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Environmental Resource Scarcity and Peaceful Co-existence between Refugees and Host Communities in Uganda*

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May 2022

Abstract

The Ugandan government has established refugee settlements near local communities. The literature highlights a progressive refugee policy, called the "Uganda Model," that brings economic benefits to host communities. However, geographical proximity may invite resource competition, impeding social integration. Using data from refugee households, this study tests whether population pressure on the resource base drives refugee-host tension. Results show that refugees with limited access to agricultural land and firewood negatively perceive interactions with the host population. This empirical pattern is particularly salient in the West Nile region, where resource scarcity is a mounting concern due to the recent influx of South Sudanese refugees. In contrast, we find no such evidence for water accessibility, except for refugees using public wells in the South West region. Overall, our empirical analyses suggest that refugees' poor access to environmental resources is a potential source of local conflict under the Uganda Model. Thus, the peaceful co-existence of refugees and host communities requires efficient resource sharing and management schemes in refugee-hosting areas.

Keywords: refugees, natural resource sharing, social integration, Uganda.
JEL Classifications: O12, O13, O15, R23.

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1 Introduction

Worldwide, the number of forcibly displaced people is increasing due to various social issues ranging from environmental disasters to armed conflicts (Naudé, 2010; Marchiori et al., 2012). In response to such shocks, people in affected areas often cross the border as refugees. According to a recent United Nations High Commissioner for Refugees (UNHCR) report, the number of refugees reached 26.4 million as of 2020, and the majority stay in low- and middle-income countries (UNHCR, 2021a).

Given the global surge of refugees, there is an urgent need to design effective policy packages to support refugees. In this regard, recent data collection efforts yielding first-hand evidence have improved our understanding of refugees' economic livelihoods (Alloush et al., 2017; Betts et al., 2019, 2020). Another strand of the literature evaluates the effectiveness of policy interventions targeting refugees (e.g., MacPherson and Sterck, 2021; Vintar et al., 2022). Researchers have also paid attention to the spillover effects of refugee influx on local economies (Taylor et al., 2016a; Alix-Garcia et al., 2018) and negative externalities such as disease propagation (Montalvo and Reynal-Querol, 2007; Baez, 2011); such research has provided insights into sustainable refugee hosting. Furthermore, a small but growing body of literature investigates the implications of economic interactions between refugees and local host populations (e.g., Alix-Garcia et al., 2019). While evidence of positive changes brought about by hosting the displaced has accumulated in the literature (Maystadt et al., 2019), refugees cannot attain sustainable livelihoods solely through economic integration.

In contrast to earlier empirical attempts from an economic perspective, this paper provides quantitative evidence on refugees' social integration into the host community by examining their perceptions of local hosts. Addressing this question is particularly important for host communities with a large influx of refugees, as it can lead to ethnic rivalry, perceived socioeconomic inequality, and public insecurity, resulting in communal conflicts in which refugees are often victims of violence (Fjelde and Østby, 2014; Fisk, 2018; Valli et al., 2019). Despite limited empirical evidence

regarding the security threat of hosting refugees (Böhmelt et al., 2019; Zhou and Shaver, 2021; Coniglio et al., 2022), careful examination of potential factors to discourage social cohesion merit serious consideration for the prevention of unproductive conflicts at the local level.

The key observation of this study is that most refugee-receiving areas in developing countries rely on environmental resources (e.g., agricultural land and forest resources) for livelihood. Hence, resource competition is paramount among the postulated fuels of local tensions (Martin, 2005; Reuveny, 2007; Berry, 2008; Ali et al., 2017). Additionally, mounting evidence of environmental stress due to demographic pressures in refugee-hosting areas has recently raised concern about the risk of local conflicts triggered by competition for limited resources (e.g., Alix-Garcia et al., 2013; Ruiz and Vargas-Silva, 2018; Maystadt et al., 2020; Aksoy and Tumen, 2021).[1] Perceiving environmental degradation and natural resource depletion around refugee settlements as a factor underlying contentious refugee-host relationships, international agencies promote sustainable forest management and fuel-efficient technologies (e.g., FAO and UNHCR, 2018; World Bank and FAO, 2020). However, quantitative attempts to test this premise are still scant, and its empirical ground is weak.

Building on this observation, we investigate environmental resource competition as a potential cause of local tension between refugees and hosts in refugee settlements in Uganda. Uganda is a good research setting in which to explore the above question for the following reasons. First, Uganda is among the world's largest refugee-hosting countries, having hosted displaced populations from South Sudan, the Democratic Republic of the Congo (DRC), Rwanda, Burundi, and other countries, totaling over 1.5 million refugees as of 2021 (UNHCR, 2021b). Reflecting the sharp influx of refugees fleeing political unrest in South Sudan after 2016, natural resource scarcity has been a growing concern in areas hosting South Sudanese refugees. Second, Ugandan refugee support policies are unique: While many refugee-receiving countries keep the displaced in camps

[1] Nevertheless, empirical evidence on refugees' ecological footprint is premature and inconclusive. For instance, Salemi (2021) finds statistically significant but modest forest cover loss in the vicinity of refugee camps in sub-Saharan Africa. Note that her estimation sample excludes refugee settlements in Uganda, the present study's research setting.

away from their citizens, Uganda has a progressive settlement policy that allows them to settle near local communities and provides them with agricultural land for cultivation so that they can be self-reliant. While the international community has praised this refugee policy package, called the "Uganda Model," close geographical proximity to host communities and thus high interdependencies may accelerate environmental stress on the already harsh environment.

Economists have provided positive evidence for the Uganda Model (Taylor et al., 2016b; Kreibaum, 2016; d'Errico et al., 2021). For example, Taylor et al. (2016b) show that hosting refugees can benefit local economies through the spill-over of aid and the income their economic activities generate.[2] However, while previous work has thoroughly documented economic impacts, little is known about the extent to which the Uganda Model achieves social integration from refugees' perspective. In this regard, some case studies have qualitatively proposed factors that may hinder a harmonious relationship, including historical contexts between Uganda and immediate neighboring countries, limited natural resources, and host communities' frustration with unfair governmental treatment (Bohnet and Schmitz-Pranghe, 2019; Khasalamwa-Mwandha, 2021; Murahashi, 2021). However, quantitative tests are scarce due to a lack of data reflecting refugees' perceptions of intergroup social cohesion, and evaluation of the Uganda Model cannot be comprehensive without examination of its social inclusion dimensions.

This study fills this gap by examining access to environmental resources as a significant factor in the peaceful co-existence of refugees and host residents using 2018 data from refugee households. We hypothesize that the sharp influx of South Sudanese refugees into the West Nile region has lowered accessibility to essential natural resources, leading to local tensions around refugee-hosting areas. Anecdotal evidence supports our view. For instance, a recent report from the region indicates that the conflicts refugees most often highlighted were related to competition for natural resources (IRRI, 2019). Indeed, the media reported a violent incident triggered by quarrels over a water

[2] Kreibaum (2016) reaches similar conclusions by highlighting the role of improved public services such as education and health. Additionally, d'Errico et al. (2021) underscores the economic benefits of direct interactions between the host community and refugees.

source, in which some locals and refugees were killed, in a refugee settlement in the West Nile region (CGTN Africa, 2020).

We quantitatively reaffirm the anecdotal evidence that environmental resource scarcity hinders refugee-host cooperation and solidarity based on quasi-random variations in access to land, water, and forest resources due to the administrative placement of refugees in settlements. Our empirical results show that refugee households with poor access to land and firewood for cooking have worse perceptions of host community interactions than their counterparts with good access. Subsample analyses show that this empirical pattern is only salient in the West Nile region, where demographic pressure on the resource base is a growing concern. In contrast, we find no significant associations in the South West region, the main home of DRC refugees, which has had mild refugee inflows in recent years. This regional contrast gives more credence to our resource scarcity hypothesis.

In contrast, we do not find significant associations with access to water resources. An exception is refugee households using public boreholes as their primary drinking water source in the South West region, among whom longer wait times at boreholes predict worse perceptions of local hosts, providing more evidence in favor of our hypothesis. Nevertheless, empirical results indicate that the severity of water accessibility has not yet reached a threshold level that triggers a contentious relationship between refugees and local hosts in the vicinity of most settlements.

Our further analysis investigates the relative importance of land and firewood resources to refugees' subjective perceptions of their social relations with Ugandan natives in West Nile. We find that a 1.6 km increase in the distance to firewood collection points (equivalent to a standard deviation [SD] increase of 1) would change our aggregated perception measure by 0.27 SD, which is higher than the expected change by 0.12 SD, after a land size increase of 0.38 acres (equivalent to 1 SD). Thus, our estimation identifies access to firewood resources as more influential than land access on social integration into host communities in West Nile among refugee households using firewood as cooking fuel. Finally, we confirm the robustness of these results to endogeneity concerns regarding access to agricultural plots and alternative measures of refugees' perceptions of

local hosts.

The main contribution of this study is the provision of quantitative support for perceptions of environmental resource competition as a deterrent to social integration. Although scholarship has long discussed this hypothesis, most previous work is descriptive (e.g., Ali et al., 2017). For example, Smith et al. (2021) report conflict over firewood in refugee camps in Ethiopia and Djibouti and also find, based on qualitative interviews, that locals perceive refugees as contributing to resource depletion, despite no such evidence from remote sensing analysis. Such misperception prevents local cooperation and invites tension between refugees and hosts in the scholars' setting. In the spirit of environmental peacebuilding in post-conflict areas (Krampe et al., 2021), participatory natural resource governance would directly mitigate the risk of small-scale conflicts by curbing environmental stress and indirectly mitigate it through the development of mutual trust. Our study aims to motivate the international community and practitioners to commit to such solutions on empirical grounds.

As another contribution to the refugee literature, this study sheds new light on the Uganda Model from a different angle: social integration. This perspective contrasts starkly with most existing assessments of Uganda's refugee policies from economic perspectives (e.g., Taylor et al., 2016b; Kreibaum, 2016; d'Errico et al., 2021). Despite the reported stimulating impacts of forced displacement on host economies, positive economic benefits may, as this study indicates, be at the cost of social cohesion due to the sharing of limited environmental resources. Furthermore, hosts' and refugees' subjective perceptions often do not follow objective measures (Kreibaum, 2016; Smith et al., 2021). Hence, no account of social integration aspects would risk overestimating the economic benefits of accommodating refugees. This study suggests the possibility of biased positive views on the Uganda Model: Geographical proximity between the two groups in resource-scarce locations invites resource competition, generating negative intergroup perceptions. Our empirical evidence offers meaningful lessons not only for the future of the Uganda Model but also for other refugee-receiving nations that follow global shifts in support policies in their pursuit

of local integration amidst refugee crises.

