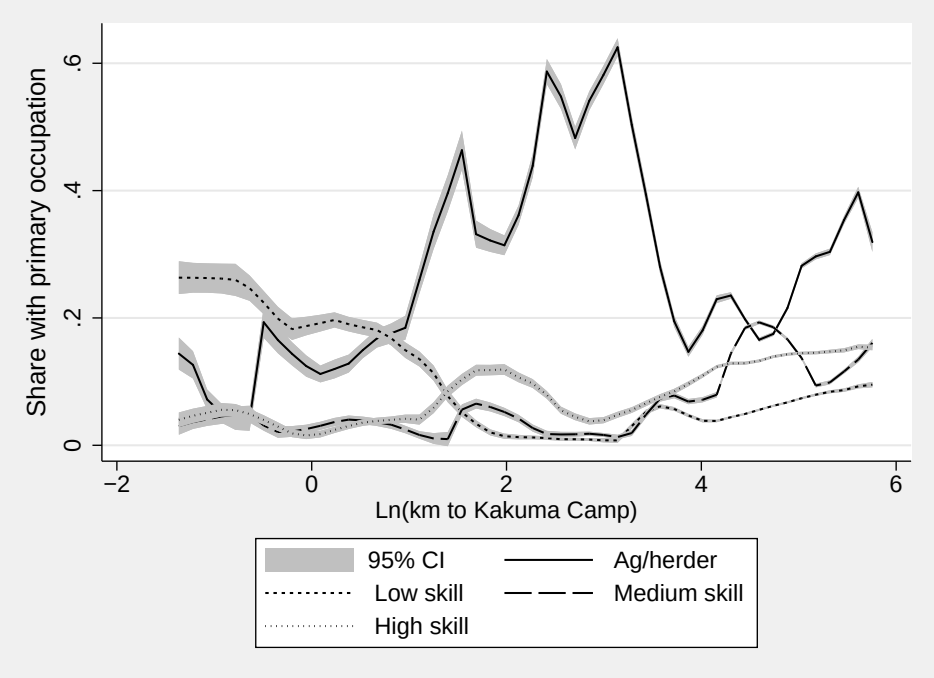
Table 3: Occupation of household head, 2012

	(1) Other Turkana	(2) Kakuma	(3) Norm diff
Household size	4.672	4.091	-0.198
Farmer/ herder/ charcoal gatherer	0.252	0.211	-0.068
Small business owner	0.133	0.043	-0.226
Livestock	28.521	13.429	-0.285
Observations	129476	9554	139030

Column (3) contains normalized differences of the means in columns (1) and (2).
Data source: HSNP (2015)

and distance from Kakuma refugee camp shown in log-transformed kilometers measured using the HSNP data. While medium and high skill sectors show little predictable correlation with distance to the camp, there is a clear decrease in low skill employment with distance to the camp, and a large increase in employment as a herder or farmer.

Figure 5: Occupational choice and distance to Kakuma



Data source: HSNP (2015)

What do our more recent data tell us about labor opportunities near the camp? The household survey shows that households in the Kakuma subsample are less likely to have claimed to own a small enterprise, which is consistent with Table 3. The most common businesses operated by Kakuma households are running a moto taxi service and doing manual labor. Informally, many individuals reported that they felt that people were better off in Kakuma due to work opportunities. Summary statistics of the survey data reveal a slightly higher incidence of wage work in Kakuma: 15% of adults between 15 and 60 in Kakuma, compared to 9% in the counterfactual towns. This difference is marginally statistically significant. In Kakuma around 30% of the wage jobs are located in the camp, while residents in other locations do not have this option. Wages are slightly lower in the Kakuma subsample, although the data is highly skewed, and the sample is small. It also bears mentioning that while Kakuma households are much less likely to have a member with secondary education, they are more likely to have a household head with a bit of primary or primary complete education (see Appendix Table B5).

Because of these differences in education levels, we condition the estimation of the probability of having a wage earner, and the level of the wage, on a binary variable indicating that a household member has secondary education. We also include an interaction term between education and Kakuma to examine if education levels have differential effects in the Kakuma subsample. The results show this to be the case; in Kakuma, having a member with secondary education more than doubles the probability of having a wage earner in the family, and the returns to secondary schooling look higher in Kakuma than in the counterfactual towns, although this difference is not statistically significant (Table 4). While our small sample size mandates that we be cautious in our interpretation, the results here suggest that if there is labor market competition from refugees, its impacts are swamped by the employment opportunities associated with the camp.

It is possible that these estimates could be confounded by migration. Leaving or coming to a particular location is a sign that returns from living there are lower (or higher) than they might be elsewhere. We do not have a perfect measure of migration. However, using the household rosters from the survey, we know when an individual began living in a particular home (if they were not born there), and where they come from. In addition, we also know who left and where they went. Taking first current residents, we explore the subsample of those who moved to their current home

Table 4: Wage earners and wages

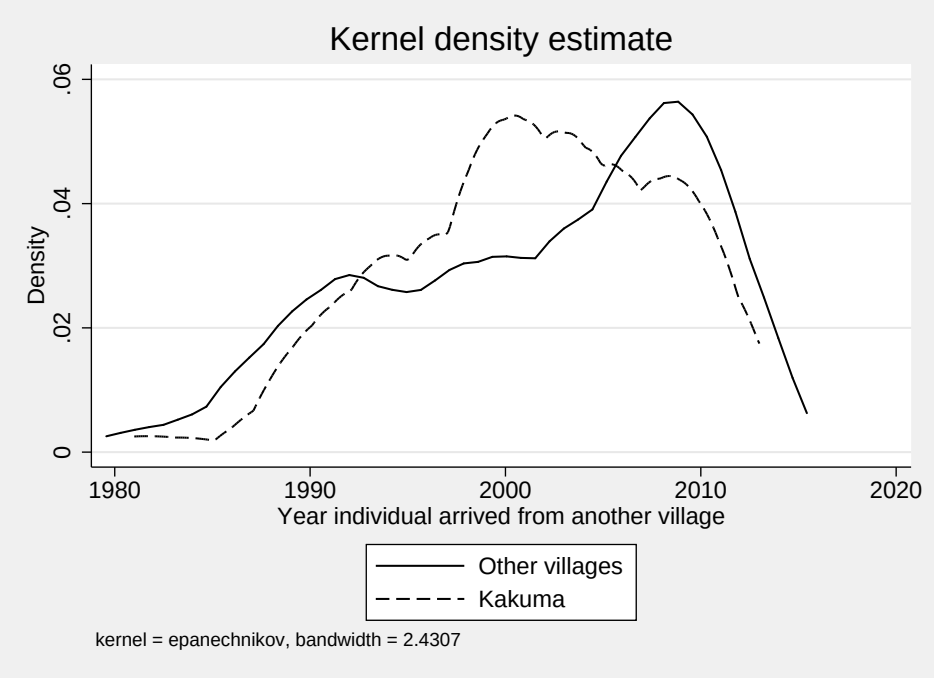
	Wage earner in family		Ln(wage) past 12 months	
	(1)	(2)	(3)	(4)
In Kakuma subsample	0.046	0.053*	-0.559	-1.492**
	(0.039)	(0.029)	(0.506)	(0.579)
	[0.212]	[0.096]*	[0.386]	[0.090]*
Household member with secondary education		0.198***		-0.936*
		(0.055)		(0.509)
		[0.000]***		[0.124]
Secondary x Kakuma		0.247***		1.121
		(0.070)		(0.725)
		[0.000]***		[0.212]
Observations	330	330	36	36
Adjusted R^2	-0.002	0.206	-0.025	-0.086

