HOUSING MARKET AND MIGRATION REVISITED

A Bayesian multilevel gravity model for Dutch municipalities

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Housing market and migration: why bother?

- Concerns about current housing market in the Netherlands:
  - large shortage of dwellings (especially in popular, urban, regions and for non-controlled rental housing)
  - large yearly prices increases (8% in 2018)
  - decrease in number of houses sold
  - large regional variation

- Policy debates about changes in housing market structure
  - $\longrightarrow$ Increase home-ownership rates

- Large literature of external effects of home-ownership (Dietz and Haurin, 2003)
  - positive: savings, labor supply, health, maintenance, etc.
  - negative: migration (by increased moving costs) and on aggregate labour market performance (Oswald, 1996, 1999)

My contributions to the literature

- Large empirical (economic) literature on impact home-ownership on migration, but:
  - usually concerns marginal effect of home-ownership
  - less attention to predictions for the whole network

- Literature on impact of social renting on migration flows is scarce (De Graaff et al., 2009)
  - In the Netherlands social renting is a large phenomenon ($\approx$ 40% of total housing stock)
  - Social renting rights only valid within city (Boyle, 1998)
  - Social renting is an urban phenomenon ($\approx$ 40–50% in Amsterdam)

So, this paper

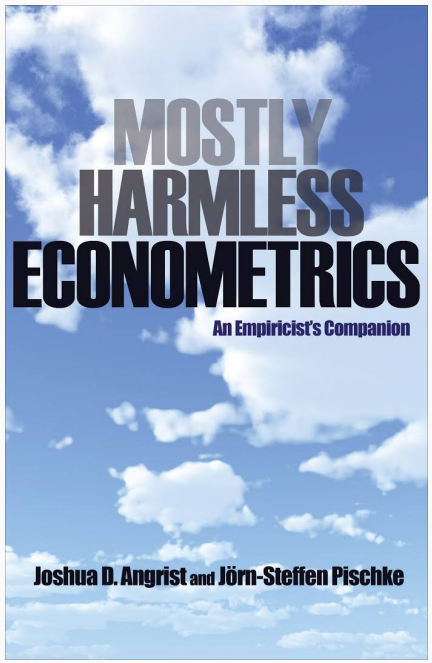
Does what? Revisits the impact of housing market structure (home-ownership and social renting rates) on within-country migration flows using a Bayesian multilevel gravity model (Congdon, 2010)

And Predict all changes in incoming and outcoming migration flows when housing market structure changes

Background: two different cultures (Breiman, 2001)

In economics:

- causal impact of x on y
- focuses on $\hat{\beta}$
- average treatment effect



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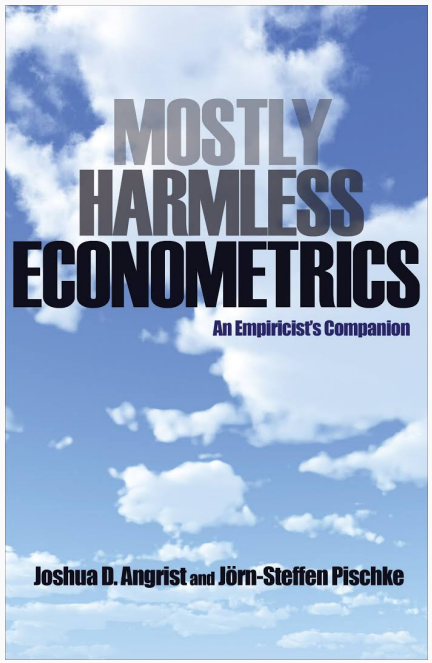
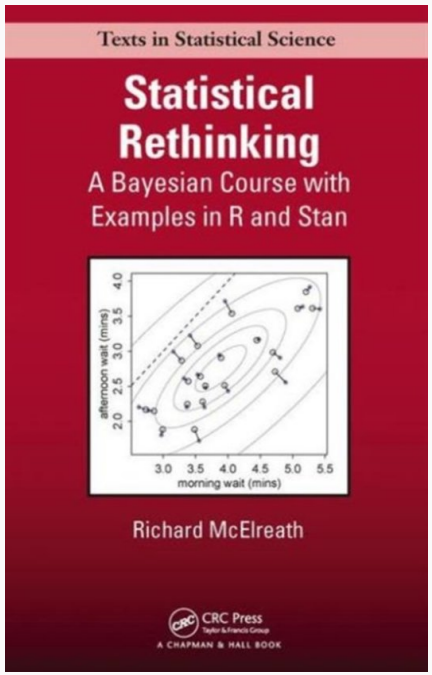
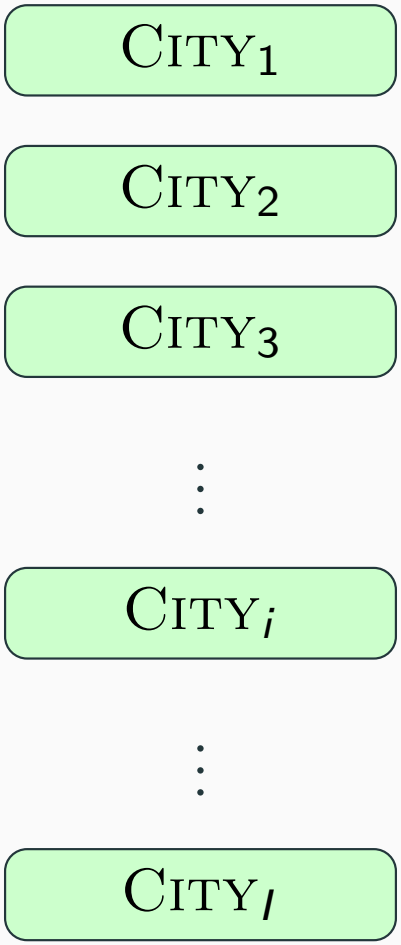