Betts et al. (2022) is a complementary study that tests intergroup contact theory to explore the determinants of social cohesion from both host and refugee perspectives using survey data from Ethiopia, Kenya, and Uganda. The current study is meaningfully distinct. While the aforementioned scholars examine the role of likely endogenous interaction with the outgroup as a driver of social cohesion, this study investigates plausibly exogenous environmental conditions due to quasi-random placement as a hurdle to social integration in non-camp settings.[3]

This paper proceeds as follows. Section 2 describes refugee settings and assistance policies in Uganda, overviews the existing research on refugees' economic lives, and presents our hypothesis for empirical analysis. Section 3 discusses the data and the empirical framework. Section 4 presents the results, and Section 5 reports on robustness checks. Section 6 concludes and offers policy implications and future research directions.

2 Setting and hypothesis

2.1 Refugees and refugee assistance policies in Uganda

With about 1.5 million refugees as of 2021, Uganda is the world's third-largest refugee recipient county, after Turkey and Pakistan. Figure 1 presents a timeseries of the number of refugees in Uganda by nationality. As Figure 1 shows, the influx of refugees from South Sudan began after armed conflict broke out in December 2013, triggering the South Sudanese civil war, and kept growing thereafter. Continuing violence and resultant political instability in South Sudan led to the arrival of many South Sudanese refugees within a short period in 2016. In addition to South Sudanese refugees, accounting for 70% of the total refugees in the country, Uganda has also accepted displaced from bordering countries in East and Central Africa, such as the DRC, Rwanda,

[3]Partly due to the empirical challenge of endogeneity, their empirical test did not find robust evidence for contact theory. For example, (non-) market interactions with local hosts do not significantly nurture refugee perceptions of host trustworthiness in the Nalivale settlement in Southern Uganda.

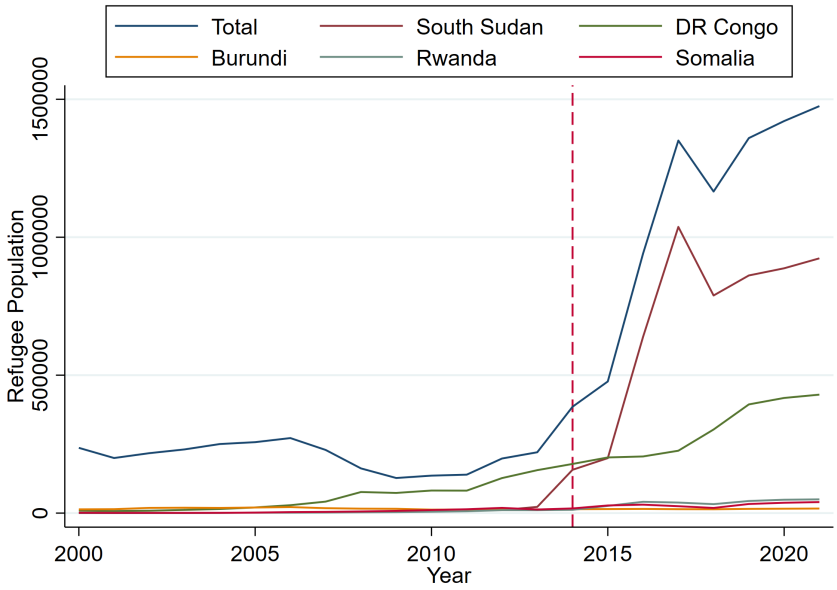


Figure 1: Number of refugees by nationality in Uganda, 2000-2021

Source: UNHCR, Refugee Data Finder. https://www.unhcr.org/refugee-statistics/
Notes: 2021 data are available up to midyear. The dotted line shows the onset of the South Sudan crisis in December 2013.

and Burundi (UNHCR, 2021b).

In September 2016, the UN Summit for Refugees and Migrants held in New York discussed a global shift away from the prevalent humanitarian model, which provides temporary assistance, toward a development model that enhances refugee agency. This transition marked an international response to protracted refugee situations in various settings, prompting long-term development plans that promote refugee autonomy and refugee-host integration. Since a massive influx of refugees from South Sudan began in the same year, Uganda's treatment of refugees has received attention from the international community. Since then, major donors and international organizations have praised Ugandan refugee support policy as "tolerant" regarding accepting refugees even when their financial resources are scarce (Murahashi, 2021).

Ugandan refugee policy is unique for the following reasons. First, the 2006 Refugee Act and 2010 Refugee Regulations grant refugees the right to free movement and business activities within the country and equal access to public services such as education and health care. Further, under

these laws, the Ugandan government allocates lands in refugee settlements for homesteading and farming to registered refugee households. Land allocation aims to reduce refugees' high reliance on humanitarian aid and facilitate their economic independence through agricultural livelihoods. Since the government demarcates refugee settlements near the local communities, geographical proximity is the first key aspect of Uganda's refugee policy.

Second, Ugandan refugee policy intends to facilitate local economic growth by integrating refugees into the host community. Hence, the National Development Plan II set out to integrate refugees into socioeconomic development plans at national and local levels in 2015.[4] Additionally, in 2016, the government launched Refugee and Host Population Empowerment (ReHoPe), a supportive strategy to create mutual development for both refugees and their host communities, thereby accelerating local integration. ReHoPe is the central component of Uganda's comprehensive refugee response framework (CRRF), which was declared at the UN summit in September 2016 and rolled out in March 2017. The CRRF enhances refugees' autonomy through effective collaboration between humanitarian and development actors to meet short-term emergency needs and achieve long-term development (UNHCR, 2018a). A series of programs encourage refugee-host interactions through economic and social activities, the policy's second noteworthy feature. These progressive refugee policies are collectively called the "Uganda Model" and are praised in the international community as among the best examples of refugee treatment (Bohnet and Schmitz-Pranghe, 2019).

Under Uganda's settlement approach, refugee settlements are a salient feature of rural communities in refugee-hosting areas. Figure 2 shows the locations of operational refugee settlements in 2020. The map illustrates a cluster of refugee settlements in northern Uganda. The growing influx of refugees from South Sudan coupled with Uganda's unique settlement policies have changed the landscape in rural West Nile. Figure 3 illustrates the composition of refugees in each district an-

[4]The Plan's crucial component was inherited from the 2015 Settlement Transformation Agenda, which states six goals for local integration: (1) land management, (2) sustainable livelihoods, (3) governance and the rule of law, (4) peaceful co-existence, (5) environmental protection, and (6) community infrastructure (UNHCR, 2018a).

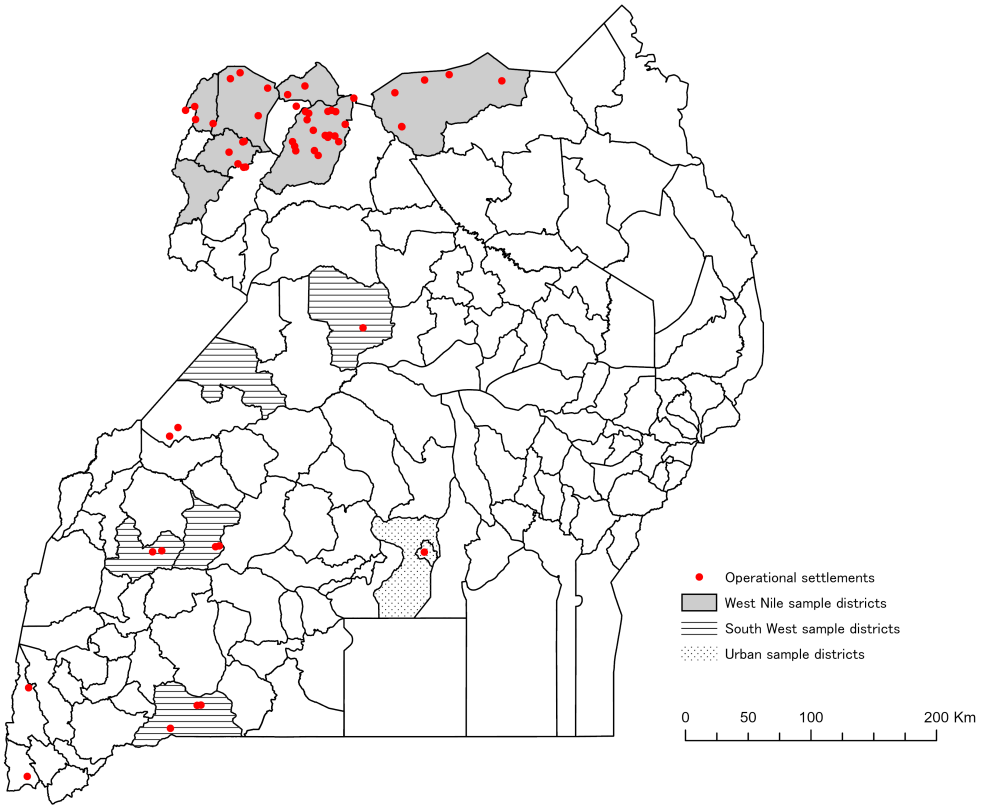


Figure 2: Location of refugee settlements in Uganda

Notes: Red points represent the location of operational refugee settlements in 2020. West Nile sample districts include Adjumani, Arua, Moyo, Yumbe, Koboko, and Lamwo. South West sample districts include Hoima, Kamwenge, Isingiro, Kiryandongo, and Kyegegwa. Urban sample districts comprise Kampala city and Wakiso district.

alyzed in this study. For example, Yumbe and Adjumani have accommodated more than 200,000 South Sudanese refugees as of April 2019. In these two districts, refugees outnumber locals, with the former accounting for 53% in Yumbe and 59% in Adjumani as of January 2018 (UNHCR, 2018b). On the other hand, the South West region is DRC refugees' main home, where refugees also account for a significant portion of the district's total population, at 21% (19%) in Kyegegwa (Ishingiro). The following subsection summarizes previous work on the implications of these recent dramatic changes in the demographic structure of refugee-hosting areas under the Uganda Model.