Ordinary least squares regressions with standard errors clustered at the village level. Observations weighted by probability of being sampled. *p<.10, **p<.05, *** p< .01. Robust clustered standard errors in (). Wild bootstrap clustered p-values in [].
Data source: Turkana Household Survey (World Bank 2015).

sometime after their birth from a village other than the one in which they currently live. This measure proxies for immigrants, though since we were not able to locate all the source villages, it is not always clear how far individuals have moved.

Of the 8,960 surveyed individuals currently living in Kakuma and the control towns, 6.8% of these were not born in the villages in which they are currently living. This number is significantly higher in Kakuma (8.6%) than in the control villages (5.9%). The test for significance of this difference (with standard errors clustered at the household level) has a p-value of 0.001. It is also interesting to note the timing of the immigration, which we show using its distribution over years in Figure 6. Although these numbers are purely correlative, it appears that the control villages had more immigrants until around 1992, when their frequency was higher in the Kakuma sublocation. This frequency remained higher until about 2009, when there was an increase in arrivals from other villages in the control areas.

Figure 6: Distribution of immigrants across years



Source: Turkana Household Survey World Bank (2015)

Interestingly, immigrants into the control cities from Kakuma are rare: out of the 449 individuals who migrated into control cities, only 10 (2%) of them were from Kakuma. While the observed

immigration patterns serve as an additional signal of the increased attractiveness of Kakuma, it may confound our average effects. However, if immigrants increase labor market competition, then our impacts may actually be underestimated.

4.3 Agricultural markets

In food markets, the food aid and refugee effects may move in opposite directions for aid-supplied goods. First, increases in the food supply through aid deliveries provided by humanitarian organizations have the effect of depressing prices for the aid goods that are supplied. However, the increase in demand for food as a result of the presence of the refugee population is likely to be quite large, and the basket of goods provided in the aid package is limited. Refugee households spend at least 60% of their income on food purchases. The top two expenditures in this category are meat (13%) and sugar (13%), followed by cereals (9%) and milk (9%). Vegetable purchases constitute only 6% of expenditures (WFP 2014). Interviews with wholesale traders in Kakuma indicate that cow, goat, and camel meat and cow and goat milk come from local markets, while maize and beans are the most widely purchased cereals and pulses. Although the arid parts of Kenya have weak market integration both across local markets and with main supply markets, refugee camps, due to their positions on transport corridors, tend to have slightly better market function (Fernandez et al. 2014). For many goods, we expect to see price increases that may be harmful for host households that purchase these goods, but beneficial for those who sell them.

Unfortunately, the grain price data that includes Turkana district is extremely limited – relatively complete price series are only available for corn. Regressions of maize price on refugee inflows and aid with market and year fixed effects show a positive correlation between refugee inflows and price, and a negative one between aid inflows and price. However, the results are far from statistically significant, and the low number of observations calls into question the validity of the estimates (results available upon request). Given the scarcity of the data, we cannot draw definite conclusions regarding the impact of the camp on local grain prices. However, the fact that 62 percent of locals report patronizing camp markets suggests that the prices and products offered there are attractive.

The survey data demonstrate that the camp has provided an incentive for greater agricultural production. The region is generally unsuitable for agriculture without significant infrastructure

investment or large demand – there is only one household in the counterfactual towns that engages in agriculture (though there are several in Lokichoggio, a phenomenon to which we will return in section 5). In Kakuma, 33% of households farmed last year, though 10% of these did not harvest due to the fact that drought devastated their crops (Table 5). The main crops farmed are millet, maize, sorghum, and legumes. The largest part of production is consumed by the households themselves (40%), with 18% sold, and a similar amount saved. Smaller proportions (6 and 8%) are fed to animals or gifted. The value of farm sales is around 3000 shillings for the prior growing season, though this number is much smaller if we take into account non-labor inputs, which decreases the revenues to 1215 shillings. Given a minimum wage for an unskilled worker in Kenya is 228 shillings per day, this revenue is easily exceeded by value of labor used on the farm.

In the environmental context of Turkana District, it is not surprising that farming households also have a variety of other income sources – half of them husband animals and 20% also own a small business. Although agricultural production is not a large part of the Turkana regional economy, the camp has clearly generated demand for products grown locally, belying the dynamic where food aid drives down local food prices, thus discouraging production, is not at play in this setting.

4.4 Livestock markets

Livestock is the main livelihood for the Turkana region, and is a significant source of tension around the camp and throughout the region, where livestock raiding was and is commonplace even in the absence of refugees. This section details both qualitative and quantitative assessments of livestock markets and dynamics resulting from the presence of Kakuma camp.

The current Turkana chief of Kakuma states that one of the biggest impacts of the camp was to displace Turkana livestock.[15] While we cannot verify this assertion quantitatively, we can verify

[15]In an interview with our team, he stated that when the refugees arrived in 1991, the site where the camp was based was a bushy forest ecosystem that supported a wealth of local indigenous trees. The local people who inhabited the camp area or moved with their cattle through it did not want to leave, and only did so after significant pressure. Even today in the camp, there are old Turkana who spend a lot of time inside the camp because they still believe that this is their land. Over time, the Kakuma's refugee numbers grew and many of the local inhabitants remained along the Tarach river so as to have access to water supplies. Many of the pastoralists, particularly during the dry season, move farther and farther away.