Outside economics:

- model performance
- focuses on $\hat{y}$
- prediction of total effect



Why a multilevel approach for the gravity model



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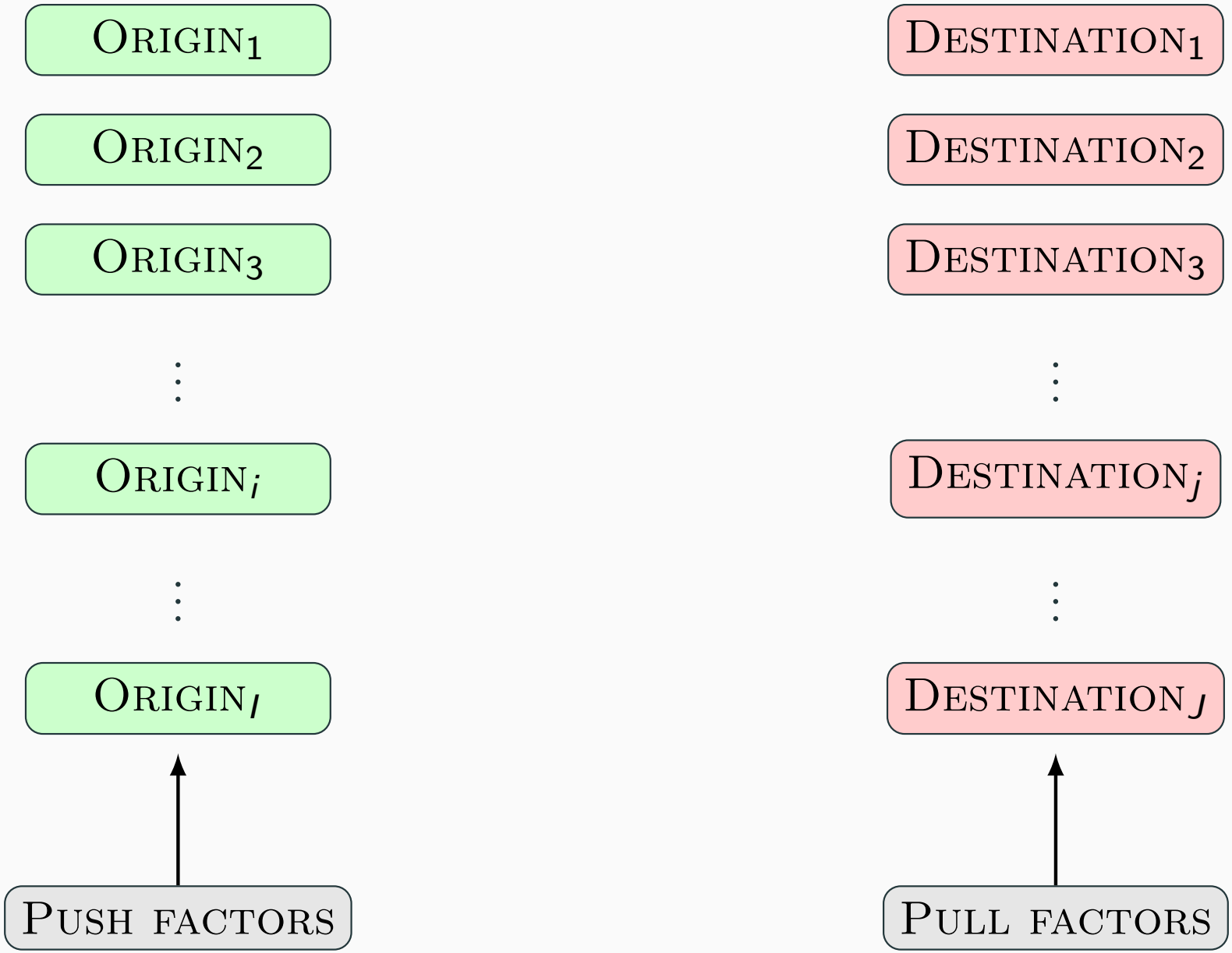
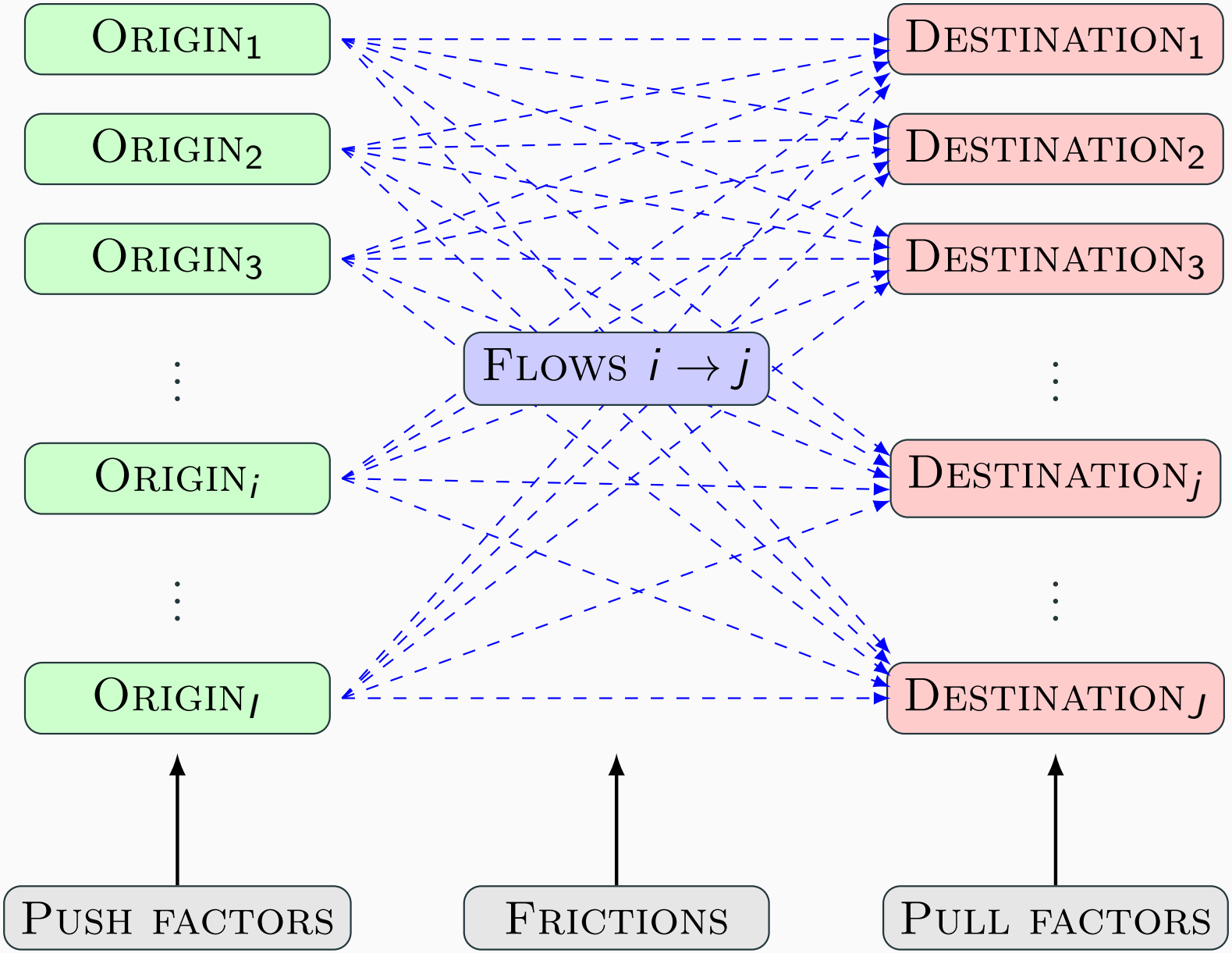


