Our Town: How Socioeconomics Shape Functional Neighborhoods in American Cities

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1. Abstract

The idea that cities can be divided into geographically bounded communities has been a mainstay of the social sciences since the turn of the 20th century. Viewing cities as collections of communities is essential for studying intra-urban variation in socio-economic phenomena, or emergent behaviours such as segregation.

There are generally two models for identifying geographically bounded sub-areas within cities; a "residential" model, and a "functional" model. Those communities into which cities are divided seldom have an empirical basis in terms of underlying urban processes. That is, geographically bounded urban communities are more typically defined through the location and characteristics of residents (or workers). Such definitions are arguably both theoretically and methodologically limiting, as they do not adequately capture those human and economic interactions and connections that bind spaces and places (Batty and Cheshire, 2011). However, a notable exception is the work on "functional regions" that aim to define geographically bounded communities based on commuting flows or other forms of transit (Coombes et al, 1986; Farmer and Fotheringham, 2011), albeit typically at aggregate scales.

While geographers recognize that there are an almost limitless number of potential divisions of geographic space, with such divisions seen as "Modifiable Areal Units" that are almost freely interchangeable, it can be argued that some potential divisions are "better" than others for particular applications, however, the empirical basis for such decisions is underdeveloped. An alternate view is that cities are multiverse, and for different types of people, different types of geographic divisions exist; with experience within the city conditioned by the intersection of both who and where we are.

In this paper we explore the idea that functional divisions of urban space vary across socio-economic gradients. That is, cities can be divided into communities but these communities are determined by the people and the place under investigation. Questions about the scale and the boundary of communities can only be addressed by considering the population under investigation.

Typically this is a very difficult problem to address because information about individual behaviour is seldom available at the population scale. Here we exploit

information from the United States Internal Revenue Service that tells us the numbers of individuals associated for every combination of residential and work location (including residence and work in the same location) at census block level for most major cities. These block to block flows are available by various socioeconomic groupings (industry of employment, age, earnings). We examine the block to block commuting flows for different socioeconomic groups in the 50 largest MSA in the United States.

We aim to empirically test the hypothesis that functional divisions of urban space are demographically dependent. That is, different types of people use urban space in different ways. To explore this hypothesis we adopt a network perspective, treating place-to-place flows as the edges of a graph and blocks as nodes. We employ community detection methods to identify structure in these flow networks. These "communities" or highly connected sub graphs, are then mapped back to geographic space. The scale and density of connection of these networks makes community detection a computationally non-trivial problem, with interesting possibilities for furthering development of geographical network analysis methods. We explore various edge weighting strategies and community detection algorithms.

We compare the geometry and composition of the demographically defined functional regions. We test various null hypotheses of the equivalence of different demographic divisions of the same city and hypotheses about the equivalence of demographically defined functional regions across MSAs.

2. References

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