

SCALE AND SPATIAL ANALYTICS (SSA): A SPARC WORKSHOP

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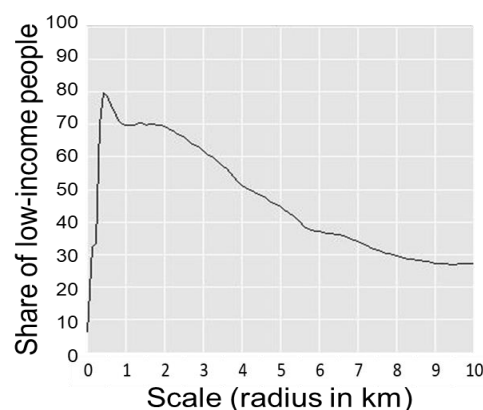
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Within the urban literature, the issue of scale is intrinsically bound up with questions about neighbourhoods, communities, areas and regions. Building on work from and observations from the literature on contextual effects (nee neighbourhood effects) this piece highlights 3 connected vignettes from scalar research that may serve to move the literature forward. Fundamental to this piece is the idea that scale needs to be considered as a plural concept (scales) and that to develop our understanding sufficiently a geographical understanding of the issue must be kept at the forefront. The central contention of this piece is that, in many of the urban literatures the geographical aspect of scale is too often pushed into the background.

Firstly, neighbourhood is often implicitly conceptualised in neighbourhood effects work. Neighbourhoods are drawn from administrative units linked to data collection practices or size constraints determined for the avoidance of disclosure. This may be a pragmatic approach driven by data requirements, but it neglects the underlying structures of the phenomenon (and data) we are dealing with. Moreover, in doing so, the very object that we wish to associate with an individual as something that transforms their life course becomes the least carefully considered aspect of the research design. Of course, the notion of neighbourhood is heavily contested (see for alternative viewpoints Galster, 2001; Talen, 2018) and as such it can be difficult to provide a distinct operationalisation that suffices all perspectives, but we can explore empirically the extent of neighbourhood and recent work using 100x100m grid data from the Netherlands does so. In a comprehensive exercise, Petrovic et al (submitted) envisioned 101 scales to find thresholds above which, analytically, neighbourhoods changed meaning. Using distance profiles, they demonstrated that the hyperlocal, local, meso- and macro-scale neighbourhood meant very different things (see figure 1).

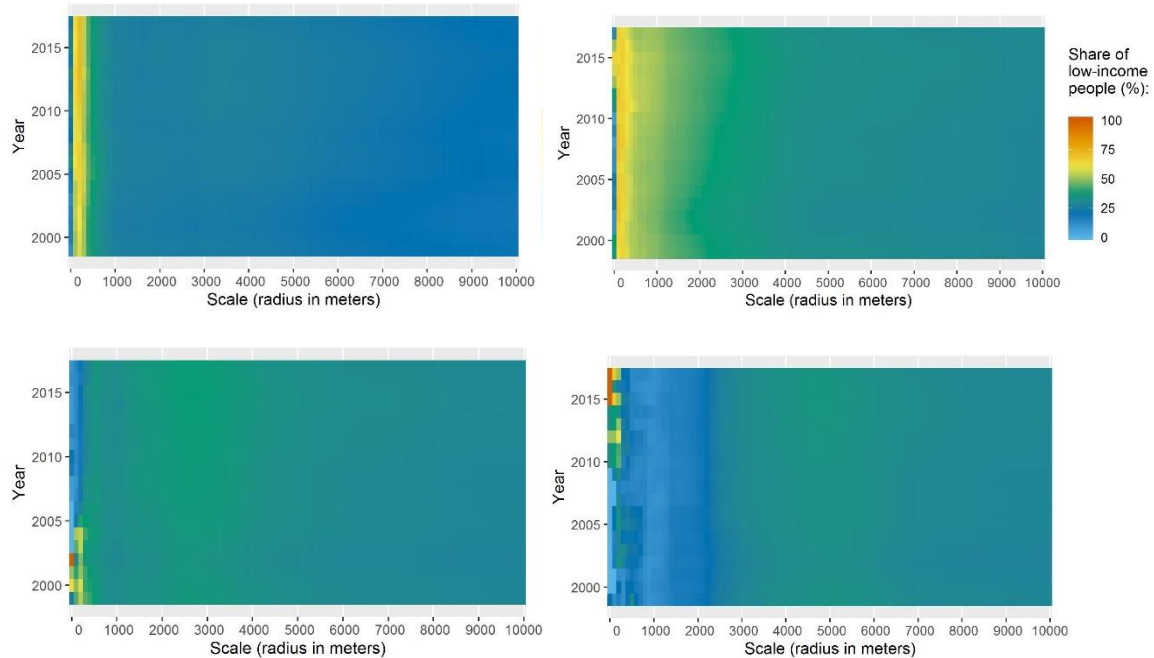
Figure 1: Distance profile of neighbourhood characteristics (from Petrovic et al., forthcoming)