Why a multilevel approach structure for the gravity model



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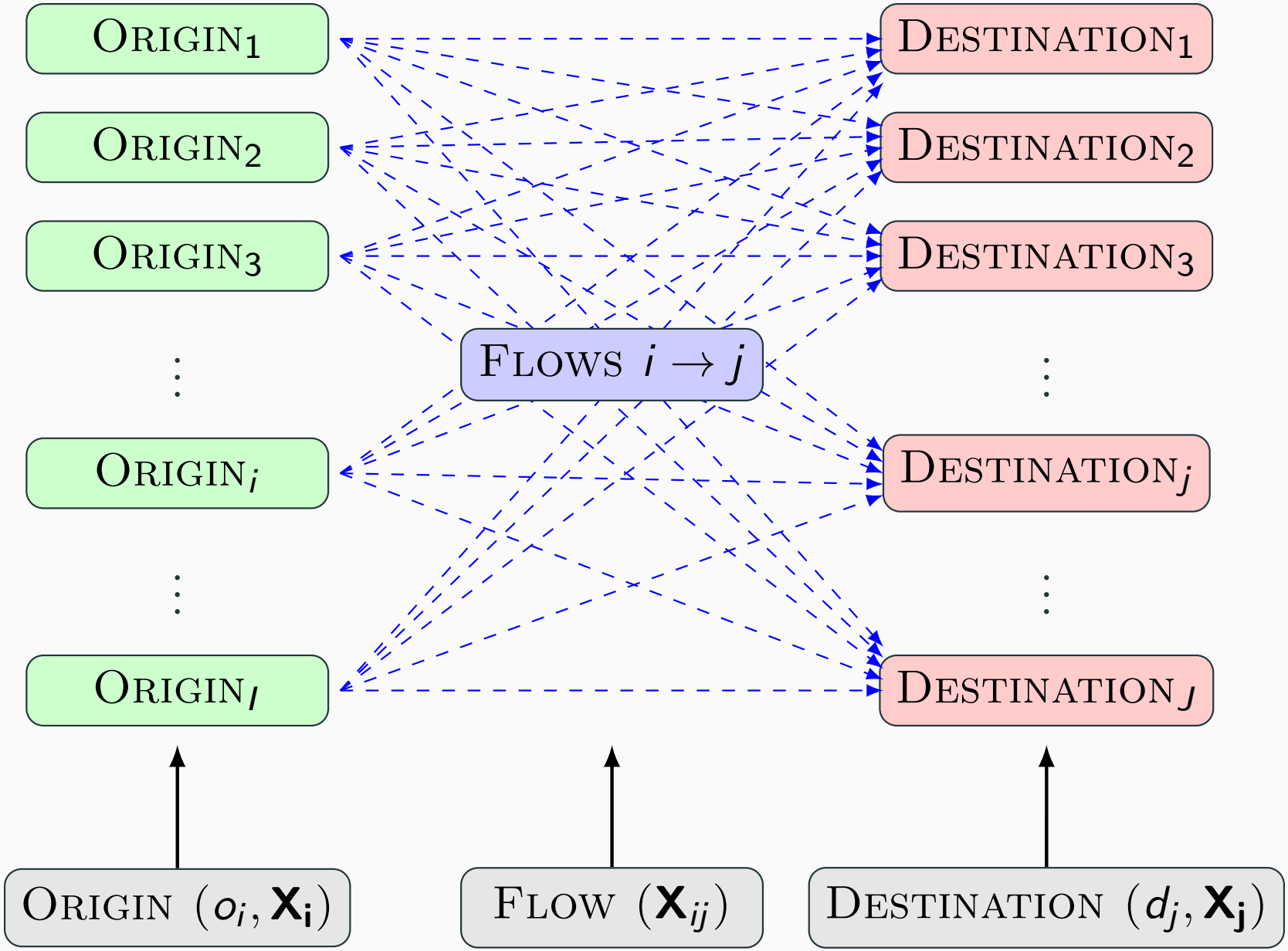