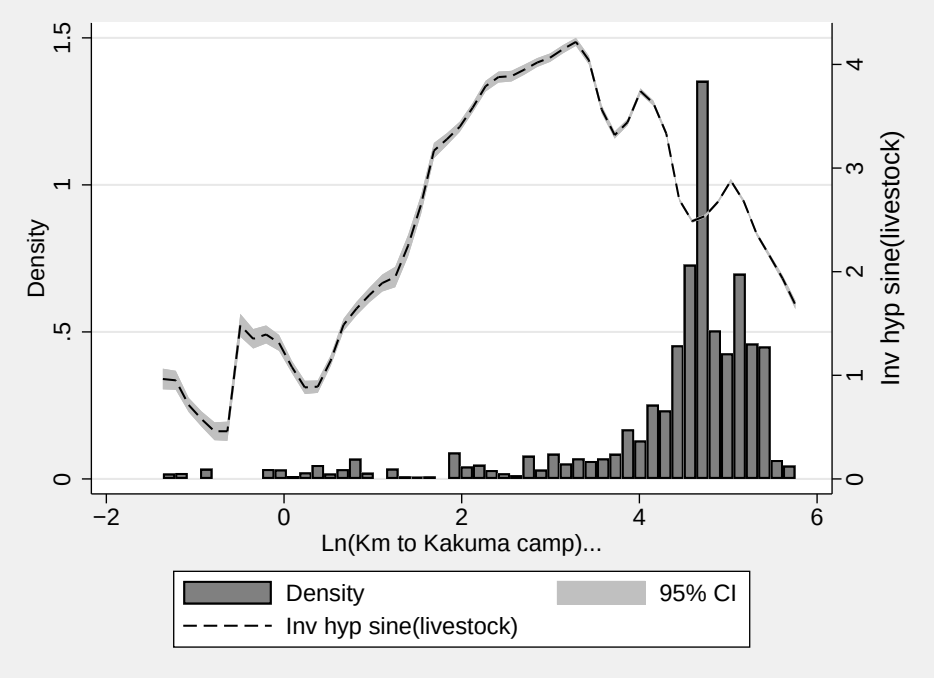
Table 5: Summary statistics agriculture, household survey

	Kakuma	Non-Kakuma	P-val	Kakuma obs	Non-Kakuma obs
Household farms	0.333	0.074	0.000***	111	337
No harvest due to drought	0.108	0.280	0.085	37	25
Area farmland owned (ha)	31.689	68.478	0.203	37	25
Value of farm sales	3018.297	5100.400	0.478	37	25
Farm sales - inputs (not labor)	1215.595	3288.400	0.466	37	25
Non-labor input costs	1802.703	1812.000	0.990	37	25
Labor days on the farm	51.111	40.040	0.307	36	25
Prop. farm production to animals	0.062	0.034	0.322	32	18
Prop. farm production consumed	0.400	0.494	0.369	30	18
Prop. farm production sold	0.181	0.109	0.361	30	16
Prop. farm production gifted	0.085	0.032	0.240	31	18
Prop. farm production saved	0.165	0.112	0.313	32	18
Had land dispute	0.432	0.160	0.024*	37	25
Borehole dispute	0.297	0.120	0.105	37	25

Data source: Turkana Household Survey (World Bank 2015)

using the HSNP census data that livestock holdings in 2012 were quite low in the Kakuma area relative to the rest of the region (Figure 7). It bears mentioning that the bulk of the Turkana population is not located around the camp (see the accompanying histogram of the district population distribution on the graph), but that those who do live nearby tend not to have cattle. Cattle holdings increase substantially at about 7 kilometers from the camp.

Figure 7: Livestock holdings by distance from camp



Data source: HSNP (2015)

The existence of the refugee camp may still be a boon for local producers, even though it may have displaced their herds, by providing higher sale prices for their meat and milk products. Analysis of monthly livestock prices from 2007 to 2013 suggests that increases in aid are correlated with price increases near the refugee camp (Table 6). These tables show the results of regressions of the log of price in a given market (l), month (m), and year (y), on market (γ_l) and month-year fixed effects (γ_{my}), with standard errors clustered at the level of the market to account for serial correlation of error terms. The key covariates are the natural log of the number of refugees (R_{my}) in a given month and year, and the ratio of food aid to refugees in that same time period (A_{my}),

each interacted with a dummy variable for Lodwar market (L_l) – the closest market to the camp[16]. Aid and refugees are not included as separate covariates, since they are subsumed into the time effects. The estimation equation is:

$$ln(p_{lmy}) = \delta_0 + \delta_1 ln(R_{my})L_l + \delta_2 A_{my}L_l + \gamma_l + \gamma_{my} + v_{lmy} \quad (2)$$

Table 6: Correlation beween refugees, aid, and goat prices

	(1)	(2)	(3)	(4)
Ln(refugees) x Lodwar		0.358*	0.353*	0.377*
		(0.152)	(0.153)	(0.162)
		[0.124]	[0.124]	[0.124]
Aid per 1000 refugees x Lodwar	0.009		0.007	0.008**
	(0.004)		(0.004)	(0.003)
	[0.494]		[0.494]	[0.000]***
Ln(volume sold)				0.109
				(0.089)
				[0.479]
Observations	205	205	205	205
Adjusted R^2	0.724	0.736	0.735	0.748

Dependent variable: ln(price in shillings). Regressions include fixed effects at market and year/month level. Data is average monthly price. Standard errors clustered at market level. Included markets are Isiolo, Lodwar, Mulot, Nairobi, and Rumuruti. *p<.10, **p<.05,*** p< .01. Clustered standard errors in (), wild bootstrap clustered p-values in []. Prices are for female goats of grade 2. Data sources: prices: LEWS (2015); refugees: UNHCR (2015).

The small number of markets, and the fact that identification depends only differences between the remote market of Lodwar and the other included markets means that we should take the results here only as suggestive. However, the correlations between prices and refugees, as well as food aid per refugee, suggest that both work to push livestock prices upwards.