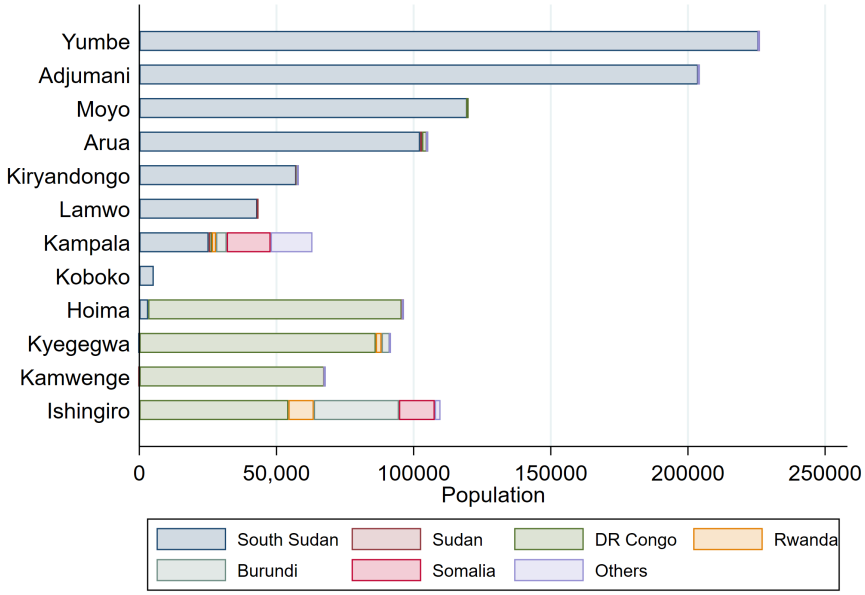


Figure 3: Refugee population by country of origin and district as of April 2019

Source: UNHCR (2019).

2.2 Literature review on refugee economies in Uganda

As introduced in the previous section, geographical proximity between refugees and hosts characterizes Uganda's refugee policy. Typical refugee settlement policies adopted by many other refugee-hosting countries set up refugee camps in peripheral regions near refugees' point of border entry (Salemi, 2021; Coniglio et al., 2022). Under such encampment policies, refugees have few chances to interact with locals. In contrast, refugees in Uganda are not confined to the camp area. Having granted refugees freedom of movement throughout the country, the Ugandan government locates refugee settlements near native residential areas. Another essential feature of Uganda's refugee policy framework is refugees' economic and social integration at the local level. The government provides refugees with the same social services to which locals have access and allows the displaced to engage unrestrictedly in economic transactions with the host community. The recent influx of refugees from South Sudan strengthened economic interactions between refugees and locals. Considering these dynamics, the Uganda Model, aimed at fostering refugees' self-reliance,

has far-reaching implications for refugee and host populations around refugee settlements.

From the economic perspective, Taylor et al. (2016a) estimate the spillover effects of humanitarian aid on average income in the local economy within a 15 km radius of refugee settlements by applying a general equilibrium model to survey data from inside and outside two refugee settlements in Uganda. Their cost-benefit analysis shows that the income gains of hosting refugees outweigh aid distribution costs. Favorable income spillovers from refugees come from stimulated demand for local goods and services after refugees receive aid and engage in income-generating activities, mainly intensive farming. These scholars' results indicate substantial economic interaction between locals and refugees in markets, which generates favorable income multiplier effects in the local economy.

d'Errico et al. (2021) complement Taylor et al. (2016a)'s finding of positive spillovers into the local economy by relating hosts' outcomes to refugees' proximity. They find favorable impacts of hosting the displaced on wage labor income and food expenditure among local hosts, indicating job opportunities linked to refugees. However, their results also show that such favorable impacts are confined to nearby refugee settlements within a roughly 5 km radius.

Kreibaum (2016) also finds positive externalities from hosting the displaced population. Exploiting sudden refugee inflows from the DRC, her difference-in-differences analysis shows improved welfare indicators such as consumption and primary school accessibility among Ugandans living near refugee settlements. However, her results are more nuanced because the influx of DRC refugees generated negative perceptions of hosts regarding the current economic situation. She also confirmed a strengthened ethnic rather than national identity among local hosts. The negative impact on hosts' subjective perceptions may stem from possible prejudices and resentments linked to food aid and generous governmental support for refugees.

Zhou et al. (2022) examine another spillover through the expansion of public service delivery

[5]The outcome variable for this part of their analysis derives from the Afrobarometer survey question about general attitudes toward immigrants and foreign workers. Thus, their measure of native Ugandans' perceptions is not specific to refugees.

and find significant improvements in local hosts' access to education, health care, and road infrastructure. More relevant to this paper's central theme, they also find no association between proximity to refugee settlements and locals' attitudes toward migrants.[5] Thus, their evidence illustrates that positive externalities, including these public expenditure shocks, might outweigh potential negative externalities, alleviating the burden of hosting refugees.

While these empirical studies provide supporting evidence for refugees' economic integration in Uganda from host communities' perspective, previous qualitative work reports several economic challenges that refugees face. First, implemented refugee support policies often diverge from the spirit of the policy. For instance, in terms of both size and quality, actual land allocations may be insufficient for refugees to achieve self-reliance through farming, especially in crowded refugee-hosting districts (Bohnet and Schmitz-Pranghe, 2019; OPM et al., 2020). Second, policy implementation often deviates from governmental intentions. For example, regarding freedom of movement, while refugees are free to leave their initial refugee settlement, secondary migration to other refugee settlements is uncommon, partly due to fear of no land access in the new location (Khasalamwa-Mwandha, 2021). Furthermore, because residing in a refugee settlement is a condition to receive benefits such as cash transfers and food rations from humanitarian aid organizations (Kreibaum, 2016; Vintar et al., 2022), refugees are generally not incentivized to move beyond settlements. Moreover, refugees have few employment opportunities around settlements, despite their right to work.

Economic integration alone does not guarantee that refugees will achieve local integration, not without peaceful co-existence with host communities. However, quantitative evaluation from social integration perspectives is an understudied area of refugee livelihoods in Uganda. Refugees' social integration into local communities is complex, as evidenced by Kreibaum (2016)'s results, showing that local Ugandans' subjective perceptions of economic situations do not align with the favorable impacts of hosting displaced people according to objective economic measures. Among potential sources of local conflicts in and around refugee settlements, the repercussions of refugee

inflows as large-scale demographic shock have long been the subject of debate (Black, 1994). Recent empirical scrutiny of the environmental impacts of hosting refugees calls for attention to the scarcity of resources shared between refugees and hosts (Maystadt et al., 2020; Aksoy and Tumen, 2021; Salemi, 2021). Considering the continuing trend of refugee inflows from neighboring countries, competition for natural resources is a pressing concern. Nevertheless, the role of natural resource scarcity in social integration is under-researched, and extant work is chiefly descriptive. In the following subsection, we detail our hypothesis regarding the potentially detrimental effect of resource scarcity on sustainable accommodation of refugees at the local level.

2.3 Natural resource scarcity hypothesis

This section presents our empirical hypothesis based on growing concerns about the scarcity of natural resources due to a recent surge of refugees into Uganda. Black (1994) discusses land degradation, deforestation, and pressure on water supply and quality as an example of potential refugee-induced environmental change. These types of environmental stress manifest after a certain period and are therefore categorizable as long-term environmental consequences. Given that the mass arrival of refugees is relatively recent in Uganda, land, water, and forest resource shortage is an urgent concern as an immediate environmental stressor, as these three natural resources are vital to support livelihoods in the Ugandan refugee context and thus constitute our study's focus.

Allocation of a fixed-size land plot to refugees for shelter and farming is a unique facet of the Ugandan refugee policy framework. According to OPM et al. (2020), the announced plot sizes were 30 m $\times$ 30 m (equivalent to 0.22 acres) in the West Nile region and 50 m $\times$ 50-100 m (0.62-1.24 acres) in the South West region.[6] Nonetheless, depending on the timing of refugee arrivals and land availability, actual allocations often differ from the official size (Bohnet and Schmitz-Pranghe, 2019; OPM et al., 2020). Additionally, IRRI (2019) points out that the rapid increase in refugees has led to the distribution of smaller, lower quality plots to newly arriving refugees, particularly in

[6]The primary reason for this regional disparity is the limited land resources in West Nile (Taylor et al., 2016b).

the West Nile region, which hosts many refugees from South Sudan.

As another key shared resource, refugees and host residents usually share public taps and boreholes for drinking water. However, the continuing influx of refugees has led to congestion (e.g., long queues) at water points (Bohnet and Schmitz-Pranghe, 2019), accelerating competition for access to an inadequate water supply (IRRI, 2019). Hosts interpret water shortages and longer wait times at water sources as signs of refugee-induced environmental stress, and resultant heightened intergroup tension may invite small-scale communal violence. This concern has already materialized in violent incidents. For example, CGTN Africa (2020) reports an incident in a refugee settlement in northwestern Uganda in which some refugees and hosts were attacked and killed after quarrels over a water source. Other refugee settlements have also witnessed such warning signs in their water environments.

Hosts and refugees both use firewood for fuel and construction. Given that humanitarian agencies have not designated specific locations for firewood collection, most refugees (especially females) travel long distances to collect firewood from bushlands and forests outside refugee settlement areas. Consequently, refugees share wood collection locations with host community residents. The sharing of forest resources has become a concern since the mass influx of refugees has led to environmental stress, especially in the West Nile region, making firewood less accessible, as evidenced by World Bank and FAO (2020), who describe escalating degradation and tree loss around West Nile refugee settlements. IRRI (2019) reports that some host populations feel threatened by the depletion of their resources due to the increasingly imposing refugee presence. Hosts' negative perceptions often degenerate into hostile reactions to refugees fetching firewood (e.g., scaring them and chasing them away) and, in worst-case scenarios, small-scale violence (IRRI, 2019).

These field reports inform our hypothesis that the scarcity of natural resources is a primary source of tension between refugees and host community residents (resource scarcity hypothesis). Heightened tensions over shared resources can invite communal conflicts and violence. As we have

Considering the tiny plots, most refugees in West Nile settlements grow vegetables for kitchen garden agriculture.

seen, qualitative studies and local media provide evidence consistent with our hypothesis. Unlike previous qualitative work, we empirically examine the resource scarcity hypothesis in relation to primary livelihood resources, i.e., land, water, and firewood.