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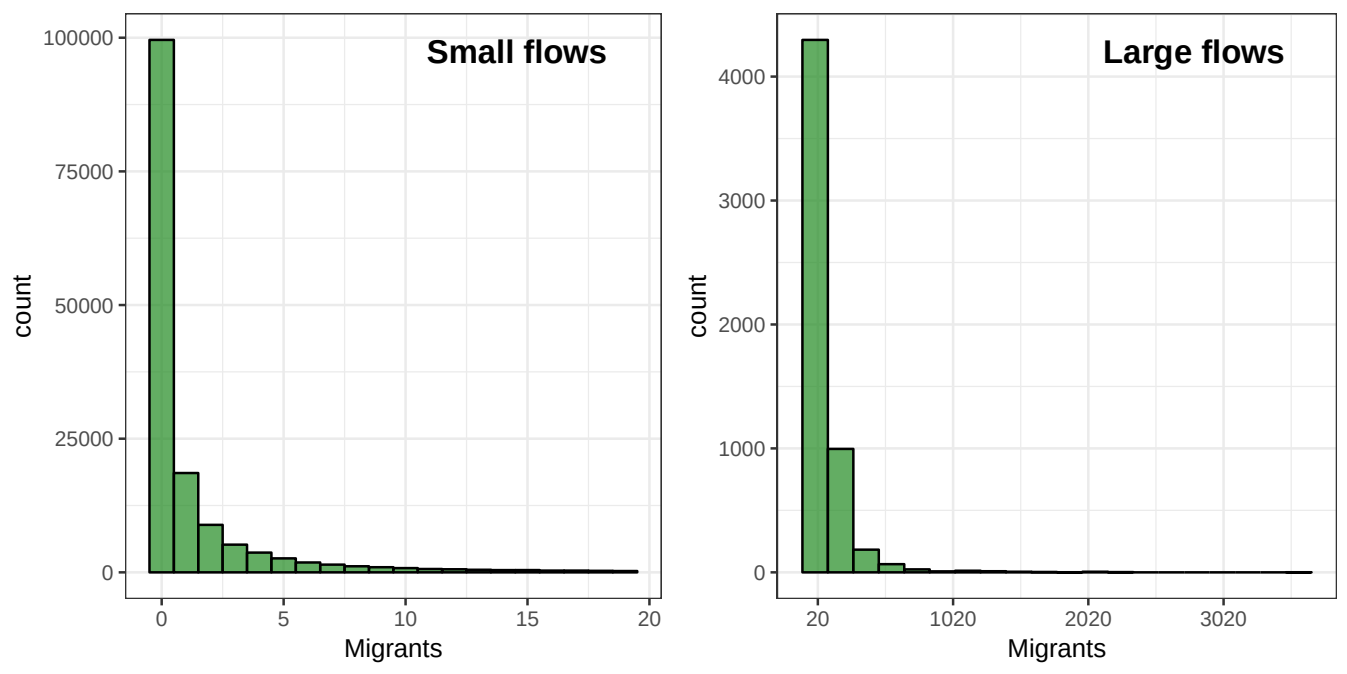
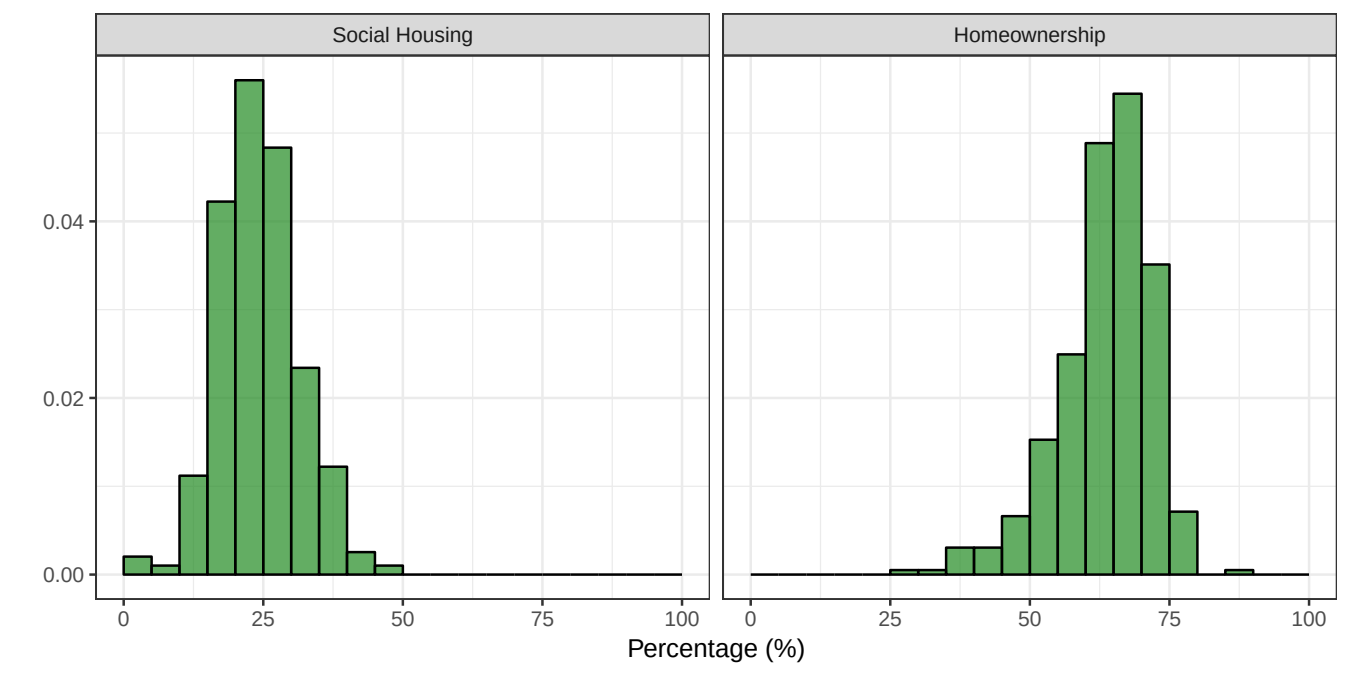
- Simultenous modeling at various levels (e.g., cities, regions, flows, individuals)
  - no two-stage models anymore
  - precision (standard deviation) is correct
- Partial pooling: origin and destination specific effects are draws from a distribution: usually $\sim$ Normal(α, σ)
  - $\sigma \longrightarrow 0$: complete pooling
  - $\sigma \longrightarrow \infty$: no pooling (fixed effects)