When we look at averages across Kakuma households versus the non-Kakuma subsamples, we

[16]Similar results obtain using lagged refugee and aid counts. Lodwar is the closest market to Kakuma with data, but is still a considerable distance from the camp (nearly 120 km by road). We would expect larger impacts on livestock markets closer to Kakuma, but there is no data to examine this hypothesis.

do not see significant differences in number and value of livestock cared for or owned in the past year. Nor do we observe that there have been changes in the movement or watering of animals during the past 5 years (results not shown). However, we do detect slightly greater numbers of livestock stolen and sold in Kakuma relative to other areas (Table 7).

The evidence in this section implies that livestock markets have been affected by the presence of the camp. For households that tend to be net sellers of livestock, higher prices and greater sales may be a channel through which they benefit from the presence of the camp. However, we do not have the information to establish the magnitude of the impact of displacing animals from Kakuma, or for assessing the overall impact of increased cattle rustling near the camp. Indeed, the impacts on this market are more difficult to detect than on the labor and agricultural markets.

5 Lokichoggio: when the aid leaves

Lokichoggio was the original site of what is now the Kakuma camp, and until 2011 housed the offices of the UN umbrella organization known as Operation Lifeline Sudan (2011). It may be considered an alternate future – an example of a place where there were large numbers of refugees and aid workers who then left. Clearly, Lokichoggio's proximity to the South Sudanese border raises questions of direct comparability, but its current status relative to Kakuma is instructive. This section summarizes similarities and differences between Lokichoggio and Kakuma. Tables of summary statistics are contained in the appendix.

The most interesting contrasts between Kakuma and Lokichoggio are in their income sources. Kakuma households are more likely to own and care for livestock. Only 28% of Lokichoggian households interviewed kept livestock, compared with 45% of Kakuma households (Table B6). Kakuma households were also more likely to state that they were caring for other people's livestock (potentially the refugees' or other investors). Herders in Lokichoggio have slightly larger herds but sold fewer animals in the past year, and had more of them stolen.

Lokichoggio has agricultural production at a similar level to Kakuma – unlike the other comparison towns – perhaps a residual of having had demand created for agricultural goods during the time when the town was a hub of aid activity (Table B7). The overall value of farm sales

Table 7: Livestock outcomes in villages Kakuma relative to other towns

	Has animals	Ln(livestock cared for)	Ln(livestock owned)	Ln(livestock stolen)	Ln(livestock sold)	Ln(value animals in care)	Ln(value animals owned)	Ln(value animals sold)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kakuma	0.053	0.655	0.112	0.083*	0.073*	2.026*	0.410	1.283
	(0.088)	(0.473)	(0.427)	(0.046)	(0.040)	(0.943)	(0.709)	(1.205)
	[0.626]	[0.328]	[0.887]	[0.038]**	[0.038]**	[0.170]	[0.733]	[0.407]
N	330	154	154	154	154	154	154	154
r2	0.001	0.007	0.000	0.002	0.002	0.011	0.002	0.005

Ordinary least squares regressions with standard errors clustered at the village level. Observations weighted by probability of being sampled. *p<.10, **p<.05,*** p< .01. Robust clustered standard errors are in () and wild bootstrap clustered p-values in [].Data source: Turkana Household Survey (World Bank 2015).

is slightly larger in Lokichoggio than in Kakuma, but slightly larger proportions of harvest are sold in Kakuma than in Lokichoggio. Enterprise development is similar in the two towns, although more Kakuma households state that their enterprise is firewood or charcoal collection, which makes sense given the absence of refugees to whom to sell these products in Lokichoggio. Finally, there are fewer households with wage-earners in Lokichoggio than in Kakuma (8.5 versus 15.3 percent), but it seems that those wage-earners are earning slightly higher salaries (Table B8).

Finally, it is interesting to note that the level of immigrants into Kakuma and Lokichoggio is quite similar – 8.6% in Kakuma and 9.1% in Lokichoggio over the past 20 years. There is a cross-migration phenomenon between the two cities, perhaps because they require migrants of similar skill levels – 75% of the migrants from Lokichoggio go to Kakuma, and 40% of those from Kakuma go to Lokichoggio. From the information that we have on previous household members from 1992 onwards, we know that of those individuals who left their households, 2.2% of them went to Kakuma, while only 0.6% of these went to Lokichoggio. Even more tellingly, of those who left after 2010 none went to Lokichoggio, and 2.1% went to Kakuma.

The overall picture of Lokichoggio as a future scenario for Kakuma is muddy, but a few conclusions can be drawn. If it is the case that international organizations and refugee presence stimulated agricultural production, this production seems to continue after the evacuation of relief efforts. However, greater numbers of households with wage earners imply higher wealth in Kakuma. Overall, it seems as if when refugee camps leave, so do wage-earning jobs, but agricultural infrastructure tends to remain in place.

6 Conclusion

In this paper we have shown that there are benefits to local citizens of living near refugee camps. Households located near such camps show higher consumption as refugee numbers increase. The mechanism behind this appears to be increases in wage and agricultural employment opportunities, as well as increases in the prices of livestock induced by refugee demand. We use a variety of data sources to examine these mechanisms, none of which contains a perfect counterfactual. In particular, we do not present experimental evidence, we are unable to test for parallel trends prior

to the refugee inflow, and there is scant data with which to test for similar baseline characteristics. However, we do believe that the consistent results across a variety of information sources constitutes a convincing case for positive impacts of refugee camps.

It bears mentioning that our results show only average effects. This average is likely to mask important heterogeneity. In particular, households who are not able to access employment benefits due to lack of education or age, and who do not have the ability to farm or raise sufficient numbers of livestock will only suffer from the price increases induced by the refugee presence rather than accruing any benefits.

An important policy implication of our results is that interventions that would support local populations' ability to exploit the increased demand from the refugees could result in even more beneficial outcomes. For example, equipping locals with the skills necessary to take advantage of new wage work, and providing technical support to improve agricultural and livestock production could help spread the benefits more widely. These recommendations are consistent with the movement to respond to protracted displacement in locations such as Kakuma include efforts to generate sustainable longer term economic and social interventions (Zetter 2014).

We recognize that our results are very context-specific. Northern Kenya is a particularly desolate setting, and the refugee inflow has been large and contained, rather than integrated as is the case in some other refugee situations. We would expect that the demand side responses of product prices in a more integrated setting would be similar to those that we observe in Kenya, but that integration would result in much different labor market effects. We also acknowledge that the current work is not able to shed light on the net benefits of the refugee camp by comparing the total costs borne, including food and other international aid, with the small observed consumption benefit to local residents. Furthermore, we cannot hope to give insight into the more subtle effects of the camp on health outcomes, local culture, and security, which may very well be negative. However, we hope that this work represents a small step towards understanding the channels through which refugees impact local economics, and that it provides some foundation upon which to build future work to respond to this pressing issue. More broadly, we also hope that it provides fodder for more nuanced conversations regarding the impact of refugees on local communities by highlighting some of the benefits that they bring.

