Defining *spatial closeness* with commuter flow rates

Leveraging 2011 UK Census data for spatial regression modeling

Matthew T. West

16 September, 2019

Relationship between separated observations

I work with Bayesian spatial CAR models to investigate the socioeconomic forces underlaying the results of recent contentious UK popular referenda at the local authority district (LAD) level.

- SOP of defining *closeness* by border contiguity misses two facts
  - Borders are often drawn to mirror physical barriers
  - Modern transit allows people to travel great distances regularly
- *Proposal* for adjacency weights matrix: W_{ij}
  - $w_{ij} =$ % of residents of district i that work in district j
  - $\tilde{w}_{ij} =$ % of workers in j that reside in i
  - $W_{ij} = \max\left(w_{ij}, \tilde{w}_{ij}\right)$
- R packages used: `sf, spdep, readr, dplyr, ggplot2`

One can still require W to be *symmetric* and/or have *binary* weights.

Links between spatially related English LADs

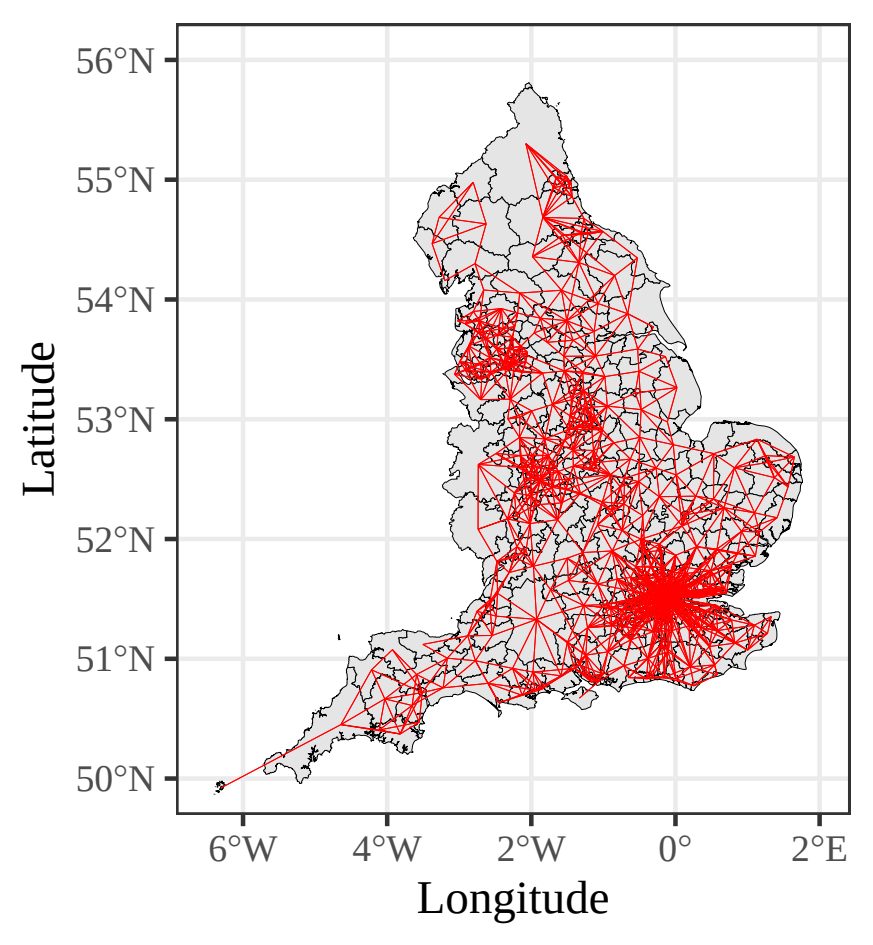

Figure 1: The grey polygons represent the 326 LADs in England. The red lines represent the 3286 unique links between districts with $W_{ij} > 0.015$ with the line thickness being related to the entry's weight value.