Data: migrations flows



- Migration flows between 393 Dutch municipalities in 2015($\approx 150,000$)
- Variance is 4 times expectation: dispersion

Data: municipal housing structure



- Positive correlation between city size and social renting (0.4)
- Negative correlation between social renting and home-ownership (-0.84)

Modeling framework: traditional gravity modeling

$$\log(\text{migrants}_{ij}) = o_i + d_j + \log(\mathbf{X}_{ij})\beta + \gamma \log(\text{dist}_{ij}) + \epsilon_{ij}$$

Origin and destination specific fixed effects for multilateral resistance (Anderson and Van Wincoop, 2003), but:

- what about zeros in migrants_{ij}?
- how to incorporate housing structure in the presence of o_i and d_j?
- dispersion and heteroskedasticity (Silva and Tenreyro, 2006)

Modeling framework: multilevel gravity modeling

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$$\begin{aligned}\log(\lambda_{ij}) =& \alpha + o_{\text{mun}[i]} + d_{\text{mun}[j]} + \qquad \text{(regional effects)}\\ & \beta_1 \log(\text{pop}_i) + \beta_2 \log(\text{pop}_j) +\\ & \beta_3 \log(\text{home}_i) + \beta_4 \log(\text{home}_j) +\\ & \beta_5 \log(\text{soc}_i) + \beta_6 \log(\text{soc}_j) +\\ & \beta_7 \log(\text{dist}_{ij}) \qquad \text{(explanatory variables)}\end{aligned}$$