The importance of resource scarcity in nurturing the host-refugee relationship depends on the tenure regime governing the three abovementioned resources. A unique feature of land resources is that the government and host communities set land use rights for each plot and refugee household. However, water and woods are common pool resources shared among refugees and host community residents. Given this contrast, sustainable water and fuel resource management matters to prevent unproductive conflicts at the local level. Thus, empirically testing the resource scarcity hypothesis for each environmental resource yields essential insights into local institutions' role in refugees' social integration.

We further hypothesize more pronounced impacts of access to environmental resources on social cohesion in the West Nile region, where the number of refugees has sharply increased, intensifying resource scarcity concerns, compared to the South West region. Testing the resource scarcity hypothesis through regional comparison also examines the role of land ownership in public security. In West Nile, land allocated to refugees was previously communal land belonging to the host community, while in the southwest, the government owns such lands. This regional difference in the land tenure system may lead to different reactions among local hosts and hence distinct social integration consequences. We will now investigate these hypotheses with household survey data.

3 Data and empirical framework

3.1 Data

The data used for empirical analysis are from the World Bank's Refugee and Host Communities Household Survey, conducted in May-July 2018.[7] The survey collected information from 880

[7]Data are available online (https://microdata.worldbank.org/index.php/catalog/3867).

refugee households in 122 communities.[8] The sample communities span 13 districts in West Nile, South West, and urban areas.[9] Figure 2 shows the locations of the surveyed districts. Among the three regions, the West Nile sample districts have experienced a drastic increase in the number of refugees from South Sudan, accelerating the scarcity of natural resources such as land and firewood. The refugee sample in the South West region consists mainly of Congolese nationals, and the influx of refugees has not been drastic in recent years.

Table 1 reports the summary statistics for primary empirical variables among refugee households by region.[10] The survey data show, irrespective of current residence, a near universal refugee registration rate and low refugee household mobility, except in urban areas. We also observe striking regional differences in refugee households' characteristics between the West Nile and South West subsamples. First, the proportion of female-headed households is higher in the West Nile region, revealing an empirical pattern consistent with qualitative evidence that most refugee families were separated due to the civil war in South Sudan, with only women and children fleeing to West Nile refugee settlements (e.g., Khasalamwa-Mwandha, 2021). Second, refugees in the West Nile region were more recent arrivals than refugees in the South West region, consistent with the recent influx of refugees to the West Nile region (see Figure 1). Additionally, the West Nile subsample features larger families and lower education and income levels than the South West subsample.

Finally, Table 1 shows that heads of refugee households in urban areas are more educated with a higher average income than their counterparts in non-urban settings. Since urban refugee households' lifestyles differ markedly from non-urbanities', our analysis focuses on rural refugee settlements in the West Nile and South West regions.

[8]The survey also interviewed 1,123 host households from 145 communities. Unfortunately, according to World Bank personnel, respondents' perceptions of refugees were not recorded due to coding mistakes. Thus, this paper focuses on refugees' perceptions, leaving analysis of local integration from hosts' perspectives to future work.

[9]The West Nile sample region includes the districts of Adjumani, Arua, Moyo, Yumbe, Koboko, and Lamwo. The South West region includes the districts of Hoima, Kamwenge, Isingiro, Kiryandongo, and Kyegegwa. Finally, the urban sample area comprises Kampala city and the Wakiso district.

[10]To construct the analysis sample and account for the ill effects of outliers, we dropped 30 households from the total sample size (880 households) where land size exceeded 5 acres, total water point commute time or wait time at the water point exceeded 2 hours, or any key information is missing.

Table 1: Descriptive statistics for refugee households

	Total	West Nile	South West	Urban
Registered, HH head (dummy)	0.96	0.96	0.97	0.94
	(0.20)	(0.20)	(0.17)	(0.23)
Years since arrived, HH head	3.63	2.34	6.04	5.73
	(4.59)	(3.44)	(5.16)	(6.40)
Moved, HH head (dummy)	0.05	0.03	0.07	0.26
	(0.23)	(0.16)	(0.26)	(0.44)
Household characteristics				
Female HH head (dummy)	0.53	0.62	0.34	0.44
	(0.50)	(0.49)	(0.48)	(0.50)
Age of HH head	39.48	38.75	41.08	39.71
	(14.65)	(14.73)	(15.40)	(9.58)
Literacy of HH head (dummy)	0.53	0.48	0.57	0.88
	(0.50)	(0.50)	(0.50)	(0.33)
Family size	5.57	5.89	4.95	5.12
	(2.89)	(2.99)	(2.63)	(2.47)
Number of children ages 0-17 years	3.57	3.92	2.97	2.72
	(2.39)	(2.44)	(2.17)	(2.19)
Welfare indicators				
Annual income (1,000,000 UGX)	2.00	1.31	1.61	9.88
	(6.27)	(1.84)	(1.60)	(21.51)
Outcomes				
Peaceful co-existence index, 0 to 5	3.52	3.40	3.61	4.19
	(1.34)	(1.39)	(1.26)	(1.00)
First principal component	0.06	0.01	-0.02	0.83
	(1.39)	(1.38)	(1.43)	(1.16)
Access to resources				
Total land size (acre)	0.27	0.19	0.51	0.00
	(0.52)	(0.39)	(0.72)	(0.00)
Land size from the GoU (acre)	0.18	0.12	0.34	0.00
	(0.39)	(0.23)	(0.60)	(0.00)
Time from and to WS (hour)	0.20	0.17	0.31	0.01
	(0.19)	(0.12)	(0.25)	(0.02)
Wait time at WS (hour)	0.43	0.39	0.63	0.02
	(0.45)	(0.37)	(0.55)	(0.06)
Use firewood (dummy)	0.81	0.91	0.77	0.00
	(0.39)	(0.28)	(0.42)	(0.00)
Distance to FWCP (km)	1.91	2.18	1.75	
	(1.66)	(1.67)	(1.50)	
Observations	850	475	319	56

Notes: Means are presented with SDs in parentheses, weighted by sampling weights. "Registered" is a dummy taking 1 if the household head is registered as a refugee with the Government of Uganda. "Moved" is a dummy taking 1 if the household head's current residence is different from their initial placement in Uganda. WS stands for drinking water source. Distance to firewood collection point (FWCP) is a variable taking 0 if the household does not use firewood, 1.5 km if the distance is coded as between 0 km and 3 km, 4 km if it is in the range of 3-5 km, 6.5 km if it is in the range of 5-8 km, and 8 km if it is coded as 8 km more. 1 USD = 3,800 UGX in 2018.

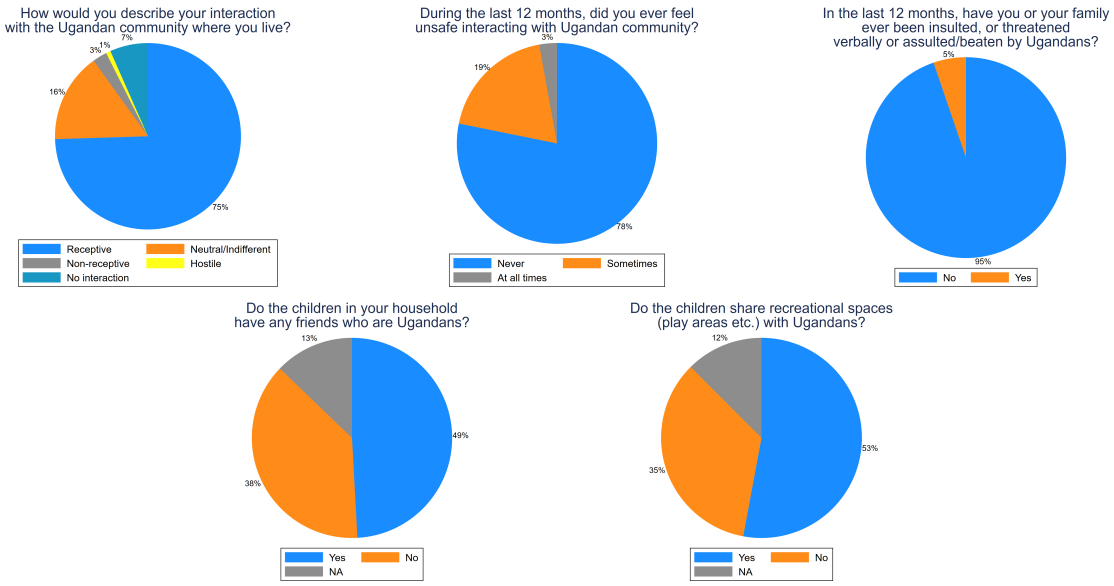


Figure 4: Perceptions of refugees' relationship with the host population

3.2 Outcome variable: Peaceful co-existence index

To test the role of natural resource scarcity in progress toward refugees' social integration, we take the degree of peaceful co-existence between refugees and host community residents as the outcome variable. To construct its empirical proxy, this study uses survey questions to refugee respondents regarding their social relationships with Ugandan nationals residing in surrounding areas. Figure 4 reports five questions used to construct the index and the distribution of respondents' answers to each. Based on these survey items, we calculate the total count for the most positive responses to each question to define the peaceful co-existence index (*PeaceCoex*). For instance, one question is "How would you describe your interaction with the Ugandan community?". Among the Likert-scale responses, the most positive answer is "Receptive," which we code as 1, while all other responses (i.e., "Neutral/Indifferent," "Non-receptive," "Hostile," and "No interaction") are coded as 0. Hence, our outcome variable *PeaceCoex* ranges from 0 to 5, and higher values indicate a more positive perception of refugees' relationship with the host community.

