Using the statistical language R as a Geographic Information System

Closing

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Now

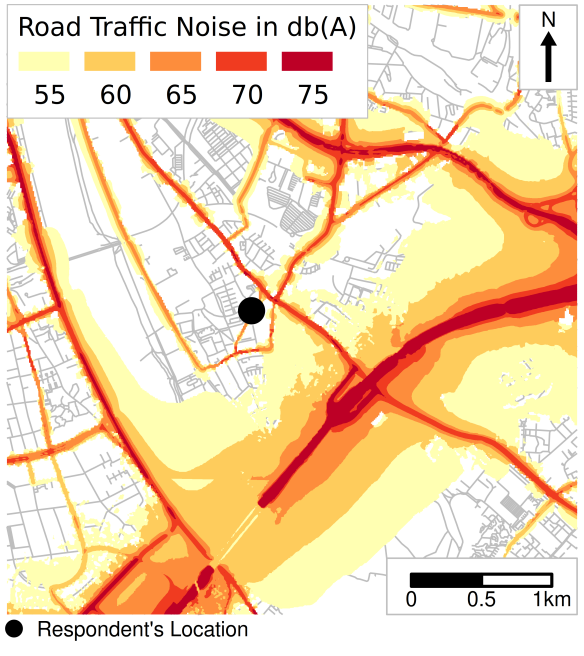
Time	Title
09:00-09:30	Introduction: Data Management & Geospatial Data
09:30-09:35	Exercise 1: R Warm up
09:35-10:00	Data Processing & Spatial Linking
10:00-10:30	Exercise 2: Geospatial Data Wrangling
10:30-10:45	Break
10:45-11:15	Easy Maps
11:15-11:45	Excercise 3: Build your own map
11:45-12:00	Closing, Q & A

There's So Much Missing...

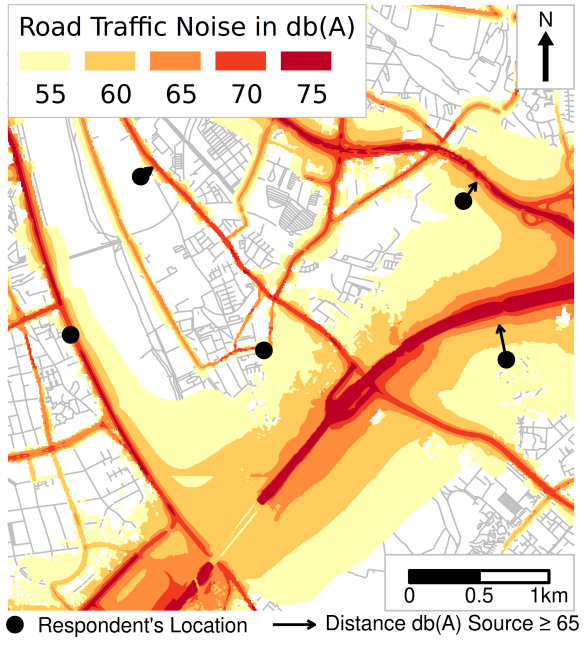
1. Spatial Linking Methods
2. Analysis
3. Applications

Spatial Linking Methods I

1:1



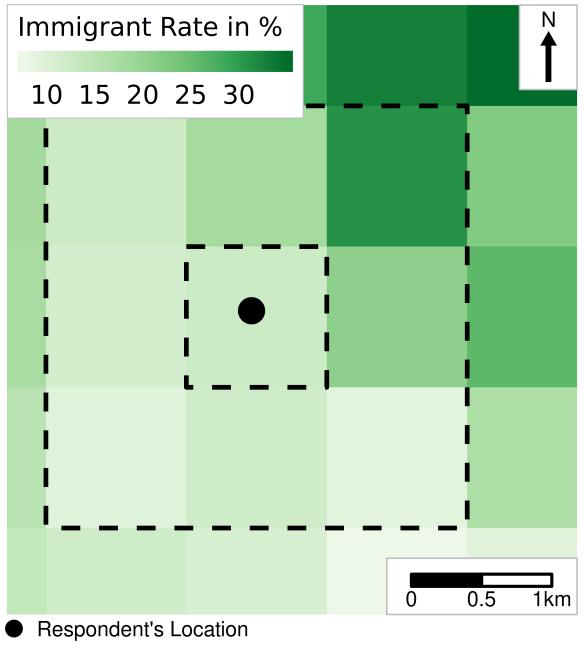
Distances



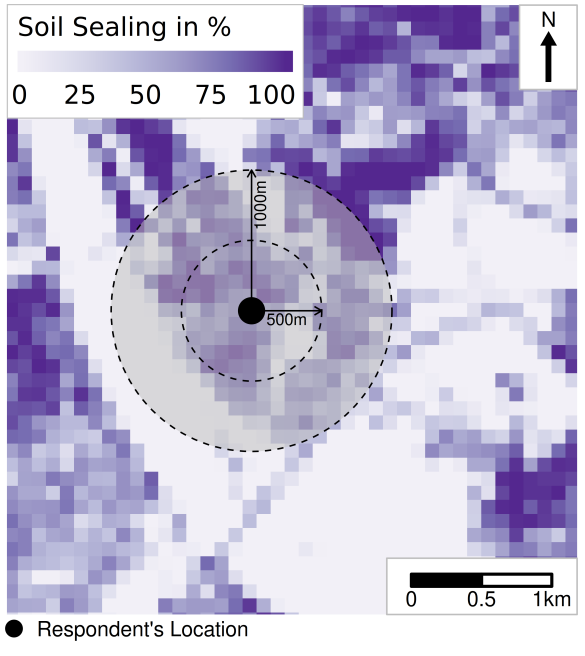
Sources: German Environmental Agency / EIONET Central Data Repository (2016) and OpenStreetMap / GEOFABRIK (2018) / Jünger, 2019