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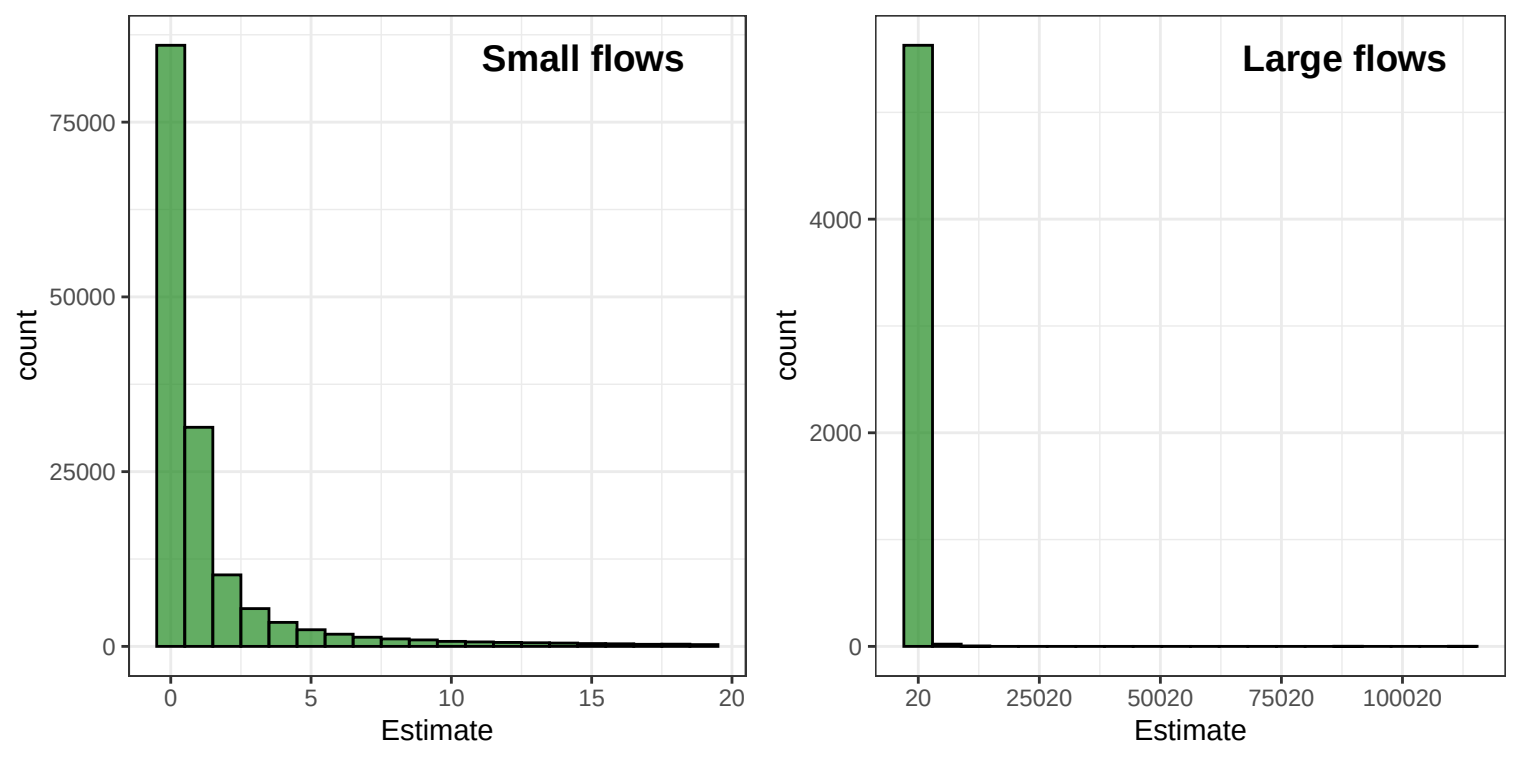
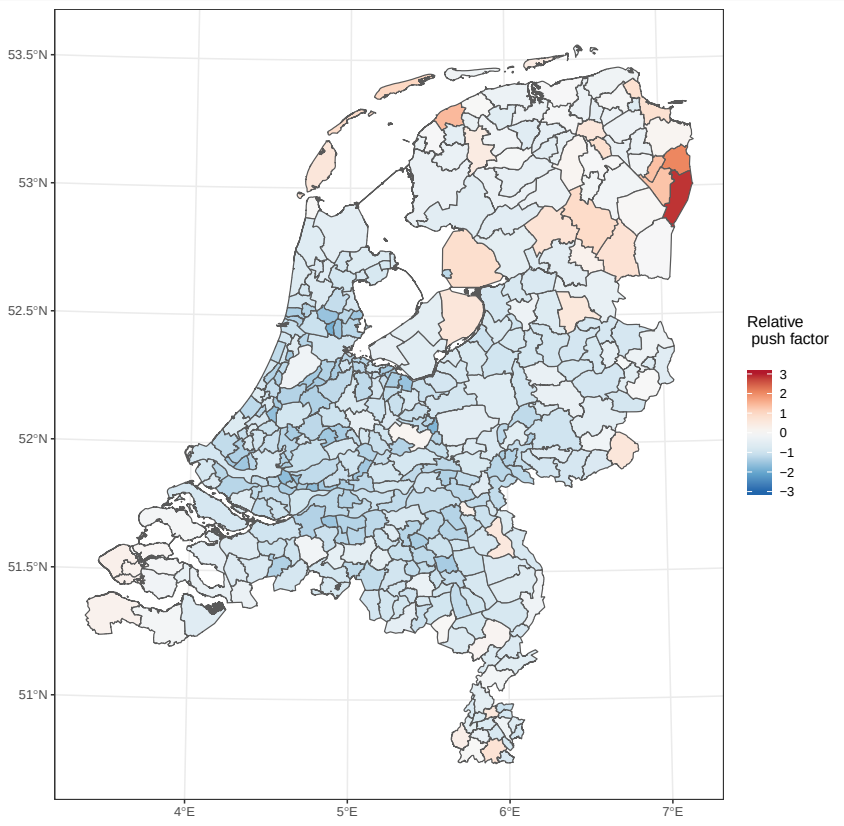
d_{\text{mun}} &\sim \text{Normal}(0, \sigma_d) && \text{(destination effects)} \\
\alpha, \beta_1, \ldots, \beta_7 &\sim \text{Normal}(0, 2) && \text{(priors)} \\
\sigma_o, \sigma_d &\sim \text{HalfCauchy}(0, 1) && \text{(priors)} \\
\tau &\sim \text{Gamma}(0.01, 0.01) && \text{(prior)}
\end{aligned}
$$