Figure 5 presents a scatter plot for the average peaceful co-existence index and the proportion of refugees in the total population at the district level. Although refugees' perceptions of their

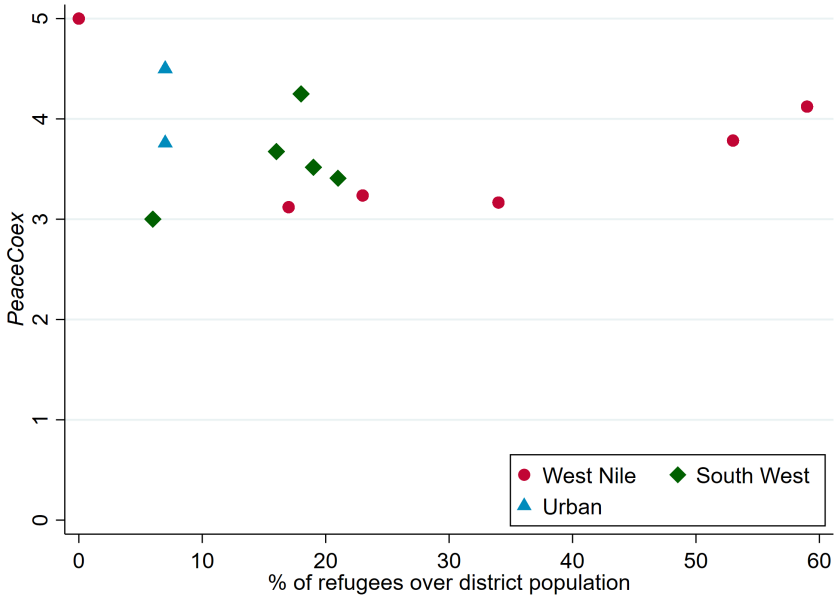


Figure 5: Refugees' perceptions of hosts and the ratio of refugees to the total district population

Source: UNHCR (2018b) for the percentage of refugees over total district population.
Notes: The horizontal axis measures the percentage of refugees over total district population. The vertical axis measures the district average of the peaceful co-existence index.

relationships with locals are not very negative on average, we observe variations across districts. The relationship with the ratio of refugees has an inverted-U shape, indicating that local tension is likely in places where refugees are in the minority. Table 1 shows that the co-existence index averages are 3.40 in the West Nile region and 3.61 in the South West region. Although the regional gap is marginally significant at the 10% level, the high index SDs imply the presence of meaningful within-district variations in the degree of social cohesion.

3.3 Main independent variable: Access to natural resources

We specify household access to environmental resources as our explanatory variable of interest to empirically test the resource scarcity hypothesis. This study focuses on land, water, and firewood resources as primary natural resources to support livelihoods in refugee settlement settings. We explain empirical variables for these resources in turn. Table 1 presents summary statistics for the

variables relating to access to the resources.

Appendix Table A1 shows refugee households' land sources. The data confirm that government allocated plots predominantly determine household access to land resources, while some refugees negotiated with local landowners to lease more land. Table 1 reports that average land sizes are 0.12 acres for the West Nile sample and 0.34 acres for the South West sample, much lower than the government's announced size of 0.22 acres in West Nile and 0.62-1.24 acres in South West. The data also show that 49% (42%) of the West Nile (South West) subsample lacks farmland access, empirical patterns that coincide with previous reports that actual refugee land allocation often diverges from the official size, depending on land availability (Bohnet and Schmitz-Pranghe, 2019; OPM et al., 2020). Therefore, the size of each refugee household's accessible land mirrors the degree of resource scarcity around the community. Hence, we use the size of the land to which refugees have access as an explanatory variable (*landsize*) to capture land resource scarcity.

Turning to water resources, Appendix Table A2 reports that refugee households' common drinking water sources are public taps and boreholes, which they often share with local hosts. To capture water resource scarcity in the local context, we measure household access to water sources and congestion at water points. Empirical analysis uses total water point commute time (*distWT*) and wait times at the water point (*waittimeWT*) as explanatory variables. As shown in Table 1, refugees spend long periods in queues at water points but can reach them relatively quickly, within 10 minutes, on average.

The final resource of interest is firewood. For refugees living in settlements, firewood is the primary cooking fuel. Our data confirm this, as Appendix Table A3 reports that 90% (72%) of refugee households in the West Nile (South West) region rely on firewood to generate energy for meal preparation. Refugees collect firewood by cutting trees from forests and bushlands near host communities. Hence, the continuous influx of refugees has affected household fuel choices, with low accessibility to nearby forests and bushlands limiting firewood access in the West Nile region (IRRI, 2019). To consider this possibility, we use the distance to the firewood collection point

(*distFWCP*) as an explanatory variable to describe firewood scarcity. We construct the distance variable based on the following four original categories: 0-3 km, 3-5 km, 5-8 km, and 8 km or more. Our distance variable takes the intermediate values for each category. Table 1 reports that the average distance to bushlands and forests for firewood collection is around 2 km.[11] Since not all households use firewood, we also create an indicator variable for using firewood as a source of energy for cooking (*firewood*).

Before empirical specification, it is worthwhile to confirm regional differences in the degree of environmental resource scarcity per Table 1. For example, the average West Nile refugee household has access to a smaller plot and collects firewood in further bushland than their counterparts in the South West region.[12] On the contrary, West Nile refugee households spend less time fetching water on average than those in the South West region. Thus, determining which region has a harsher environment depends on the natural resources comprising our focus.

3.4 Empirical specification

To empirically test the resource scarcity hypothesis, we model the peaceful co-existence index as a function of household access to natural resources as below:

$$\begin{aligned} PeaceCoex_{ij} = \beta_0 \quad &+ \quad \beta_1 landsize_{ij} + \beta_2 distWT_{ij} + \beta_3 waittimeWT_{ij} \\ &+ \quad \beta_4 firewood_{ij} + \beta_5 refyears_{ij} + \beta_X X_{ij} + \gamma_j + \varepsilon_i \end{aligned} \tag{1}$$

where i and j index household and district. $refyears$ is the duration in years of the head of household i's stay in Uganda. We include this variable since longer stay durations may directly affect trust in host populations by virtue of more chances to interact (Betts et al., 2022). X_{ij} is a vector of household i's characteristics, such as household size and number of children, and the

[11] The distance to firewood collection points variable in Table 1 takes 0 if the refugee respondent does not use firewood for cooking fuel. The variable used for empirical analyses keeps them missing to account for systematic sample selection based on fuel choice.

[12] Among firewood users, the average (SDs) distance to a firewood collection point is 2.39 (1.60) km based on 429

head of household i's characteristics, including gender, age, literacy, and education. We add district fixed effects γ_i to account for time-invariant regional differences in refugees' nationality and their general environment. ε_i is an error term. Since urbanite refugees' economic activities and lifestyles differ completely in terms of resource use from those in and around rural refugee settlements, we exclude urbanites from the estimation sample. We account for sampling weights in the regression analysis. In addition to regression results for the pooled sample, we also present the results for the West Nile and South West regions separately to highlight the regional contrast arising from the heterogeneous degree of natural source scarcity.

We estimate Equation (1) using ordinary least squares (OLS), with standard errors clustered at the refugee settlement level. We test our hypothesis with signs and significance of the estimated coefficients, β_1-β_4. Since the regression equation controls for district fixed effects, identifying these coefficients of interest comes from within-district variations in household access to natural resources. In other words, our estimation strategy does not exploit across-district variations in resource availability, which Table 1 confirmed. Nevertheless, reflecting differences in resource availability across communities, we still expect significant variations, even after controlling for differences across districts. OPM et al. (2020) and Khasalamwa-Mwandha (2021) provide supporting evidence for this assumption.[13] Our empirical specification considers the remaining variations after controlling for time-invariant regional characteristics and arrival date as quasi-randomly assigned by the administrative allocation rule governing refugees' placement. Since the UNHCR and the Office of the Prime Minister (OPM) make criteria-based allocation decisions (e.g., settlement capacity, country of origin, ethnicity, and needs assessment), there is no room for refugees' self-selection of specific settlements, which solidifies our premise for the identification (d'Errico et al., 2021).

refugee households in West Nile and 2.26 (1.32) km based on 234 households in the South West region. The difference in means is not statistically significant at the conventional level. While the group of firewood users is a selective sample, average access to firewood is comparable across the two regions after controlling for household fuel choice.

[13]For instance, Khasalamwa-Mwandha (2021) reports that average plot sizes are 20 m $\times$ 30 m in the Nyumanzi settlement, 10 m $\times$ 10 m in the Mirieyi settlement, and 30 m $\times$ 30 m in the Maaji settlement, with all the settlements located in Adjumani district in West Nile.

According to our resource scarcity hypothesis, β_1 is expected to have a positive sign, since we hypothesize that land size reflects the degree of land scarcity in host communities. Larger plot holdings for refugee households would indicate relatively abundant land resources in their locations and suggest little tension fueled by land scarcity and the maintenance of a harmonious intergroup relationship. In contrast to the resource scarcity hypothesis, one may expect β_1 to have a negative sign, given that host community residents may be jealous of refugees' land access, fueling local tension and refugees' poor perceptions of host community residents. Therefore, the sign of β_1 cannot be determined *ex-ante*; this is an interesting question to explore in the data.

The water-related variables' coefficients are expected to have negative signs. Longer distances to water fetching points and longer wait times at water sources indicate water resource shortage and congestion. We speculate that our perception measure will be lower among refugees in such resource-limited environments.

Additionally, we expect a negative coefficient for the indicator variable representing the use of firewood as cooling fuel; because both hosts and refugees collect firewood from common places (e.g., forests), households that use firewood as cooking fuel would be more likely to compete over fuel sources than their counterparts who use private goods (e.g., charcoal) for the same purpose. To explore the role of distance to firewood collection locations in social integration at the local level, we also run the regression equation (1), replacing $firewood$ with $distFWCP$. Similarly, a longer distance to firewood collection points would lower our outcome because this empirical proxy measures forest resource accessibility within communities. Since we test the resource scarcity hypothesis by comparing households within the same district, some refugee households may live in settlements situated far away from the host community (and thus bushlands), making them less likely to interact with the host community and thus have lower trust. These two channels would lower the co-existence index outcome. If we find negative and significant coefficients of the distance measure for the West Nile subsample only, the regional contrast would imply that the first mechanism outweighs the second, supporting the resource scarcity hypothesis. Given these testable

Table 2: OLS regressions of peaceful co-existence index on access to natural resources

	(1)	(2)	(3)	(4)	(5)	(6)
Total land size (acre)	0.323***	0.346***	0.532***	0.455**	0.187**	0.213*
	(0.078)	(0.094)	(0.186)	(0.202)	(0.083)	(0.114)
Time from and to WS (hour)	-0.225	0.153	-1.218*	-0.798	0.223	0.549
	(0.353)	(0.414)	(0.721)	(0.772)	(0.336)	(0.372)
Wait time at WS (hour)	0.045	0.011	0.078	0.031	-0.088	-0.104
	(0.164)	(0.176)	(0.295)	(0.270)	(0.129)	(0.164)
Use firewood (dummy)	-0.234		-0.200		-0.318*	
	(0.173)		(0.278)		(0.185)	
Distance to FWCP (km)		-0.191***		-0.231***		0.012
		(0.046)		(0.051)		(0.060)
Years since arrived, HH head	-0.003	-0.004	0.003	-0.001	-0.009	-0.002
	(0.014)	(0.016)	(0.015)	(0.017)	(0.016)	(0.019)
Sample	All	All	West Nile	West Nile	South West	South West
R squared	0.17	0.21	0.18	0.23	0.25	0.30
N cluster	93	92	56	56	37	36
N	794	663	475	429	319	234

Notes: Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water source. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

hypotheses regarding the role of environmental resources in nurturing refugee-host relations at the local level, we now turn to the estimation results.

