Economic impact of refugees

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In 2015, the United Nations High Commission for Refugees accommodated over 15 million refugees, mostly in refugee camps in developing countries. The World Food Program provided these refugees with food aid, in cash or in kind. Refugees' impacts on host countries are controversial and little understood. This unique study analyzes the economic impacts of refugees on host-country economies within a 10-km radius of three Congolese refugee camps in Rwanda. Simulations using Monte Carlo methods reveal that cash aid to refugees creates significant positive income spillovers to host-country businesses and households. An additional adult refugee receiving cash aid increases annual real income in the local economy by $205 to $253, significantly more than the $120–$126 in aid each refugee receives. Trade between the local economy and the rest of Rwanda increases by $49 to $55. The impacts are lower for in-kind food aid, a finding relevant to development aid generally.

refugee | economic impact | Rwanda | general equilibrium | aid

Recent events shed light on the growing number of refugees displaced by conflicts around the world. The influx of Syrian refugees to Europe is currently in the spotlight, but every year the United Nations High Commission on Refugees (UNHCR) places thousands of people displaced by civil conflict or natural disasters, which may be related to one another (1, 2), in refugee camps across the globe (3), and the UN World Food Program (WFP) provides refugees with food aid, in kind or cash. The number of refugees under UN mandate reached an estimated 15.1 million in 2015, the highest level in 20 y (4). Most of these refugees are in camps located in less-developed countries neighboring the refugees' country of origin.

Controversy surrounds the impacts of refugees on host economies (5–7). The popular perception might be that camps house people who are helpless and dependent on food aid, but some recent studies reveal that refugee populations are actively engaged with host-country economies in an effort to improve their circumstances (8). There is little reliable empirical evidence of how refugees affect the economies of host countries. Some studies suggest that refugees have no significant impact (9). Others suggest heterogeneous impacts, with negative shocks more likely to affect poor host-country households (10–12). Alix-Garcia and Saah (13) consider the impact of refugee camps on agricultural prices in Tanzania and find positive effects on prices of some agricultural products and a decrease in the price of food distributed in kind at refugee camps. Most studies suggest that despite undergoing forced migration and often living in destitute conditions, refugees have productive capacities and assets, and they actively interact with host-country economies (8, 14).

Rigorous evidence of the economic impacts of refugee camps on host countries is scant for three reasons: a lack of before-and-after data to estimate impacts of new and often unexpected refugee influxes, the complex effects refugees can have on host-country economies, and the infeasibility of an experimental approach to identify refugee impacts. A branch of the economics literature indirectly related to refugees addresses the impacts of migration on host communities. It is not clear how findings from migration-impact studies are applicable to understanding impacts of refugees; however, they may offer some insights into possible economic impacts of refugees in some host-country contexts. Studies that use rigorous impact identification strategies find that immigration has little to no effect on local unemployment, and it may result in a slight decrease in unemployment due to the income multipliers it creates (15–17). Some evidence suggests that a large influx of immigrants increases unemployment among the less-skilled workforce and also decreases wages among certain populations (18, 19). An obvious difference between migrants and refugees is that refugees' displacement is involuntary and often temporary, whereas most migrants choose their destination and duration in the host economy, unless contracted specifically for temporary work. A second difference is that, in most migration studies, host countries are high-income nations, whereas the majority of refugees are hosted by less-developed countries (12).

The WFP teamed up with researchers from the University of California, Davis to examine impacts of three Congolese refugee camps in Rwanda on the surrounding host-country economy using an in silico approach informed by microsurvey data gathered inside and outside of camps. Econometric analysis of new microsurvey data was used to construct models of refugee and host-country households and production activities, detailing the expenditure patterns and incomes of each, as well as the locations at which all economic transactions took place. These models were then integrated into localized general-equilibrium (GE) models of the economies inside and outside of the camps, out to a 10-km radius. Product and factor markets, in which prices transmit impacts, link refugees with host-country businesses and households. The GE models were used to simulate the local economy-wide impacts of refugees at three camps: two (Gihembe and Nyabiheke) at which refugees received cash aid