Observed versus predicted data



- Predictions have large outliers: caused by Rotterdam (large population, low percentage home-ownership)

d_{mun} as measure of attractivity?



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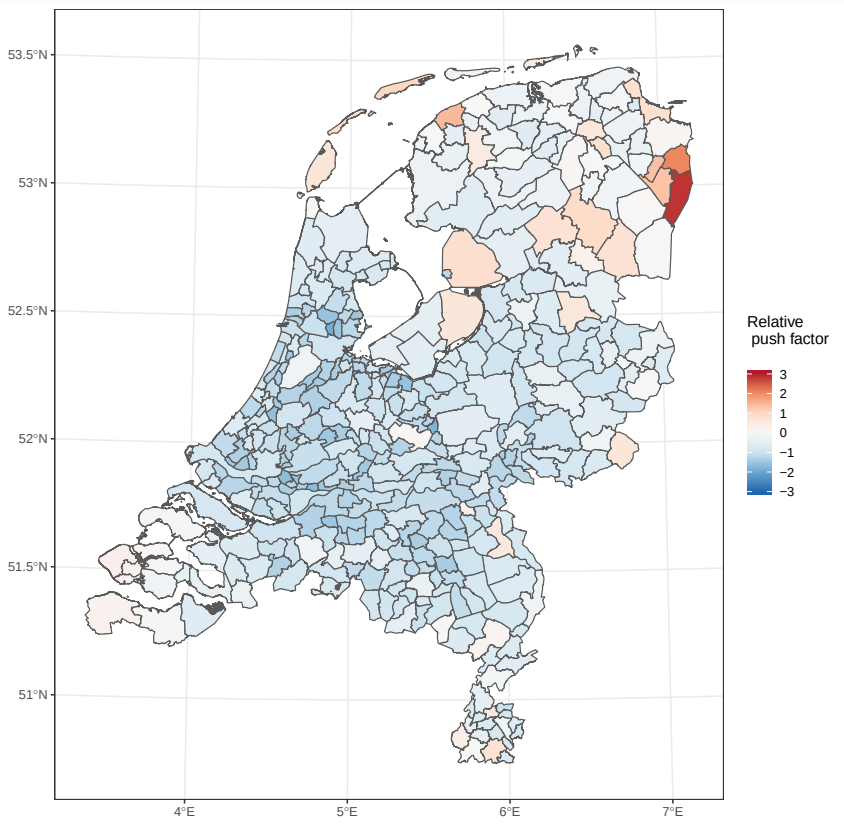

Home-ownership rate in Amsterdam decreases with 10%?

Conclusions

Migration flows:

- homeownership has an elasticity well below -1
- social renting has negative elasticity as well, but close to zero (Boyle, 1998)
- most migration dynamics *outside* the most popular areas

Bayesian multilevel gravity framework:

- flexible and powerful
- suitable for predictions within and outside sample
- with good model specification, estimation runs smoothly
- not very scalable; 154,056 obs. $\approx$ 6 hrs. of estimation

Supplementary materials

Paper, presentation, data and code can be retrieved from the project's GitHub page:

`https://github.com/Thdegraaff/migration_gravity`

Thank you!

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