4 Results

Table 2 presents the estimation results for the regression equation (1). Columns (1) and (2) report estimated coefficients for the full sample, pooling the West Nile and South West samples. Irrespective of different specifications of variables relating to firewood resources, the land size coefficient is positive and significant at the 1% level. Additionally, Column (1) shows a lower peaceful co-existence index for refugee households that use firewood as cooking fuel, although the link is not statistically significant. Furthermore, among firewood users, refugee households that travel a long distance to firewood collection points have negative perceptions of their host communities. These

pieces of evidence are coherent with our resource scarcity hypothesis. In contrast, the variables relating to drinking water access do not reveal significant associations with our peaceful co-existence measure across the entire sample.

Pooling the two regions into one sample may mask substantial heterogeneity in the importance of population pressures on natural resources. Hence, we run the regression equation (1) separately for the West Nile and South West regions. Columns (3)-(6) show stark regional differences. First, the positive land size coefficient is much larger in magnitude for the West Nile sample (Columns (3)-(4)) than for the South West sample (Columns (5)-(6)). Column (3) suggests that a 1 SD increase in land size (0.386 acres) would boost our co-existence index by 0.205, equivalent to 0.148 SD, among the sample refugees in West Nile. This regional contrast adds credence to our resource scarcity hypothesis, since resource scarcity should be more salient in the West Nile region, to which refugees fled from unrest in South Sudan.

Another regional contrast lies in the estimation results for proximity to firewood collection points. We find a significant association with refugees' perceptions of their hosts in the West Nile region only (Column (4)). Thus, the overall negative correlation of distance to firewood collection points with the peaceful co-existence measure comes primarily from the West Nile sample, indicating that refugee households with restricted access to firewood face more challenges cultivating social constructs with locals in the region, given the recent mass influx of refugees, a finding that further supports our resource scarcity hypothesis.[14]

While our estimation results also show a marginally significant association with distance to water fetching points in West Nile (Column 3), its economic significance is not sizable relative to land access. For example, a 1 SD (7 mins) reduction in commute time would increase the perception measure by 0.151, equal to 0.109 SD. Additionally, the coefficient loses its significance when we limit our attention to households that use firewood (Column 4). Thus, the West Nile region offers

[14]Column (5) shows a significant coefficient on the dummy for using firewood as fuel. However, this marginally significant result is not robust to the subsequent regression analyses. Considering the failure to confirm the robustness and assuage the endogeneity concerns regarding fuel choice, we do not emphasize this result.

weak empirical support for the natural resource scarcity hypothesis regarding water access.

On the other hand, Column (6) reports a positive coefficient for this water access variable for the South West subsample. The estimated coefficient's sign is in an unexpected direction, while statistical significance is marginal. One possible explanation for the unexpected sign is that distances to water fetching points vary among water sources, and this empirical measure may capture variations in the availability of water supply facilities rather than household access. To test this specification, we run the same regression in the restricted sample with respect to familiar water sources, i.e., public taps and boreholes (see Appendix Table A2 for the distribution of water sources among refugee households). Estimation results in Appendix Table A4 no longer show unexpected signs of the water access variables' coefficients. Since a significant fraction of refugee households use and share public boreholes with host community residents in both regions (Appendix Table A2), we further restrict the estimation sample to refugee households that rely on public wells for drinking water. Estimation results in Appendix Table A5 show negative and significant correlations between wait time at water sources and our social cohesion index for the South West sample, unlike in the pooled sample (Table 2).

Hence, estimation results for access to water sources do not support the resource scarcity hypothesis, except among refugee households in the South West region that collect water from public boreholes. These findings indicate that water accessibility is, unlike land and forest resources, not an urgent concern in West Nile. As is evident in the summary statistics in Table 1, this interpretation is consistent with better access to water resources in the West Nile region than in the South West region.[15]

Overall, our estimation results show that refugees' access to land and firewood resources plays a crucial role in building harmonious refugee-host relations in West Nile. Using the result in Column (4) for firewood users in the West Nile region, we check the relative importance of these

[15]The empirical finding is also consistent with Bohnet and Schmitz-Pranghe (2019)'s claim of the superiority of refugees' water supply to that of the host communities in some areas of West Nile, thanks to newly drilled boreholes compliments of aid agencies.

two resources by comparing the magnitude of the outcome index after a 1 SD increase across the resource variables. Our regression result suggests that a 1 SD increase in distance to firewood collection points (1.598 km) would reduce the index by 0.369, equal to 0.268 SD. This change in the index is higher in absolute terms than the expected change of 0.172, or its 0.124 SD, after a 1 SD increase in land size (0.377 acres). Thus, household access to forest resources is more significantly linked with subjective perceptions of social cohesion than land access among refugees using firewood as their primary cooking fuel.

These results suggest that the recent influx of South Sudanese refugees into the West Nile region has created competition over environmental resources key to both refugees' and hosts' livelihoods, leading to local intergroup tension. Another important finding is that refugees' land access is influential in establishing a balanced relationship with local hosts. However, the wood resource is the most vital factor in peaceful co-existence for firewood users in the West Nile region. For the South West region subsample, the same empirical test of the resource scarcity hypothesis finds weaker supporting evidence for land resources and a specific water source—public boreholes—exclusively among their users.

5 Robustness checks

This section confirms our benchmark results' robustness to (1) the endogeneity concern regarding household access to land resources and (2) alternative definitions of the outcome variable.

5.1 Endogenous land size

The current empirical variable for land access ($landsize$) is the total size of the refugee household's agricultural land, comprising plots initially allocated by the government and lands acquired through individual negotiations with host landowners. The mixture of the two land sources raises concerns about the potential reversal causality path from the degree of peaceful co-existence to refugees'

land access, which is particularly concerning when refugees who trust host community residents easily acquire land in addition to government allocated plots. Since land arrangements between refugees and locals are informal, mutual trust is key to smooth transactions (Adong et al., 2021). Thus, our observed association may reflect a causal path running from refugees' perceptions to land transactions and the path of interest from land resource scarcity to perceptions. This potential reverse causality would bias estimated land size coefficients.

To address this concern, we run the same regression using the size of government allocated plots instead of total land size on the premise that the former only reflects land resource scarcity near refugee settlements. Understanding the determinants of the size of initial government land grants to refugees provides clues to handling the abovementioned empirical concern. The key factor in the Government of Uganda's (GoU) refugee land allocation is the target region's land tenure system. For example, in the South West region, the GoU owns the land it allocates to refugees and exercises discretion regarding plot sizes, considering land scarcity situations. In such cases, plot size is plausibly exogenous to refugee-host relations because land allocation is beyond refugees' and hosts' control.

On the other hand, in West Nile, the lands used a refugee settlements are communal and administrated under customary tenure systems(IRRI, 2019). The OPM negotiates with the host community to get permission to establish a refugee settlement and distribute land to refugees (Khasalamwa-Mwandha, 2021). Given this institutional context in West Nile, availability of agricultural lands for refugees depends on resource scarcity and negotiation between the GoU and host communities. The negotiation process and its results may indirectly affect future refugee-host relations if local hosts perceive large land grants as land grabbing. Although we cannot rule out this possibility, the potential effect works in opposition to our expectations per the resource scarcity hypothesis. Thus, estimates based solely on GoU land grants would at least provide us with a lower bound for the impact of resource scarcity on refugee-host relations in West Nile.

Appendix Table A6 presents the regression results for this exercise. The estimation results

produce pictures that are qualitatively similar to the main results in Table 2. Compared to the previously estimated coefficients of total land size, the size of the plots granted by the GoU for shelters and farming, albeit less precisely estimated, has higher explanatory power for the West Nile region, where the large inflow of refugees causes natural resource congestion.[16] Overall, the regression results based on government land grants show the significance of the resource scarcity hypothesis regardless of refugees' land acquisition processes, thus confirming the main results' robustness to reverse causality concerns.

5.2 Alternative perception outcome measures

Another empirical concern relates to constructing the outcome variable, i.e., $PeaceCoex$. In constructing the peaceful co-existence index, we aggregate answers to five questions regarding refugees' perceptions of interactions with the host community by counting the incidence of the most positive response to each question. While this construction method relies on natural aggregations, we confirm the main results' robustness to alternative aggregation methods.

For this purpose, we apply principal component analysis (PCA) to the five questions about refugees' perceptions of hosts and use the first principal component score as the outcome variable in Equation (1). As shown in Appendix Table A7, the estimation results for this additional regression do not qualitatively change the main results in Table 2, although the coefficients are less precisely estimated. Therefore, this exercise confirms robustness against the alternative aggregation method for measuring social cohesion. The larger standard errors in Appendix Table A7, compared to the estimation results in Table 2 and Appendix Table A6, may indicate measurement error in the outcome variable. This is likely when the questions capture different perspectives of refugees' perceptions of host community residents. Thus, the previous regression analyses with the aggregated

[16]Nevertheless, access to firewood resources is still the most influential factor among firewood users in the West Nile region. The estimated coefficients in Column (4) of Appendix Table A6 suggest that a 1 SD increase in distance to firewood collection points (1.598 km) would reduce the index by 0.372, equal to 0.269 SD. This predicted change in the index is higher in absolute terms than the expected change of 0.179, or 0.129 SD, in the index after a 1 SD increase in GoU land allocation size (0.241 acres).

index may miss important variations across the original questions.[17]

Hence, we run the OLS regression separately for each original question.[18] Appendix Tables A8-A12 present the estimation results for the disaggregated perception measure.[19] The results provide further evidence consistent with our resource scarcity hypothesis, especially for the West Nile subsample. For example, in the West Nile region, additional land access of 0.39 acres, approximately equal to 1 SD for the subsample of this region, would increase the score representing refugees' perceptions of their interactions with the host community by 0.075, equal to 0.10 SD. The same quantitative experiment also suggests a probability increase among refugee households where children have friends in the Ugandan community and share a play area with host children by 4.5 and 5.9 percentage points (p.p.), respectively, in the West Nile region (Appendix Tables A11 and A12).