References

Abdulai, A., Barrett, C. & Hoddinott, J. (2005), 'Does Food Aid Really Have Disincentive Effects? New Evidence from Sub-Saharan Africa', *World Development* **33**(10), 1689704.

ACTED (2014), 'Can Markets Work for the Turkana Pastoralists? An Analysis of Livestock Market Systems in Turkana County'. A Report carried out by ACTED and Kenya Markets Trust.

Akol, L. (2005), 'Choosing to engage: Armed groups and peace processes', *Accord* . downloaded 4/18/16.

URL: *http: http://www.c-r.org/accord/engaging-armed-groups/operation-lifeline-sudan*

Alesina, A., Michalopoulos, S. & Papaioannou, E. (2012), 'Ethnic Inequality'. NBER Working Paper 18512.

Alix-Garcia, J. & Saah, D. (2010), 'The Effect of Refugee Inflows on Host Communities: Evidence from Tanzania', *World Bank Economic Review* **24**, 148–170.

Anderson, M. (1999), *Do no harm: how aid can support peace – or war*, Lynne Rienner Publishers, Inc.

Aukot, E. (2003), 'It Is Better to Be a Refugee Than a Turkana in Kakuma?: Revisiting the Relationship between Hosts and Refugees in Kenya', *Refuge* **21**.

Bakewell, O. (2000), 'Repatriation and Self-Settled Refugees in Zambia: Bringing Solutions to the Wrong Problems', *Journal of Refugee Studies* **13**.

Barrett, C., Mohaptra, S. & Snyder, D. L. (1999), 'The Dynamic Effects of U.S. Food Aid', *Economic Inquiry* **37**(4), 647–656.

Baskaran, T., Min, B. & Uppal, Y. (2015), 'Election cycles and electricity provision: Evidence from a quasi-experiment with Indian special elections', *Journal of Public Economics* **126**, 64–73.

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. (2013), 'The analytics of the wage effect of immigration', *IZA Journal of Migration* **2**, 1–25.

Borton, J., Brusset, E. & Hallam, A. (1996), 'The International Response to Conflict and Genocide: Lessons from the Rwanda Experience', *Journal of Humanitarian Asssistance* . http:www.reliefweb.int/library/nordic/book3/pb022.html.

Buchanan-Smith, M. & McElhinney, H. (2011), 'City limits: urbanisation and vulnerability in Sudan. Nyala case study', *Overseas Development Institute: Humanitarian Policy Group, London* .

Calderón, V. & Ibánez, 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.

Chen, X. & Nordhaus, W. D. (2011), 'Using luminosity data as a proxy for economic statistics', *Proceedings of the National Academy of Sciences of the United States of America* **108**(21), 8589–8594.

Cortes, P. (2008), 'The Effect of Low-skilled Immigration on US Prices: Evidence from CPI Data', *Journal of Political Economy* **116**, 381–422.

Crisp, J. (2003), 'No Solution in Sight: the Problem of Protracted Refugee Situations in Africa'. Working paper, Center for Comparative Immigration Studies, UC San Diego.

de Montclos, M.-A. P. & Kagwanja, P. M. (2000), 'Refugee Camps or Cities? The Socio-economic Dynamics of the Dadaab and Kakuma Camps in Northern Kenya', *Journal of Refugee Studies* **13**.

Dercon, S. & Krishnan, P. (2004), 'Food Aid and Informal Insurance'. World Bank Policy Research Working Paper No. 3217.

Fernandez, D., Kisingu, J., Wanambwa, D. & Njoroge, P. (2014), 'Dadaab and Kakuma Refugee Camps Market Assessment'. A World Food Programme Report, June 2014.

Fitzgibbon, K. (2014), 'HSNP Phase II Registration and Targeting Lessons Learned and Recommendations'. Final Report, July 2014. UK Department of International Development (DFID).

Grindheim, K. A. (2013), 'Exploring the impacts of refugee camps on host communities. A case study of Kakuma host community in Kenya'. Master?s thesis, University of Agder, Faculty of Economics and Social Sciences Department of Development Studies.

Henderson, J. V., Storeygard, A. & Weil, D. N. (2012), 'Measuring Economic Growth from Outer Space', *American Economic Review* **102**, 994–1028.

Henderson, V., Storeygard, A. & Deichmann, U. (2015), Has climate change driven urbanization in africa?, Technical report, Working paper, London School of Economics.

HSNP (2015), 'Registration dataset, Kenyan Hunger Safety Net Programme, 2012-2013'. Financing from the National Drought Management Authority, Australian Aid, and DIFID.

Insenman, P. J. & Singer, H. W. (1977), 'Food aid: Disincentive effects and their policy implications', *Economic Development and Cultural Change* **25**, 205–237.

Jacobsen, K. (2002), 'Can refugees benefit the state? Refugee resources and African statebuilding', *Journal of Modern African Studies* **40**, 577–596.

Jacobsen, K. (2005), *The Economic Life of Refugees*, Kumarian Press.

Kratli, S. & Swift, J. (2014), 'Understanding and Managing Pastoral Conflict in Kenya'. Report for DIFD. , Institute of Development Studies, University of Sussex, UK.

Lach, S. (2007), 'Immigration and Prices', *Journal of Political Economy* **115**, 548–587.

Landau, L. (2002), 'The Humanitarian Hangover'. Ph.D. Dissertation, Department of Political Science, University of California, Berkeley.

LEWS (2015), 'Livestock Early Warning System Price database'. Livestock Information Network Knowledge System. Ministry of Industry, Trade and Marketing, Dar es Salaam, Tanzania, USAID, and UCDavis GLCRSP Group. Lmistz.net.

Maxwell, S. J. & Singer, H. W. (1979), 'Food aid to developing countries: A survey', *World Development* **7**, 225–247.

Maystadt, J.-F. & Verwimp, P. (2014), 'Winners and Losers among a Refugee-Hosting Population', *Economic Development and Cultural Change* **62**, 769–809.

