Causes of Variation in Conflict-Induced Displacement: An Agent-Based Simulation Model

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Background

One often-overlooked aspect of civil conflict is displacement, the forced removal of people from their homes. As of 2012, there were 28.8 million internally displaced persons (IDPs) and 10.4 million refugees globally (UNHCR). An entire discipline of "refugee studies" focuses on various issues surrounding these populations, although many are still not well understood. As a consequence, national governments, humanitarian agencies, and other actors have much room for improvement in terms of their capacity to handle conflict-induced displacement situations.

Definitions

• Internally displaced persons (IDP) – "have been forced or obliged to flee or leave their homes… and have not crossed an internationally recognized state border." (UN)

• Refugee – "Any person who, owing to a well-founded fear of being persecuted… is outside the country of his nationality…" (UN)

In particular, three stylized facts motivate this project as a way to better understand the process of displacement:

• Given sufficient risk, people will flee their homes preemptively [1];

• IDPs prefer to live with host families (friends, relatives, etc.) [2];

• IDPs consider several factors when making a relocation choice: Affordability, Security, Livelihood, Existing Networks, and Cultural Similarities [1]

The preceding facts and definitions prompt the following research question, as well as the operationalizations in the model (see Experimental Design).

Research Question

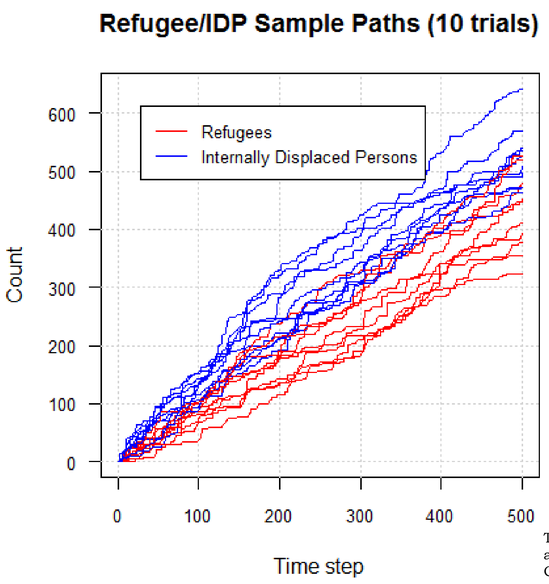
Note: The level of violence is an obvious factor that affects displacement; all else held constant, one would expect that more violence would cause more displacement. Therefore, a more interesting question is, ***Keeping the pattern of violence fixed, what other factors could cause variation in the level and nature of displacement? In particular, what is the effect of different network structures?***

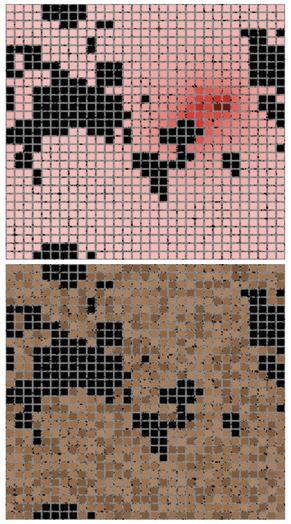
Methods

Agent-Based Modeling

Keeping with the spirit of this class, I used an agent-based modeling (ABM) approach. Generally, ABM is useful for problems in which empirical research is difficult; in this particular case, there is little data on networks in conflict regions, and, even with data, unobserved variables may confound analysis. With ABM, I can focus on variables of interest to test whether a theory is at least feasible in the real world, given how it plays out in an abstract setting (the grid world).

Previous studies have used ABMs to model phenomena within refugee camps (in particular, the spread of disease). However, there are currently no major studies which use ABM to model the process of conflict-induced displacement.





Two views of the model. Top: Risk view. Dark red cells are households with high risk of displacement.; Bottom: Capacity view. Dark brown cells are households that are close to capacity. In both, black cells represent uninhabitable households whose members have been displaced.

Software

I implemented this model (see section below) using the simulation software NetLogo (https://ccl.northwestern.edu/netlogo/), and analyzed the generated data in R, a popular statistical programming language.