Regarding firewood access in the West Nile region, a 1 SD shift (1.60 km) would lead to a 0.170 point reduction of the score representing refugees' perceptions of their interactions with the host community, equivalent to 0.24 SD (Column 2 in Appendix Table A8). Moreover, the same shift in distance to firewood collection points would decrease the likelihood of refugees' children having Ugandan friends and sharing a playground by 8.4 and 10.4 p.p., respectively. Finally, as in the main results, we find no significant empirical patterns for access to water resources.

Overall, the results of the separate regression by question guide us to a conclusion similar to that derived from the results of the regression with the aggregated index for peaceful co-existence between refugees and hosts.

[17]The finding that the first component explains only 40% of the variation in the five original variables also suggests this possibility. Additionally, the Kaiser-Meyer-Olkin test statistic based on the five questions is 0.52, which is slightly above the rule of thumb value for factor analysis, indicating that PCA does not perform well at summarizing these variables.

[18]To facilitate interpretation, we convert codes so that a higher value represents a more positive perception on the part of the refugee respondent.

[19]We confirm that the (ordered) Probit model regressions do not cause meaningful change in the estimation results compared to OLS results. Our preferred specification is the linear probability model since the discrete choice specification loses some observations due to the perfect prediction problem.

6 Conclusions

The Ugandan government implements progressive refugee policies, known as the Uganda Model, by promoting economic and social integration of the displaced into the local community. This study empirically examined the hypothesis that limited access to environmental resources hinders peaceful co-existence between refugees and host community residents in Uganda. Our estimation results supported the hypothesis with respect to land and firewood resources. Consistent findings across these two resources lend credence to the direction of the role of demographic pressure. This empirical pattern is more striking in the West Nile region, where the refugee population has sharply increased in recent years, intensifying resource scarcity concerns. We also found evidence that access to public boreholes has explanatory power for refugees' positive perceptions of their local hosts, albeit only for a specific subset of refugees in the South West region. These results were robust to endogeneity concerns regarding refugees' access to agricultural plots and alternative definitions of the peaceful co-existence index. Overall, our empirical results regarding refugees' social integration provide cautionary evidence on the Uganda Model, which is commended in the literature and by the international community as a progressive refugee policy.

We raised the possibility that limited access to environmental resources impedes refugees' social integration into the host community. Considering the ongoing political instability in neighboring countries such as South Sudan, we expect a continued influx of refugees into Uganda, although the population inflow may not increase as drastically as it did in 2016. The steep increase in the number of displaced also implies a rise in population pressure on the resource base in refugee-hosting communities, leading to heightened tension at the local level. Since mistrust hinders economic interactions, the deterioration of refugee-host solidarity may prevent smooth economic transactions in the local economy. To address the concerns this study has raised, policy interventions should aim for sustainable management schemes for shared natural resources, especially land and firewood.

We found a robust relationship between land scarcity and peaceful co-existence for the West Nile region subsample. This result implies that land allocation to the displaced, a unique facet of the Uganda Model, is likely to affect the degree of refugees' social integration into the local community. Considering ongoing population pressure due to a refugee surge, addressing land conflicts through governmental policies alone may be challenging. Private land arrangements may help achieve efficient land reallocation at the local level to complement government land provision (Adong et al., 2021). As a by-product, direct land arrangements between refugees and local landowners would strengthen intergroup social interaction, contributing to building mutual trust and integrating refugees into local communities. As a current concern around direct land transactions in the West Nile region, most agreements between refugees and landowners are informal and verbal (Khasalamwa-Mwandha, 2021), and IRRI (2019) reports discouraging evidence that land transactions without written formal contracts have invited further land conflicts between refugees and host landowners. Furthermore, insecure land use agreements would discourage refugees' agricultural investments. Therefore, the introduction of supportive institutions (e.g., the protection of property rights) to supplement the lack of trust in undocumented contracts would be a promising future policy option to achieve the dual goals of refugees' self-reliance and local integration.

Our empirical results suggest the urgent need to solve common resource problems, especially regarding bushlands and forests in the West Nile region. Incorporating forestry interventions (e.g., afforestation and community forestry schemes) for sustainable forest management into the refugee assistance program is an attractive policy response to the protracted refugee situations to suppress the risk of resource-related conflicts around the host community. In the Ethiopian context, where forest dependency is high, Kahsay and Bulte (2021) confirm the effectiveness of participatory approaches (e.g., internal monitoring) in community forest management. Based on observations in refugee camps in Ethiopia and Djibouti, Smith et al. (2021) highlight the importance of disseminating correct information to address bias among locals and promote local cooperation in terms of resource sharing. Their results suggest that improved communication channels provide the basis

for efficient intergroup resource sharing and livelihood cooperation. Providing rigorous evidence on the effectiveness of cooperative resource management arrangements with well-designed field experiments is a promising avenue for future work.

Finally, our findings warrant further empirical research to evaluate refugee policies from the sustainable social integration angle. Our empirical results regarding perceptions of refugees suggest that local hosts may view refugees as competitors in a resource-poor environment. The social cohesion measurement is inconclusive, and our measure captures a specific domain. Unlike Kreibaum (2016), we could not directly address the host populations' perceptions of refugees due to data constraints. In future work, the assessment framework should incorporate both host community and refugee perspectives to provide more comprehensive evidence of social inclusion progress. For instance, testing whether market-based economic interactions and public programs cultivate intergroup social constructs is an interesting future research direction.

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A Appendix Tables

The data source for all tables below is the 2018 Refugee and Host Community Household Survey.

Table A1: Refugee households' land sources

	West Nile		South West	
	Freq.	%	Freq.	%
Purchased	5	2	12	6
Inherited or received as gift	8	3	17	9
Leased-in	4	1	4	2
Received from the government	213	80	145	73
Agreement with land owner	36	13	19	10
No agreement with land owner	1	0	3	2
Total	267	100	200	100

Notes: The unit of analysis is a plot of land.

Table A2: Refugee households' main drinking water sources

	West Nile		South West	
	Freq.	%	Freq.	%
Public taps	238	49	69	21
Borehole in yard	3	1	11	3
Public borehole	220	45	212	64
Well/spring	9	2	14	4
River/stream/lake	3	1	2	1
Tanker truck	10	2	7	2
Other	2	0	15	5
Total	485	100	330	100

Table A3: Refugee households' main cooking fuel sources

	West Nile		South West	
	Freq.	%	Freq.	%
Electricity-Solar	3	1	4	1
Charcoal	37	8	79	24
Firewood	436	90	239	72
Grass	1	0	2	1
Other	8	2	6	2
Total	485	100	330	100

Table A4: OLS regression results for users of public taps and boreholes

	(1)	(2)	(3)	(4)	(5)	(6)
Total land size (acre)	0.374***		0.680***		0.153	
	(0.096)		(0.246)		(0.097)	
Land size from the GoU (acre)		0.309**		0.823**		0.097
		(0.123)		(0.391)		(0.090)
Time from and to WS (hour)	-0.431	-0.400	-1.322*	-1.355*	0.098	0.112
	(0.398)	(0.403)	(0.728)	(0.739)	(0.413)	(0.416)
Wait time at WS (hour)	-0.011	-0.043	0.027	0.003	-0.159	-0.183
	(0.201)	(0.199)	(0.389)	(0.391)	(0.159)	(0.159)
Use firewood (dummy)	-0.265	-0.267	-0.297	-0.368	-0.279	-0.264
	(0.179)	(0.179)	(0.285)	(0.278)	(0.191)	(0.190)
Years since arrived, HH head	-0.004	0.001	0.003	0.015	-0.013	-0.012
	(0.016)	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)
Sample	All	All	West Nile	West Nile	South West	South West
R squared	0.18	0.17	0.18	0.18	0.25	0.25
N	719	719	448	448	271	271

Notes: The dependent variable is the peaceful co-existence index. Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: OLS regression results for public borehole users

	(1)	(2)	(3)	(4)	(5)	(6)
Total land size (acre)	0.276**		0.739**		0.071	
	(0.117)		(0.280)		(0.100)	
Land size from the GoU (acre)		0.112		1.179*		-0.046
		(0.137)		(0.620)		(0.107)
Time from and to WS (hour)	-0.228	-0.219	-1.158	-1.264	0.040	0.031
	(0.425)	(0.430)	(0.825)	(0.812)	(0.465)	(0.469)
Wait time at WS (hour)	-0.211	-0.236	-0.083	-0.122	-0.408**	-0.421**
	(0.213)	(0.213)	(0.418)	(0.419)	(0.182)	(0.183)
Use firewood (dummy)	-0.321*	-0.334*	-0.535**	-0.684**	-0.162	-0.159
	(0.187)	(0.186)	(0.243)	(0.255)	(0.226)	(0.224)
Years since arrived, HH head	-0.005	-0.002	0.007	0.021	-0.024	-0.022
	(0.019)	(0.020)	(0.018)	(0.017)	(0.019)	(0.019)
Sample	All	All	West Nile	West Nile	South West	South West
R squared	0.24	0.23	0.27	0.26	0.33	0.33
N	422	422	215	215	207	207

Notes: The dependent variable is the peaceful co-existence index. Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A6: Robustness to using government allocated plot size

	(1)	(2)	(3)	(4)	(5)	(6)
Land size from the GoU (acre)	0.315***	0.319***	0.862**	0.739*	0.140	0.132
	(0.109)	(0.118)	(0.397)	(0.410)	(0.128)	(0.155)
Time from and to WS (hour)	-0.199	0.173	-1.247*	-0.831	0.233	0.561
	(0.355)	(0.414)	(0.733)	(0.787)	(0.337)	(0.372)
Wait time at WS (hour)	0.036	0.000	0.079	0.031	-0.108	-0.135
	(0.165)	(0.177)	(0.297)	(0.273)	(0.132)	(0.166)
Use firewood (dummy)	-0.242		-0.261		-0.306	
	(0.175)		(0.275)		(0.189)	
Distance to FWCP (km)		-0.192***		-0.233***		0.021
		(0.047)		(0.051)		(0.062)
Years since arrived, HH head	-0.000	-0.003	0.010	-0.001	-0.008	-0.000
	(0.014)	(0.016)	(0.015)	(0.017)	(0.016)	(0.019)
Sample	All	All	West Nile	West Nile	South West	South West
R squared	0.17	0.21	0.18	0.23	0.25	0.29
N	794	663	475	429	319	234