Michalopoulos, S. & Papaioannou, E. (2014), 'National Institutions and Subnational Development in Africa', *Quarterly Journal of Economics* **129**, 151–213.

Michelson, H. C., Lentz, E., Mula, R., Morey, M., Cramer, L., McGlinchy, M. E. & Barrett, C. B. (2012), 'Cash, food or vouchers in urban and rural Kenya? An application of the Market Information and Food Insecurity Response Analysis Framework', *Food Security* **4**, 455–469.

Ohta, I. (2005), 'Coexisting with Cultural "Others": Social Relationships between the Turkana and the Refugees at Kakuma, Northwest Kenya', *Senri Ethnological Studies* **69**, 227–239.

Oka, R. (2011), 'Unlikely Cities In The Desert: The Informal Economy As Causal Agent For Permanent Urban Sustainability In Kakuma Refugee Camp, Kenya', *Urban Anthropology* **40**, 3–4.

Oka, R. (2014), 'Coping with the Refugee Wait: The Role of Consumption, Normalcy, and Dignity in Refugee Lives at Kakuma, Kenya', *American Anthropologist* **116**.

Ottaviano, G. I. & Peri, G. (2008), 'Immigration and National Wages: Clarifying the Theory and the Empirics'. NBER Working Paper 14188, Cambridge, MA.

Pinney, A. (2013), 'Household Registration and Targeting in the Hunger Safety Net Programme 2'. Report, Reading University for Evidence on Demand with the assistance of the UK Department for International Development (DFID).

Polzer, T. (2004), 'We Are All South Africans Now: the integration of Mozambican refugees in rural South Africa'. Forced Migration Working Paper Series #8 Forced Migration Studies Programme University of the Witwatersrand.

Ruttan, V. (1993), *Why Food Aid?*, Johns Hopkins University Press, Baltimore.

Sarzin, Z. I. (2017), 'Stocktaking of global forced displacement data'. World Bank Policy Research Working Paper 7895.

Singer, H. W., Wood, J. & Jennings, T. (1987), *Food Aid: The Challenge and the Opportunity*, Oxford University Press, Oxford.

Storeygard, A. (2016), 'Farther on down the Road: Transport Costs, Trade and Urban Growth in Sub-Saharan Africa', *Review of Economic Studies* **83**, 1263–1295.

Taylor, J. E., Filipski, M. J., Alloush, M., Gupta, A., Valdes, R. I. R. & Gonzalez-Estrada, E. (2016), 'Economic impact of refugees', *Proceedings of the National Academies of Sciences* **113**(27), 7449–7453.

UNHCR (2015), 'Statistical yearbook, 2014'. United Nations High Committee on Refugees.

UNHCR (2017), 'UNHCR Population Statistics Database'. United Nations High Committee on Refugees.
URL: *http://popstats.unhcr.org*

Verdirame, G. (1999), 'Human Rights and Refugees: the Case of Kenya', *Journal of Refugee Studies* **12**(1).

Veridame, G. & Harrell-Bond, B. (2005), *Right in Exile: Janus Faced Humanitarianism*, New York: Berghahn Books.

Watson, D. J. & van Binsbergen, J. (2008), 'Livestock market access and opportunities in Turkana, Kenya'. International Livestock Research Institute Research Report No. 3.

WFP (2014).

Whitaker, B. E. (1999), 'Changing opportunities: refugees and host communities in Western Tanzania'. New Issues in Refugee Research Working Paper no. 11.

World Bank (2015), 'Turkana household survey, kenya'.

Young, H. (2007), 'Looking beyond food aid to livelihoods, protection and partnerships: strategies for WFP in the Darfur states', *Disasters* **31**, S40–S56.

Zetter, R. (2014), 'Reframing Displacement Crises as Development Opportunities', *Roundtable on Solutions, Copenhagen, 2-3 April* .