Significance

The number of refugees displaced by civil conflict or natural disasters is on the rise. Economic impacts of refugees on host countries are controversial and little understood, because data have not been available and the question of refugee impacts does not lend itself to conventional impact evaluation methods. We use a unique Monte Carlo simulation approach with microdata from refugee and host-country surveys to obtain the first estimates of refugee camps' impacts on surrounding host-country economies and to compare impacts of cash versus in-kind refugee aid. An additional refugee increases total real income within a 10-km radius around two cash camps by significantly more than the aid the refugee receives. Impacts around a camp receiving in-kind (food) aid are smaller.

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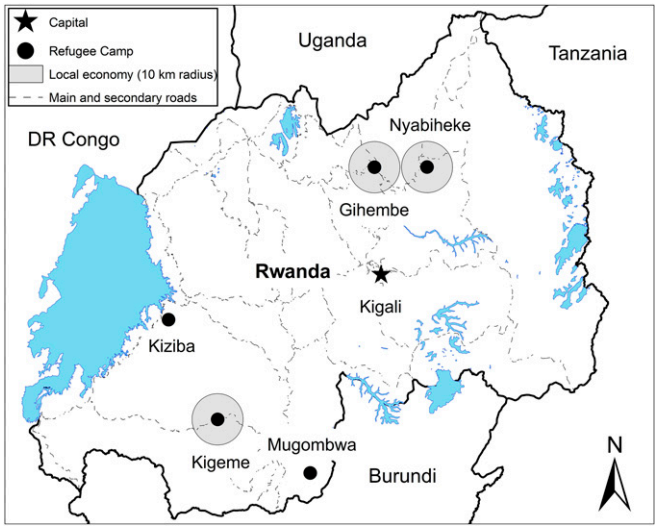

Fig. 1. Three study sites, Gihembe, Nyabiheke, and Kigeme, are shown as solid dots (the camps) surrounded by 10-km radius circles corresponding to local economies.

via cell phone accounts, and one (Kigeme) at which they received in-kind food aid (Fig. 1). A Monte Carlo method was used to construct 95% confidence intervals (CIs) around the simulation results.

Results

Spillovers into the Host Economy. The simulations found that an additional refugee increases total real (inflation-adjusted) income within a 10-km radius around the two cash camps by US$205 (CI: 166, 260) and $253 (CI: 194, 320) annually (Fig. 2 and *SI Appendix*, Table S1). These are equivalent to 63% and 96% of the average host-country per-capita income around the camps, and they exceed the value of per-refugee WFP assistance ($126 and $120, respectively). Most of the difference ($70 and $126) consists of income spillovers resulting from market interactions between refugees and host-country businesses and households. Other transfers to refugees, including private remittances, account for the rest ($10 and $7).

Economic spillovers result as refugee households and businesses inside the camps purchase goods and services from host-country businesses outside the camps. All agricultural, livestock, other production activities, and all retail businesses outside the camps are owned by host-country households. Our surveys found that refugee households account for 5.5% of total income within a 10-km radius of the three camps; 17.3% of surveyed businesses outside the camps report that their main customers are refugees from the camps.

The increase in refugee demand raises host-country incomes and spending which, in turn, generate additional rounds of spending impacts in the local economy. The familiar identity of economics, where total expenditures, including savings, equal total income for all households and activities, ensures that changes in expenditures match changes in incomes for all agents in the local economy. Host-country households do not receive any WFP cash transfers, but their real income increases by an estimated $41 per refugee at Gihembe camp and $69 per refugee at Nyabiheke camp (the rest of the local spillovers, $28 and $56, accrue to refugee households). Some refugees supply labor to host-country farms and businesses, creating additional impacts. Approximately 6% of hired workers (7% of hired farm workers) outside the camps are refugees. Refugees also stimulate trade between the local economy and the rest of the country, by an amount equal to $55 and $49 per refugee per year.

