

Building the right tools to answer the right questions? Probing the role of an open computational geographic tool within urban polycentricity research

In the field of urban and regional studies, there is a widely held consensus that a new form of urbanization gradually became dominant in the second half of the 20th century, of which the spatial outcomes diverge from the monocentric city. These changing patterns are attributed to fundamental changes in how spatial economies work, with more 'polycentric' urban systems emerging in tandem with changes in agglomeration economies. These developing regional geographies are increasingly studied through the lens of 'polycentric urban regions' (PURs): a concept used to denote regions characterized by synergies between proximate and densely connected urban centres (Harrison et al. 2020).

Despite a rich scientific debate, ongoing PUR research paints a mixed picture (Derudder et al. 2022). At the conceptual level, there is no consensus on what a polycentric urban system is (Van Meeteren et al. 2016), how the concept should be formally operationalized, and how its empirical diversity can translate into equally robust conceptual diversity. At the methodological level, a plethora of individual and ad hoc analytical-operational frameworks are invoked to measure degrees of polycentricity and its associated effects (e.g. agglomeration economy effects), making it difficult to interpret and compare results and, ultimately, to draw robust conclusions on the impact of this regional form on people and places.

To push forward these three directions of PUR research (conceptualizing, measuring and associating), recently calls were raised to establish a stronger tool-building community to work around collective, data-driven, computational geographic tools (Caset et al. 2022, Derudder et al. 2022). These calls resonate more broadly with appeals to develop more accessible and modifiable software and tools with and within academic communities to advance the spatial sciences (Boeing 2020, Poorthuis and Zook 2020). In the context of PUR research, the proposition (Caset et al. 2022) is that such pursuit could, at the very least, advance the comparability, reproducibility, replicability and reusability of findings linked to the measuring and associating research agendas.

While, today, there exist several successful examples of open-source spatial software projects and tools in GIScience and urban science communities (e.g., Anselin et al. 2006, Boeing 2017, Rey 2019), concrete explorations of what a PUR-oriented academic tool could look like remain thin on the ground. Additionally, and arguably more importantly, there exist no prior efforts to elicit insights, opinions, and epistemological positions from scholars who are actively shaping the field of PUR research with respect to the proposition to commit more strongly to tool-building. The latter venture is nonetheless crucial to anticipate to what extent, why, and to whom such tool-building interventions may be useful, and if these should be pursued in the first place.

Against this background, our contribution to this special session generates new and critical insights with respect to academic tool-building endeavors in the fields of urban and regional studies in general, and PUR-driven research in particular. We particularly focus on the anticipated potential of a PUR-oriented academic tool to effectively advance the field's main research agendas, viewed from the various (sometimes conflicting) perspectives of and within the academic community itself. To this end, we have developed a web-based survey to elicit insights from scholars involved in PUR-driven research. Conceptually, our analysis engages with usefulness appraisals in the field of planning support systems (Pelzer 2017). Depending

on the thrust of our findings, we will produce a set of specific recommendations (in terms of data requirements, tool capabilities, etc.) to develop a tool prototype, which will be evaluated in further rounds of validation.

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