Notes: Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A7: Robustness to using the first principal component score as an outcome variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total land size (acre)	0.435**	0.364*			-0.016	-0.012		
	(0.193)	(0.215)			(0.031)	(0.032)		
Land size from the GoU (acre)			0.797*	0.696			0.113	0.084
			(0.453)	(0.471)			(0.124)	(0.145)
Time from and to WS (hour)	-1.087*	-0.682	-1.127*	-0.731	0.350	0.660*	0.385	0.686
	(0.625)	(0.682)	(0.637)	(0.699)	(0.344)	(0.383)	(0.373)	(0.409)
Wait time at WS (hour)	0.011	-0.008	0.010	-0.009	-0.127	-0.126	-0.102	-0.109
	(0.259)	(0.243)	(0.260)	(0.246)	(0.154)	(0.167)	(0.147)	(0.161)
Use firewood (dummy)	-0.182		-0.235		-0.254		-0.268	
	(0.223)		(0.223)		(0.162)		(0.162)	
Distance to FWCP (km)		-0.196***		-0.196***		0.124**		0.124**
		(0.050)		(0.049)		(0.052)		(0.051)
Years since arrived, HH head	0.004	-0.001	0.009	-0.001	-0.020	-0.011	-0.021	-0.011
	(0.013)	(0.014)	(0.012)	(0.014)	(0.017)	(0.019)	(0.017)	(0.020)
Sample	West Nile	West Nile	West Nile	West Nile	South West	South West	South West	South West
R squared	0.24	0.27	0.24	0.27	0.34	0.39	0.34	0.39
N	475	429	475	429	322	237	322	237

Notes: Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A8: OLS regressions on the relationship between access to natural resources and refugees' perceptions of their interactions with the Ugandan community

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total land size (acre)	0.194**	0.159**			0.110*	0.053		
	(0.075)	(0.069)			(0.059)	(0.052)		
Land size from the GoU (acre)			0.250*	0.177			0.070	0.034
			(0.139)	(0.132)			(0.062)	(0.079)
Time from and to WS (hour)	-0.265	-0.053	-0.263	-0.047	0.192	0.364	0.194	0.356
	(0.345)	(0.343)	(0.342)	(0.341)	(0.287)	(0.303)	(0.289)	(0.303)
Wait time at WS (hour)	0.001	0.020	0.002	0.021	-0.168*	-0.190	-0.194*	-0.215
	(0.132)	(0.127)	(0.134)	(0.128)	(0.097)	(0.131)	(0.103)	(0.137)
Use firewood (dummy)	0.066		0.047		-0.081		-0.082	
	(0.188)		(0.186)		(0.140)		(0.137)	
Distance to FWCP (km)		-0.106***		-0.108***		0.099*		0.099*
		(0.027)		(0.026)		(0.054)		(0.056)
Years since arrived, HH head	0.010	0.010	0.012**	0.010	-0.026	-0.021	-0.023	-0.019
	(0.006)	(0.007)	(0.006)	(0.007)	(0.026)	(0.031)	(0.025)	(0.031)
Sample	West Nile	West Nile	West Nile	West Nile	South West	South West	South West	South West
Mean DV	2.62	2.62	2.62	2.62	2.45	2.40	2.44	2.38
N	475	429	475	429	319	234	322	237

Notes: The outcome variable is an ordered categorical variable that takes 0 for "Hostile" or "No interaction", 1 for "Non-receptive", 2 for "Neutral/Indifferent", and 3 for "Receptive" in response to the question "How would you describe your interaction with the Ugandan community where you live?" Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A9: OLS regressions on the relationship between access to natural resources and refugees' sense of feeling unsafe while interacting with the host community

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total land size (acre)	0.092**	0.093*			0.034	0.030		
	(0.044)	(0.051)			(0.025)	(0.026)		
Land size from the GoU (acre)			0.093	0.092			0.021	0.035
			(0.086)	(0.092)			(0.044)	(0.041)
Time from and to WS (hour)	-0.252	-0.241	-0.247	-0.235	-0.098	-0.062	-0.099	-0.065
	(0.250)	(0.263)	(0.248)	(0.262)	(0.121)	(0.108)	(0.121)	(0.107)
Wait time at WS (hour)	-0.065	-0.093	-0.064	-0.092	-0.005	-0.008	-0.010	-0.010
	(0.107)	(0.109)	(0.107)	(0.109)	(0.039)	(0.045)	(0.039)	(0.044)
Use firewood (dummy)	-0.046		-0.055		-0.040		-0.036	
	(0.096)		(0.096)		(0.056)		(0.057)	
Distance to FWCP (km)		-0.007		-0.008		-0.023		-0.022
		(0.019)		(0.019)		(0.020)		(0.019)
Years since arrived, HH head	0.001	0.000	0.002	0.000	0.006	0.007	0.006	0.007
	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
Sample	West Nile	West Nile	West Nile	West Nile	South West	South West	South West	South West
Mean DV	1.71	1.71	1.71	1.71	1.82	1.82	1.82	1.82
N	475	429	475	429	319	234	322	237

Notes: The outcome variable is an ordered categorical variable that takes 0 for "At all times", 1 for "Sometimes", and 2 for "Never" in response to the question "During the last 12 months, did you ever feel unsafe interacting with Ugandan community?" Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A10: OLS regressions on the relationship between access to natural resources and violence involving refugees and Ugandan perpetrators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total land size (acre)	0.036	0.043*			0.022	0.029		
	(0.024)	(0.025)			(0.019)	(0.023)		
Land size from the GoU (acre)			0.045	0.054			0.023	0.022
			(0.030)	(0.035)			(0.027)	(0.030)
Time from and to WS (hour)	0.059	0.032	0.060	0.032	0.101	0.153	0.098	0.151
	(0.090)	(0.100)	(0.088)	(0.098)	(0.064)	(0.097)	(0.063)	(0.095)
Wait time at WS (hour)	-0.015	-0.013	-0.015	-0.013	-0.018	-0.028	-0.020	-0.032
	(0.042)	(0.044)	(0.042)	(0.044)	(0.037)	(0.048)	(0.039)	(0.051)
Use firewood (dummy)	0.001		-0.002		-0.138***		-0.136***	
	(0.056)		(0.055)		(0.043)		(0.043)	
Distance to FWCP (km)		0.007		0.006		-0.027		-0.026
		(0.006)		(0.006)		(0.023)		(0.023)
Years since arrived, HH head	-0.007**	-0.008**	-0.007***	-0.008***	-0.004	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.007)	(0.009)	(0.007)	(0.009)
Sample	West Nile	West Nile	West Nile	West Nile	South West	South West	South West	South West
Mean DV	0.93	0.93	0.93	0.93	0.90	0.88	0.90	0.89
N	475	429	475	429	319	234	322	237

Notes: The dependent variable is a dummy variable that is equal to 1 if the response to the question "In the last 12 months, have you or your family ever been insulted, or threatened verbally or assaulted/beaten by Ugandans?" is "No" and 0 otherwise. Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A11: OLS regressions on the relationship between access to natural resources and whether children in refugee households have any Ugandan friends (Yes=1, No=0)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total land size (acre)	0.117*	0.097			0.049	0.072		
	(0.060)	(0.069)			(0.036)	(0.044)		
Land size from the GoU (acre)			0.235*	0.226			0.050	0.044
			(0.137)	(0.150)			(0.051)	(0.059)
Time from and to WS (hour)	-0.277	-0.156	-0.292	-0.177	0.103	0.191	0.129	0.220
	(0.206)	(0.230)	(0.212)	(0.237)	(0.102)	(0.119)	(0.124)	(0.140)
Wait time at WS (hour)	-0.019	-0.028	-0.020	-0.029	-0.009	0.003	0.000	0.009
	(0.071)	(0.067)	(0.071)	(0.068)	(0.053)	(0.058)	(0.050)	(0.054)
Use firewood (dummy)	-0.077		-0.092		-0.080		-0.080	
	(0.072)		(0.072)		(0.056)		(0.056)	
Distance to FWCP (km)		-0.053***		-0.052***		0.028		0.034
		(0.016)		(0.016)		(0.021)		(0.023)
Years since arrived, HH head	-0.001	-0.002	0.001	-0.002	-0.002	0.001	-0.003	-0.001
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
Sample	West Nile	West Nile	West Nile	West Nile	South West	South West	South West	South West
Mean DV	0.48	0.47	0.48	0.47	0.47	0.48	0.47	0.48
N	475	429	475	429	319	234	322	237

Notes: Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A12: OLS regressions on the relationship between access to natural resources and whether children in refugee households share recreational spaces (play areas, etc.) with Ugandans (Yes=1, No=0)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total land size (acre)	0.152*	0.128			0.044	0.061		
	(0.077)	(0.087)			(0.033)	(0.040)		
Land size from the GoU (acre)			0.288	0.241			0.014	0.008
			(0.192)	(0.194)			(0.040)	(0.042)
Time from and to WS (hour)	-0.456*	-0.332	-0.471*	-0.348	0.084	0.169	0.106	0.194
	(0.234)	(0.255)	(0.238)	(0.261)	(0.108)	(0.127)	(0.126)	(0.143)
Wait time at WS (hour)	0.029	0.019	0.028	0.019	-0.030	-0.035	-0.025	-0.032
	(0.101)	(0.094)	(0.101)	(0.095)	(0.050)	(0.051)	(0.048)	(0.049)
Use firewood (dummy)	-0.074		-0.093		-0.097*		-0.094*	
	(0.075)		(0.075)		(0.056)		(0.055)	
Distance to FWCP (km)		-0.065***		-0.065***		0.028		0.033*
		(0.019)		(0.019)		(0.017)		(0.018)
Years since arrived, HH head	0.001	-0.001	0.003	-0.001	-0.004	-0.001	-0.006	-0.003
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
Sample	West Nile	West Nile	West Nile	West Nile	South West	South West	South West	South West
Mean DV	0.54	0.52	0.54	0.52	0.50	0.50	0.49	0.49
N	475	429	475	429	319	234	322	237

Notes: Robust standard errors clustered by settlement are in parentheses. Household characteristics (i.e., household head's gender, age, and literacy and educational levels, family size, and number of children aged 0-17) and district fixed effects are included but not reported. WS stands for drinking water sources. FWCP stands for firewood collection point. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.