In-Kind Aid Attenuates the Impacts. The simulated impacts are smaller around the in-kind camp. There, refugees were given allocations of four food items (maize, beans, cooking oil, and salt) designed to meet their minimum calorie requirements. Nearly all refugee households (89%) sold part or all of their allotments in host markets outside the camp. The amounts sold differed by food item: On average, one-quarter of all maize allotments and smaller percentages of beans (2.5%) and cooking oil (3.9%) were sold, whereas salt was not sold at all. Overall, one-fifth of the value of food aid distributed gets sold. On average, refugees received significantly less than the local retail price for the maize (57%; $P < 0.00$) and cooking oil (81%; $P < 0.00$) they sold. (The share for beans, for which fewer sales were recorded, was 83%; $P < 0.00$.) The transaction cost of converting food to cash reduced the value of the food packet as well as refugees' demand and the spillovers created. Refugee food sales add to the local food supply, putting slight downward pressure on prices. This adversely affects local producers, who compete with cheap food assistance. The multiplier effect to the host-community economy is therefore largely offset by the downward push on prices. The simulated real-income impact of an additional refugee at the in-kind camp is $145 (CI: 133, 164), or 66% of host-country per-capita income around the camp. The income generated by the local multiplier is just $25 annually (Fig. 2), and it remains within the refugee camp rather than entering the host community. (There is a small negative spillover to host-country households around the in-kind camp.) The impact on trade with the rest of Rwanda ($35) is also smaller for the in-kind camp.

The juxtaposition of impacts in and around cash versus in-kind camps suggests that a shift from in-kind to cash aid can yield benefits for host countries as well as for refugees. We simulated the impacts of a $1 increase in the value of WFP transfers (cash or in-kind) in and around the three camps (Table 1). Each additional dollar in aid to refugees in the two cash camps increases income in the local economy by $1.51 and $1.95. Both of these income multipliers are significantly greater than 1. The difference between the multiplier and the dollar transferred ($0.51 for Gihembe, $0.95 for Nyabiheke) represents the real-income spillover effect of a dollar of additional cash aid in the local economy. Trade with the rest of Rwanda increases by $0.40 to $0.43. In-kind assistance creates impacts that are more complex, and on balance they appear to be less beneficial to the host country. The local income multiplier for the in-kind camp is $1.19, and the impact on trade with the rest of Rwanda is $0.29.

Limited Impacts on Prices. Whereas increased demand may increase prices if supply does not respond, increased demand due to an additional refugee exerts limited upward pressure on prices around the cash camps in our simulations. We find that an additional refugee leads to an increase in the consumer price index around the cash camps of 0.00034% and 0.00026%, respectively. However, small changes in prices have larger effects when calculating real-income multipliers, because prices affect all households in the local economy. Development projects that increase the supply response of local farms and businesses could increase the real impact of cash aid by minimizing these price effects.

Discussion

Our simulations do not include the impacts of constructing, maintaining, or expanding refugee camps. UN agencies and other donors invest in building the camp, providing services inside the camp, paying salaries to UN and other aid personnel, purchasing supplies to run the camp, and so on. This spending undoubtedly adds to the impacts of hosting refugees. For example,

