Effects of spatial interaction on migration flows

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Human movement, ranging from short-term commuting to long-term migration, is the foundation of various social phenomena. Modeling human mobility is thus an important step toward a wide range of applications. Among a number of mathematical models of human mobility, the most widely used is probably the gravity model [1,2], which describes migration flows between two populations. This model assumes that migration flows depend on the numbers of inhabitants in the origin and destination populations and the distance between them. Therefore, although it is likely that the number of inhabitants in the neighborhood of the origins and destinations could affect the migration decisions of individuals, the previous studies with the gravity model have not revealed the relevance of spatial interaction among populations.

In the present study, we use demographic data from the Population Census in Japan to investigate spatial patterns of population changes. Our analysis shows that the presence of spatial interaction in the sense that the population in a cell surrounded by cells with low (high) population density is more likely to decrease (increase). We also developed computational models based on the gravity model with such spatial interaction. By comparing the patterns of population changes in the empirical and simulated data, we find that considering the numbers of inhabitants not only in the destination cells but also in cells surrounding the destination cells can enhance the accuracy of the model.

References

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