Experimental Design

Model Specification

The IDP model has four major components:

• Attack model. Attacks are exogenous and follow a Gaussian random walk on the map. Magnitudes follow a power law distribution.

• Household risk model. Each attack inflicts a 'shock' to nearby households which increases their perception of risk. If a household's risk exceeds a threshold, its members will relocate.

• Household networks. Each household is connected to N other households within distance d. The connections give household members a number of relocation options in the case of displacement.

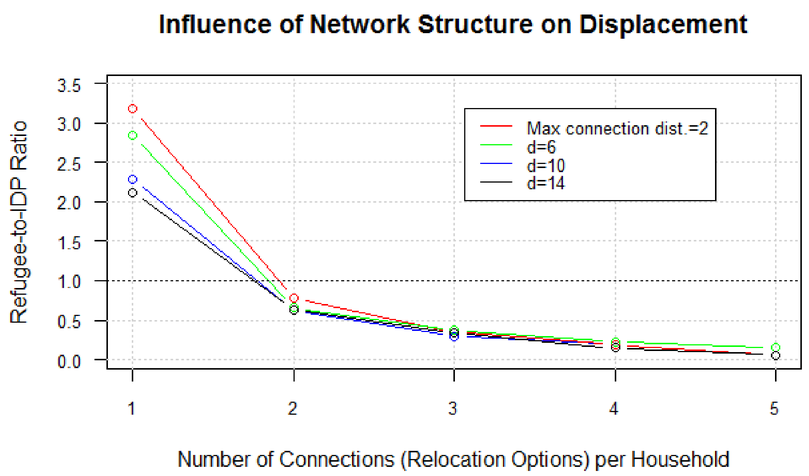
• Preferences over options. Households form preferences over connections based on security (lower risk is better), distance (closer is better), and capacity (no family separation preferred). They will attempt to relocate in order of preference; if there are no connections with capacity, they will become refugees.

Simulation

To generate data, I ran 2500 simulations over a range of parameter values. Different values of N and d controlled the size and locality of the household network, while . For each simulation, I recorded the total numbers of refugees and IDPs after 250 time steps. In particular, the ratio of refugees to IDPs is the dependent variable of interest.

Results

As shown in the figure below, the ratio of refugees to IDPs decreased substantially with the number of network connections per household. Disperse networks (larger d) also help to limit the proportion of refugees; although this is only evident below for $N \leq 2$, plotting the IDP-to-refugee ratio (i.e., the inverse of the current y-axis), shows that it also holds when the number of connections is higher.



Conclusions

I conclude that the topology of the household network (i.e., the density and locality) significantly influences the relative number of refugees and IDPs, and thus may explain variation in displacement, at least in this artificial setting. While these processes are more complex in the real world, it is feasible that networks play a similar role.

Of course, there are many possible improvements and extensions to this model which may address its shortcomings. Specifically, more attention should be given to the other model components (risk and preferences), to test whether the above results are robust to changes there. Also, network formation should be constrained so that the topologies are more 'reasonable' (for example, it is assumed here that links are independent).

Implications

The results suggest that more attention should be given to networks in war/conflict settings. Given that humanitarian agencies are often resource-constrained, efficiently prioritizing operations is crucial to the goal of minimizing casualties and displacement. When the networks of at-risk households are large and disperse, humanitarian interventions may be less efficient at reducing the number of refugees than when networks are small and concentrated. As one example, communities of migrant workers may be less vulnerable in areas under imminent threat, by virtue of having long-distance network connections.

References

[1] Schmeidl, Susanne, Alexander D. Mundt, Nick Miszak (2010). ``Beyond the Blanket: Towards More Effective Protection for Internally Displaced Persons in Southern Afghanistan." Brookings-Bern Project on Internal Displacement: The Liaison Office (TLO), May 2010.

[2] "Action Sheet 13: Shelter." Handbook for the Protection of Internally Displaced Persons, United Nations High Commissioner for Refugees, June 2006.

[3] "Internally Displaced People." United Nations High Commissioner for Refugees.