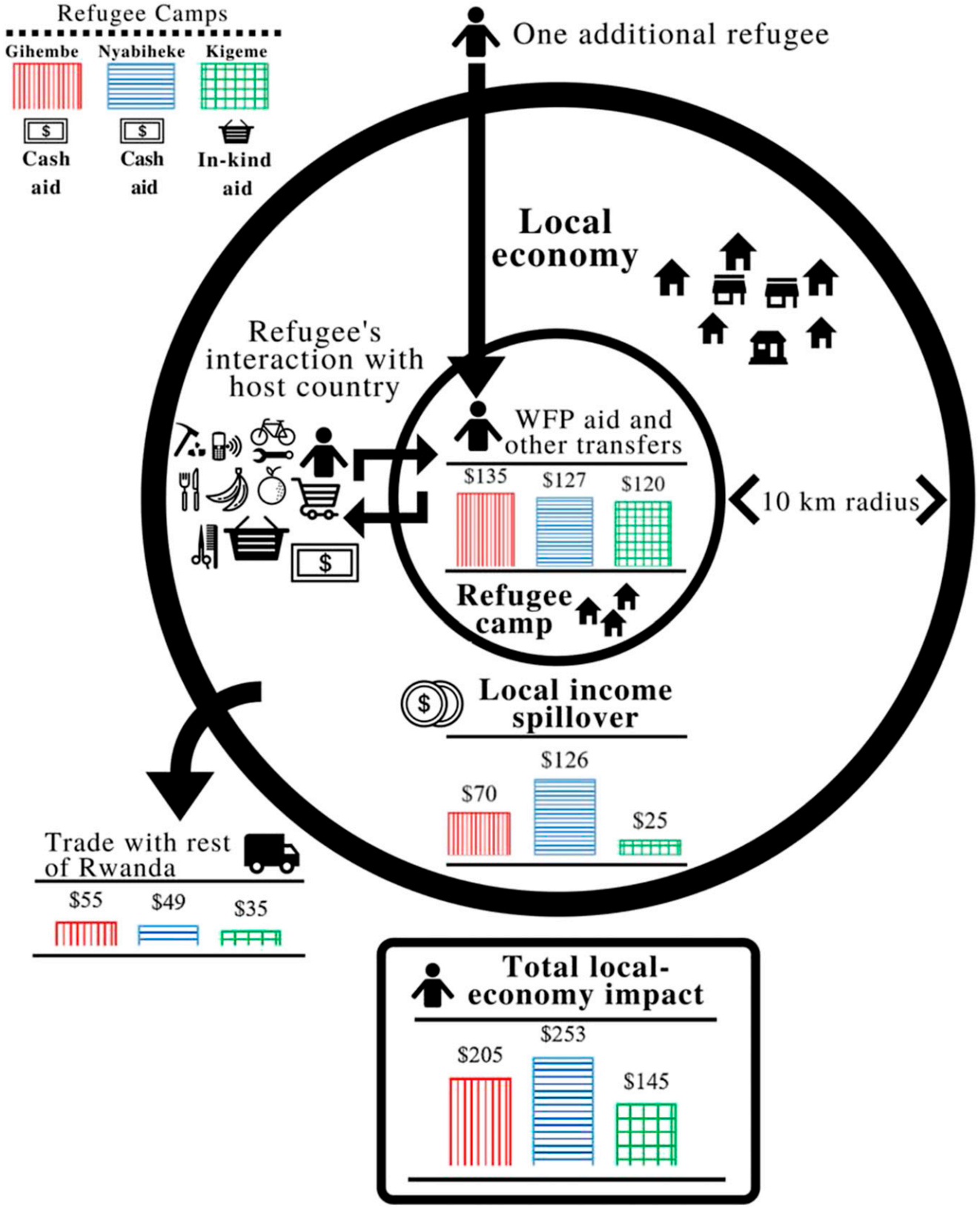

Fig. 2. Impacts of an additional refugee on income within a 10-km radius of each camp and trade with the rest of Rwanda. The bars within the refugee camp represent the WFP aid and other transfers, including the income refugees bring with them. The bars in the local economy circle are real-income spillovers within a 10-km radius of each camp, created by refugees' interactions with local markets. The total local-economy impact is the sum of all real-income increases inside and outside the camps, including spillovers to host-country households and their feedback on refugee households, for example, through employment and the prices of goods and services. These impacts, shown in the box at the bottom of the figure (*Center*), significantly exceed the amount given in aid (see CIs in *SI Appendix*, Table S1). The bars outside the circle (*Left*) show the stimulus to trade with the rest of Rwanda.