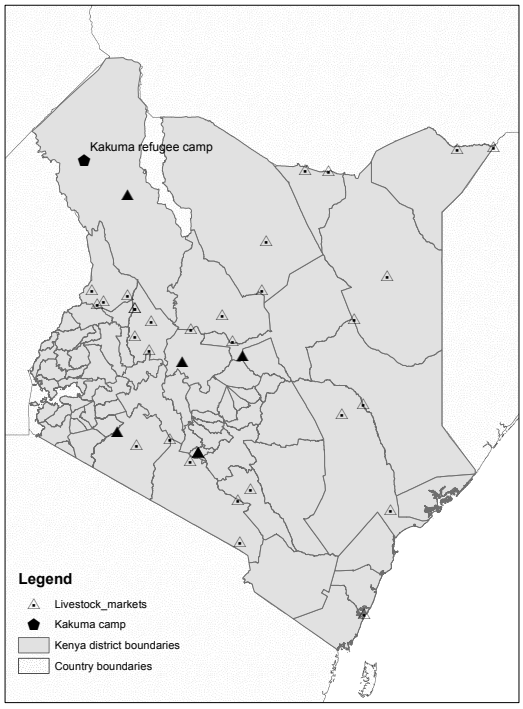
Appendix A Additional figures

Figure A1: Turkana district



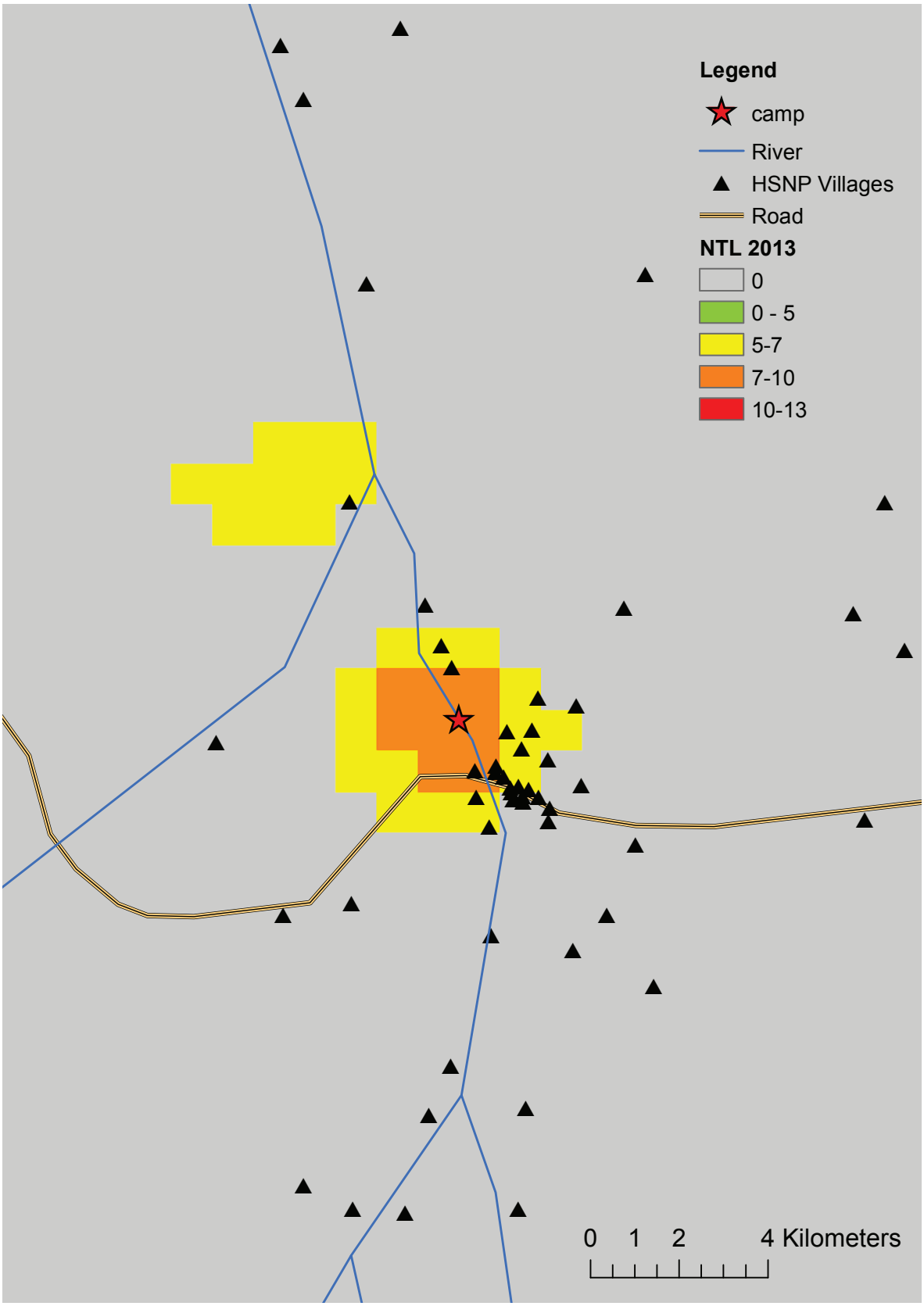
This map was produced by the Cartography Unit of the World Bank Group. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Figure A2: Livestock market locations, LEWSNET



Source: authors' calculations from LEWSNET data

Figure A3: Kakuma camp and surrounding villages



Appendix B Appendix tables

Table B1: School attendance and livelihoods in Turkana vs rest of Kenya, 2005

	Kenya		Turkana
	Urban	Rural	
Poverty rate	33.7	49.1	94.3
Household size	4.0	5.5	6.5
School Net Attendance ratio (primary)	83.2	78.3	44.1
School Net attendance ratio (secondary)	29.9	15.9	1.4
Proportion households crop farming	68.8		12.2
Proportion of households owning livestock	66.0		62.0
Average number of cattle	6		23
Average number of goats	10.9		44.5
Average number of sheep	10.7		14
% of households in retail/wholesale	65.5		67.5

Data source: KIHBS Basic Report (2005)

Table B2: Effect of Refugees on Economic Activity by Distance

Dep variable: IHS(Night Lights)	(1)	(2)	(3)	(4)
IHS(Refugees) x 0-9 km	0.356***	0.368***	0.070	-0.070
	(0.049)	(0.063)	(0.064)	(0.055)
IHS(Refugees) x 10-29 km	-0.000	0.004	-0.001	-0.046
	(0.001)	(0.009)	(0.008)	(0.036)
IHS(Refugees) x 30-74 km	0.000	-0.007	0.040	-0.044
	(0.001)	(0.010)	(0.041)	(0.034)
IHS(Refugees) x 75-109 km	0.004	-0.005	0.175**	-0.049
	(0.012)	(0.014)	(0.082)	(0.032)
IHS(Refugees) x 110-149 km	0.001	-0.000	-0.004	-0.041
	(0.002)	(0.008)	(0.005)	(0.032)
Distance to	Kakuma	Kakuma	Lokichoggio	Lokichar
Sample	Full	Restricted	Full	Full
Village FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	13608	5502	13419	13608
Adjusted R^2	0.040	0.046	0.021	0.009

* p< 0.10, ** p<0.05, *** p < 0.01. Observations at the village level for the years 1993 to 2013 over 648 villages. Standard errors clustered at the *Location* administrative level. IHS is the inverse hyperbolic sine. All regressions include village fixed effects, year fixed effects, and year by distance to road controls. The dependent variable is the inverse hyperbolic sine of the nighttime lights index. The omitted category is all distances greater than 150 km. "Restricted" sample is all villages in Locations that had a population of 5,000 or greater in 1989.

Table B3: Correlation of Nighttime lights and Consumption

Dep Var: IHS(Consumption)	(1)	(2)	(3)	(4)
IHS(Lights Index)	0.158*	0.146*		
	(0.081)	(0.082)		
Any lights (0/1)			0.396*	0.365*
			(0.205)	(0.209)
Sample	Full	Restricted	Full	Restricted
Mean of consumption	476.94	490.69	476.94	490.69
Observations	648	262	648	262
Adjusted R^2	0.169	0.200	0.166	0.194

* p< 0.10, ** p<0.05, *** p < 0.01. Observations at the village level for 2012. Standard errors clustered at the *Sub-location* administrative level. IHS is the inverse hyperbolic sine. All regressions control for IHS(distance to road), annual precipitation (mm), and the percentage of household heads that have no education. The dependent variable is the inverse hyperbolic sine of the HSNP consumption index, which represents household adult monthly consumption in KSH. "Full sample" is all villages in the HSNP dataset. "Restricted" sample is all villages in Locations that had a population of 5,000 or greater in 1989.