Taking this range of neighbourhoods and using them empirically to understand neighbourhood effects on income produced outcomes from strong negative associations (local), to strong positive (macro) associations and no effect (meso). The changing nature of neighbourhood over scale and time is demonstrated in figure 2 with (a) hyperlocal low shares and higher scale stability with clearly defined concentrations, (b) hyperlocal stability with more gradual scalar change (c) hyperlocal change through gentrifying neighbourhoods and, (d) hyperlocal change through declining

neighbourhoods. Here neighbourhood is no longer conceptualised as a discrete scalar entity but as a continuous space into which we can slice dependent on the scale required.

Figure 2: Neighbourhood Change in Concentration of Low Income Neighbours (101 scales from 100m to 10000m) over 19 years



Secondly, if as we suggest, neighbourhoods change meaning over multiple scales then many of the urban phenomenon we routinely explore – such as segregation – are also likely to have multiscale properties underpinning them. Within the segregation literature a stylised ‘fact’ has gained traction which suggests that segregation always increases as finer scale units are deployed. However, this is not the case and when it has been identified empirically it exists as an artefact of data (through aggregation as a smoothing process) and methods (the descriptive indices which are unable to account for the net contributions of multiscale processes) rather than as a consequence of urban process or population distributions. Recent work exploring segregation in an inferential multilevel setting has demonstrated that the relationship between segregation and scale is more complex, dependent not only on the urban space in question but also the specific groups identified. For instance, in the case of ethnic minority groups in Auckland, the strongest segregation was found at both the micro and macro scales, often more intense at the latter. By contrast, segregation in Chicago Wards in the early 1900s was consistently greater than in the smaller ED neighbourhoods. Moving to the UK, ethnic segregation in London was examined and for some groups the micro neighbourhood was the most segregated space (Bangladeshi’s, Pakistanis, Chinese and Mixed) while for others (White, Black African, Black Caribbean and Indian), it was the Macro neighbourhood where the greatest intensity of segregation was identified. Thus, the nature of the segregation is both scale and group dependent, highlighting the importance of using tools that can decompose the impact of scale in each case.

Finally, combining the exploratory scalar approach – highlighted in the Dutch data – with the scalar thinking within the multilevel model setting and the modelling of segregation we can explicitly explore the appropriateness of scale and neighbourhood. Manley et al (2006) highlighted the incongruence between neighbourhood scale (as measured by the areal units used to deploy the data) and the spatial processes that were present (Jones et al, 2018). More formally within an urban setting there

are various degrees of spatial dependency between the spatial units and this spatial dependency drives uncertainty in the modelling process. If the spatial dependency can be taken into account, so it is possible to move to a situation where it is possible to develop scalar measures that are inherently resistant to the MAUP and scalar changes. Moreover, in doing so, the tools that provide the stability also provide the means to identify the spatial structure that we are interested in and which governs the space.

Using these vignettes we suggest 4 key areas in which scalar thinking needs to be connected with spatial analytical approaches in the urban geography literature.

1. Single scale analyses provide false accuracy about spatial processes. Embracing scales is to embrace the uncertainty of the objects we are analysing.
2. The scalar process(es) are uncoverable and we must work with the techniques we have to develop the means to identify them.
3. When defining scale (temporal and well as spatial) it is necessary to consider the theoretical and empirical bounds of the process(es) that are to be captured in the modelling work. Using multiple scales is not a substitute for well thought out scalar strategies.
4. We need visual strategies to enrich the multi-scalar compositions within which we are working.

References

- Galster, G. (2001). On the nature of neighbourhood. *Urban studies*, 38(12), 2111-2124.
- Jones, K., Manley, D., Johnston, R., & Owen, D. (2018). Modelling residential segregation as unevenness and clustering: A multilevel modelling approach incorporating spatial dependence and tackling the MAUP. *Environment and Planning B: Urban Analytics and City Science*, 45(6), 1122-1141.
- Manley, D., Flowerdew, R., & Steel, D. (2006). Scales, levels and processes: Studying spatial patterns of British census variables. *Computers, environment and urban systems*, 30(2), 143-160.
- Petrovic, A., Manley, D., van Ham, M. (2018) Freedom from the tyranny of neighbourhood: Rethinking sociospatial context effects. *Progress in Human Geography*. Online First
- Petrovic, A., Manley, D., van Ham, M. (Submitted) where do neighbourhood effects end? The Complexity of Multiscale Contexts. *Annals of the Association of American Geographers*.
- Talen, E. (2018). *Neighborhood*. Oxford University Press.