Table 1. Multiplier effects of a $1 increase in aid (cash or in-kind)

Aid multipliers (in $ per $ of aid)	A Gihembe (cash)	B Nyabiheke (cash)	C Kigeme (in-kind)
Real income (inflation-adjusted)	1.51	1.95	1.19
Refugees	0.91	1.01	0.91
Locals	0.59	0.95	0.28
Production effects			
Crop	0.70	1.07	0.34
Livestock	0.03	0.03	0.02
Retail	0.63	0.68	0.42
Other	0.44	0.58	0.36
Trade with rest of Rwanda	0.43	0.40	0.29

The 95% confidence bounds around total real-income multipliers are Gihembe (1.22, 1.87), Nyabiheke (1.52, 2.45), and Kigeme (1.10, 1.30). Results were obtained by simulating a $1 increase in WFP transfers. In the in-kind camp, the transfer is the market value of food aid, and the partial reselling of food aid (at prices discounted 20%) was simulated as an increased local supply of agricultural goods.

camp workers spend income outside the camp and thus increase the demand for goods and services supplied by host-country farms and businesses. Because our analysis does not include these expenditures, it is likely to give a lower-bound estimate of refugee impacts on the host-country economy.

Simulations are useful tools to understand how impacts unfold in complex systems. The reliability of impact simulations turns on how well the model represents the behavior of the system being simulated. Econometric estimation of model parameters using microdata lends confidence that the model captures the economic behavior of local actors. The Monte Carlo method discussed in *Materials and Methods* addresses uncertainties with regard to model parameters. Some parameters and system constraints (market closure, labor supply elasticities, and liquidity and capital constraints) are less certain and do not lend themselves to econometric estimation with the available data in Rwanda (as in most countries). Sensitivity analysis can be used to test the robustness of simulation findings to modeling assumptions. The results (*SI Appendix*, Table S10) reveal that involvement in local labor markets allows refugees to capture more spillovers, but it does not change the overall size of the spillovers as long as the labor supply around the camps remains elastic. Relaxing capital constraints results in higher multipliers, particularly in the in-kind camp. Only in the most constrained scenario, in which the local economy has almost no ability to increase supply and capture spillovers, do we see significantly reduced overall spillovers and negative impacts of refugees on host-country incomes. Estimates of labor supply elasticities are not available for Rwanda, but simulated impacts vary little over the range of estimates available from other countries. The elasticity in our base model ($\varepsilon = 100$) gives a lower-bound estimate of refugee impacts (*SI Appendix*, Fig. S1).

The resettlement of refugees around the world takes different forms, ranging from isolated camps to nearly complete integration with host-country communities. We do not pretend to reach conclusions that are universally applicable to these diverse resettlement situations. Our findings would seem to apply most directly to the more than 50% of UN-supported refugees who live in camps, mainly in developing countries. Others live in host-country towns and cities. These "urban refugees" are likely to be more integrated with the host-country economy and society but more difficult for UNHCR and other support services to reach (20).

The economic impacts of refugees depend on the rules governing interactions between refugees and the host country, the structure of host economies, and the characteristics of refugees. Under Rwanda's rules, refugees are free to interact with the host-country economy. Congolese refugees and Rwandans speak the same language (Kinyarwanda); studies show that language and other human capital are important to the economic success of refugee immigrants (21). The heads of refugee households in the three camps averaged 2.2–2.7 y of schooling, and most who worked were used in low-skilled agricultural jobs on Rwandan household farms. Low education potentially limits refugees' access to nonfarm jobs. However, current school enrollment rates for refugee children approach 100% in all three camps, thanks to UNHCR-run schools, and young adults in older camps are likely to have had access to education at an early age. Refugees 18–35 in Gihembe (the oldest of the camps) average 4.5 y of schooling.

Our simulations reveal that refugees, given the opportunity to interact with the economy around them, can create positive income spillovers for host-country households. Congolese refugees in Rwanda appear to generate considerably more income than the cash aid they receive. However, spillovers are smaller when refugee aid is in the form of food instead of cash, a finding potentially relevant for aid programs in general as well as refugee aid in particular. Access to supplies of food and other commodities, along with the cash to interact with the local economy, are critical to refugee welfare and refugees' potential to create benefits for the host country.