Spatial Linking Methods II

Filter methods

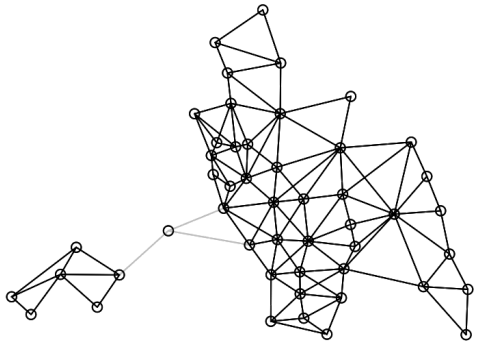


Buffer zones



Sources: Leibniz Institute of Ecological Urban and Regional Development (2018) and Statistical Offices of the Federation and the Länder (2016) / Jünger, 2019

Analysis



Source

Spatial Error Model (SEM)

- Clustering on Unobservables

$$\mathbf{y} = \alpha\boldsymbol{\iota} + \mathbf{X}\boldsymbol{\beta} + \mathbf{u},$$
$$\mathbf{u} = \lambda\mathbf{W}\mathbf{u} + \boldsymbol{\varepsilon}$$

Spatial Autoregressive Model (SAR)

- Interdependence

$$\mathbf{y} = \alpha\boldsymbol{\iota} + \rho\mathbf{W}\mathbf{y} + \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$$

Spatially lagged X Model (SLX)

- Clustering on Spillovers in Covariates

$$\mathbf{y} = \alpha\boldsymbol{\iota} + \mathbf{X}\boldsymbol{\beta} + \mathbf{W}\mathbf{X}\boldsymbol{\theta} + \boldsymbol{\varepsilon}$$

Moreover, there are models combining two sets of the above specifications.

Spatial Durbin Model (SDM)

$$\mathbf{y} = \alpha\boldsymbol{\iota} + \rho\mathbf{W}\mathbf{y} + \mathbf{X}\boldsymbol{\beta} + \mathbf{W}\mathbf{X}\boldsymbol{\theta} + \boldsymbol{\varepsilon}$$

Spatial Durbin Error Model (SDEM)

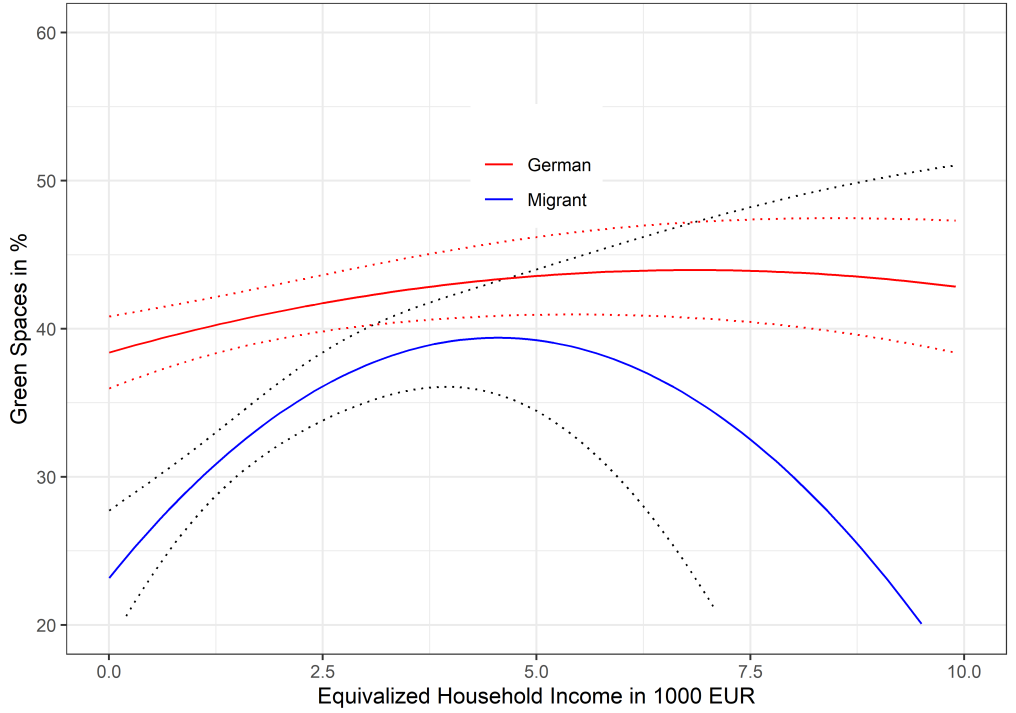
$$\mathbf{y} = \alpha\boldsymbol{\iota} + \mathbf{X}\boldsymbol{\beta} + \mathbf{W}\mathbf{X}\boldsymbol{\theta} + \mathbf{u},$$
$$\mathbf{u} = \lambda\mathbf{W}\mathbf{u} + \boldsymbol{\varepsilon}$$

Combined Spatial Autocorrelation Model (SAC)

$$\mathbf{y} = \alpha\boldsymbol{\iota} + \rho\mathbf{W}\mathbf{y} + \mathbf{X}\boldsymbol{\beta} + \mathbf{u},$$
$$\mathbf{u} = \lambda\mathbf{W}\mathbf{u} + \boldsymbol{\varepsilon}$$

Source: Tobias Rüttenauer's SSCI Workshop

Application(s): Environmental Inequalities



Data source: GGSS 2016 & 2018; N = 6,117; 95% confidence intervals based on cluster-robust standard errors (sample point); all models control for age, gender, education, household size, german region and survey year interaction, inhabitant size of the municipality, and distance to municipality administration

Q & A

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