Review of: "Time evolution and convergence of simple migration models"

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Potential competing interests: No potential competing interests to declare.

This project examines the time evolution of the two main migration models: the gravity model, initially proposed by Zipf (1946), which introduces the physical distance between areas, and the intervening opportunities model, initially proposed by Stouffer (1940) and amended by Simini et al. (2012). This project may be very interesting for projection purposes.

However the first kind of migration model is in my opinion not enough developed. First the origin and destination population are intervening with a different power, α and β, while they are usually equal to 1, like in the Zipf's title. Then the author distinguishes the cases where $\alpha - \beta > 0$ and $\alpha - \beta < 0$, letting aside the usual case where $\alpha - \beta = 0$. He says that the fist case will eventually lead to a homogeneous population distribution, and that the second case will eventually converge towards a population distribution with one area inhabiting all people. A more clear demonstration of this result will be useful, particularly for the case $\alpha = \beta = 1$.

For example I have developed in a paper, published in 1991 unfortunately in French, migration perspectives with such a model where $\alpha = \beta = 1$. In this case

is measured at the beginning of the period of observation and

is measured at the end of this period, as usually. I showed mathematically that in this case populations do not tend towards stability, and that some may even become extinct, or even negative. Although these methods do not result in stable populations, they make it possible to disentangle the interactions that exist between populations of different regions and to show the consequences of this distribution. I also tested continuous time models which leads to a unique solution for a given initial population and hazards of moving, and discussed the measure of these hazard rates. I think that the author may discuss these results.

For the second kind of migration models, their discussion and their dependence on the geographical and geometrical settings are very interesting. However these results are highly depending on the *Modifiable Areal Unit Problem* (Openshaw, 1984), and only simulations can be made to try to solve this problem. Is it possible to avoid this problem for these projections?

References

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Openshaw, S. (1984). *The Modifiable Areal Unit Problem*. Norwich: Geo Books.