Table B4: Consumption across space in the Turkana district

	IHS(predicted consumption)				Good roof	Good wall	IHS(children under 15)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln(Km to Kakuma camp)	-0.047***	-0.046***					
	(0.017)	(0.017)					
Inverse km to Kakuma			0.170***		0.173***	0.187***	-0.014***
			(0.048)		(0.027)	(0.035)	(0.003)
0-9 km				0.222***			
				(0.080)			
10-29 km				0.016			
				(0.033)			
30-74 km				0.084**			
				(0.036)			
75-109 km				0.094*			
				(0.054)			
110-149 km				0.100*			
				(0.058)			
Ln(precip in mm)		0.209*	0.213**	0.231**	0.341***	0.442***	-0.018
		(0.105)	(0.105)	(0.092)	(0.126)	(0.155)	(0.017)
Observations	137964	137964	137964	137964	137964	137964	137964
Adjusted R^2	0.064	0.072	0.072	0.073	0.058	0.066	0.001

Unit of observation is the household. Standard errors are in parentheses and are clustered at the locality level. * p< 0.10, ** p<0.05, *** p < 0.01. Good roof indicates a non-grass roof and good wall a non-grass wall. All regressions contain 1/km to Lodwar as a control variable. Data source: HSNP (2015).

Table B5: Household summary statistics, Turkana

	Kakuma	Non-Kakuma	P-val	Kakuma obs	Non-Kakuma obs
Num. members age 5 or less	0.486	0.612	0.227	111	219
Num. members ages 6 to 15	1.351	1.352	0.999	111	219
Num. members ages 16 to 60	2.640	2.521	0.457	111	219
Num. members older than 60	0.243	0.228	0.799	111	219
Num ages 6-15 enrolled in school	0.369	0.233	0.122	111	219
Member has wage job, past 12 months	0.153	0.091	0.093	111	219
Num. employed by NGO or UN	0.294	0.250	0.771	17	20
Num. members working in camp	0.294	0.000	0.008**	17	20
Prop. wage earners working in camp	0.294	0.000	0.008**	17	20
Prop. ages 16 to 60 employed with wage	0.424	0.398	0.610	17	20
Tot. household wage, past 12 months	125128.235	254283.900	0.087	17	20
Num. household members	4.730	4.726	0.987	111	219
Household head no education	0.667	0.763	0.064	111	219
Mem w second educ	0.162	0.333	0.001***	111	219
Prop. ages 6 to 15 enrolled in school	0.270	0.196	0.220	71	137
Date household head arrived	1995.211	1989.857	0.027*	71	203

Data source: Turkana Household Survey (World Bank 2015).

Table B6: Summary statistics livestock, Lokichoggio

	Mean Loki	Mean Kakuma	P-value diff	Obs Loki	Obs Kakuma
Household cares for animals	0.280	0.450	0.007**	118	111
Dist to watering hold increased	0.636	0.500	0.226	33	50
Movement of animals increased	0.606	0.520	0.446	33	50
Location of grazing changed	0.636	0.660	0.828	33	50
Value of animals cared for	193475.758	146222.000	0.528	33	50
Value of animals owned	162884.848	129382.000	0.555	33	50
Value of animals sold	7206.061	6624.060	0.850	33	50
Num. livestock owned	40.545	35.260	0.726	33	50
Num. livestock cared for	41.818	37.600	0.812	33	50
Num. livestock sold	1.818	2.260	0.608	33	50
Num. livestock consumed	1.394	1.560	0.767	33	50
Num. livestock dowried	9.545	5.300	0.526	33	50
Num. livestock died	7.727	5.480	0.544	33	50
Num. livestock stolen	13.636	3.480	0.033*	33	50
Num. poultry owned	0.909	1.300	0.700	33	50
Num. poultry cared for	0.455	1.440	0.389	33	50
Num. poultry sold	0.091	0.120	0.771	33	50
Num. poultry consumed	0.000	0.080	0.305	33	50
Num. poultry dowried	0.000	0.000	.	33	50
Num. poultry died	0.364	0.080	0.348	33	50
Num. poultry stolen	0.000	0.040	0.420	33	50

Data source: Turkana Household Survey (World Bank 2015).

Table B7: Summary statistics agriculture, Lokichoggio

	Mean Loki	Mean Kakuma	P-value diff	Obs Loki	Obs Kakuma
Household farms	0.203	0.333	0.026*	118	111
Area farmland owned (ha)	50.498	31.689	0.455	24	37
Value of farm sales	3812.917	3018.297	0.776	24	37
Farm sales - inputs (not labor)	2012.917	1215.595	0.767	24	37
Non-labor input costs	1800.000	1802.703	0.997	24	37
Labor days on the farm	41.083	51.111	0.363	24	36
Prop. farm production to animals	0.036	0.062	0.368	17	32
Prop. farm production consumed	0.511	0.400	0.298	17	30
Prop. farm production sold	0.107	0.181	0.363	15	30
Prop. farm production gifted	0.034	0.085	0.270	17	31
Prop. farm production saved	0.118	0.165	0.384	17	32

Data source: Turkana Household Survey (World Bank 2015).

Table B8: Summary statistics labor, Lokichoggio

	Mean Loki	Mean Kakuma	P-value diff	Obs Loki	Obs Kakuma
Num. household members	4.576	4.730	0.592	118	111
Household head no education	0.737	0.667	0.244	118	111
Mem w second educ	0.331	0.162	0.003**	118	111
Member has wage job, past 12 months	0.085	0.153	0.110	118	111
Prop. ages 6 to 15 enrolled in school	0.177	0.270	0.175	71	71
Tot. household wage, past 12 months	234440.000	125128.235	0.202	10	17

Data source: Turkana Household Survey (World Bank 2015)

Appendix C Additional details on data sources

Within Turkana province, there are 5 market towns that were similar to Kakuma in 1989, according to sublocation data available from the 1989 census. These are: Lokichar (pop 4887), Lokori (pop 5590), Kangatet (pop 5590), and Lokwal Kalokol (pop 6842). These towns are shown in Figure C4.

Figure C4: Final sample of towns for household survey



This map was produced by the Cartography Unit of the World Bank Group. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Because Lokwal is found off of the main highway, and Kangatet is very close to Lokori and somewhat to the east of the main highway, we eliminated these from consideration. Unfortunately, security challenges made it impossible to arrive at Lokori during the time of our fieldwork. Turkana and UNHCR colleagues suggested that the town of Lorugum (pop 3153 in 1989), located on the

main highway west of Lodwar en route to Uganda, which is halfway between Lokichar and Kakuma, as a reasonable comparison for Kakuma in the late 1980s.