Materials and Methods

Our simulation model is based on a local economy-wide impact evaluation—LEWIE (22, 23) approach, designed to understand the general equilibrium impact of projects and policy shocks in local economies. The three camps are located in areas in which farms and businesses invariably are connected with households. We first construct separate microeconomic models of refugee and host-country household producers in and around each camp, respectively, following a rich literature on agricultural household modeling (24, 25). The sets, accounts, variables, parameters, equation definitions, and equations in the model are summarized in *SI Appendix*, Tables S2–S7. The model equations include production and input demand functions; expenditure functions for each household group; and local market-clearing conditions, which determine prices for nontradables or, for tradables, net trade with the rest of the country at exogenous prices.

Parameters of production and expenditure functions were estimated econometrically with microdata from surveys of households and businesses inside and around each camp, out to a 10-km radius. A 10-km radius captures the main markets in which refugees transact. Given poor transportation infrastructure, refugees rarely engage directly with markets outside this radius. Random samples of 155–224 refugee households per camp were drawn from lists provided by the WFP. Samples of 162–243 host-country households in 5–8 sectors surrounding each camp were randomly drawn from household lists provided by district authorities; 14–20% of host-country households and 8–17% of refugee households had a nonfarm business covered by the household surveys. This produced samples of 86–148 host-household and 36–52 refugee-household businesses. The household business samples were augmented by randomly sampling 63–100 businesses at the main commercial sites, including periodic markets, within the 10-km radius around each camp, and 15–23 refugee businesses inside the camps. There are no lists of businesses around the camps, so a systematic (Nth name selection) sampling method was used for the additional host business surveys.

Estimation assumed Cobb–Douglas production functions and Stone–Geary demands without subsistence minima. We estimated activity-specific production functions for crops, livestock, retail, other services, and other production activities, and household-specific expenditure functions for these as well as goods purchased outside the 10-km radius around the camp, transfers to and from other households, and formal and informal savings. From these estimates we obtained the model parameters as well as their SEs (*SI Appendix*, Tables S8 and S9). The lack of land inside camps precluded refugees from participating in crop and livestock production except as wage workers on Rwandan farms.

The refugee and host-country household models were integrated into a GE model of the economy within a 10-km radius of each camp (see *SI Appendix* and Datasets S1–S4). Market clearing conditions link refugee and host-country

households within each local economy and determine prices for nontradable goods, services, and factors or, for tradables, net trade with the rest of the country outside the local economy at exogenous prices. Economic linkages between refugees and host-country households include refugees' demand for goods and services sold by host-country businesses and households, refugee business demand for inputs from host-country businesses and households, interhousehold transfers, and refugee workers' supply of labor to host-country as well as refugee businesses. These linkages shape the impacts of refugee aid on host-country economies.

The base solution to the GE model replicates the initial conditions in the economy in and around each camp. It is the basis for simulating impacts of refugees on the local economy. To obtain confidence bounds around simulated impacts, we used a Monte Carlo method that makes repeated draws from all of the parameter distributions and, for each draw, recalibrates the base model (6). This generates multiple (1,000) base models on which to simulate the impact of an additional refugee. The 95% CIs are created from the middle 95% of the distribution of simulated impacts for each outcome of interest. The base models, including the Monte Carlo module, are available in Datasets S1–S4.

We used these models to evaluate the impacts of refugee assistance on both refugee and host-country households in and around each of the three camps, and to compare impacts between cash and in-kind camps. The LEWIE simulations capture the full economic impact of an additional refugee or an additional dollar of refugee aid on the host-country economy, as represented by the simulation model. Sensitivity analysis was used to test the robustness of simulation findings to market closure, labor supply elasticity, and liquidity and capital constraints (*SI Appendix*, Table S10 and Fig. S1).

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