Does transport infrastructure reduce or reinforce regional inequality?

Evidence from the expansion of the railroad network in 19th century Austria-Hungary

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Research Question and Motivation

- Transport infrastructure is widely seen as a major driving force of economic development → National and supra national organisations spend a large share of their budget in transport infrastructure projects

- Policy planners want often to combine two objectives with transport infrastructure projects
  - Promote growth
  - Diffuse economic activity to peripheral regions

- This paper studies one of the largest public infrastructure projects in Central Europe – the roll-out of the Austrian-Hungarian railroad network to provide evidence on two questions:

- *Does transport infrastructure spur economic growth?*
- *How does transport infrastructure affect the spatial distribution of economic activity*?

Literature

- Theory predicts different effects of transport infrastructure on growth
  - Growth effect
    - Price convergence and reallocation of resources along the lines of comparative advantages
    - Increasing market size, gains from increasing returns
  - Relocation and displacement effects:
    - Decline in transport costs strengthen agglomeration forces → firms might relocate from rural to urban areas.

- Most of the literature finds positive relationship between transport infrastructure investments and local economic growth
  - Focus on urban areas
  - Focus on direct effects, neglects relocation effects

This Paper

- Novel data set on municipality population growth and transport costs for over 1,171 municipalities for the years 1846, 1857, 1869 and 1880
- Provides causal evidence on the impact of decreasing transport costs on the annual population growth rate of a municipality
- and on the distributional effects of transport infrastructure

Methodological challenges and identification strategy

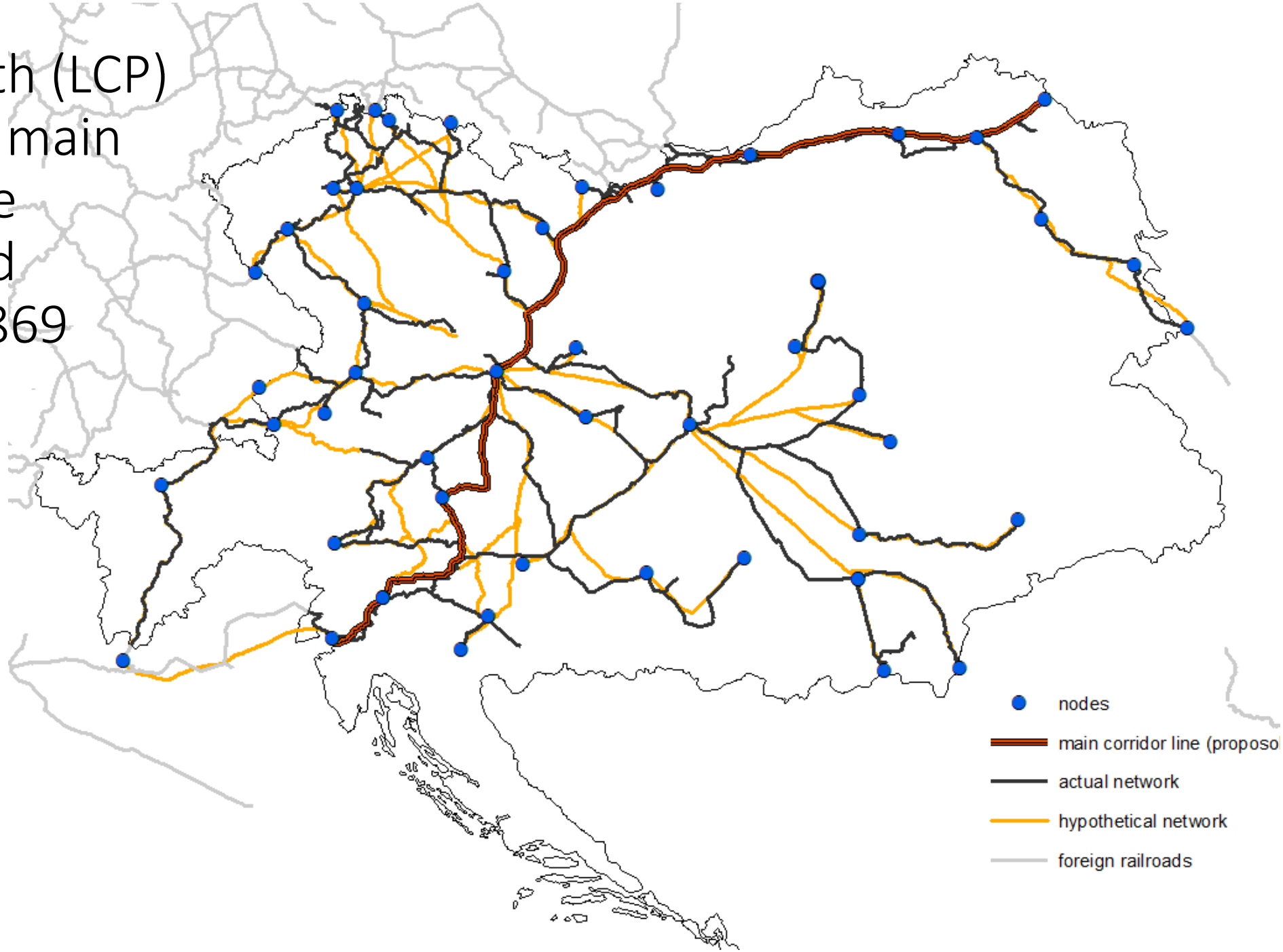
- Direct and indirect effects
  - Growth attributed to transport infrastructure investment might reflect a reorganization of economic activity. Shift from non endowed to endowed regions or also between endowed regions
  - This paper measures the effects of transport improvements by changes in “market access”
  - Transport infrastructure improvement does not only improve the market access of one municipality (direct effect) but also has an effect on the market access of all other regions (indirect effect)
- Endogeneity of transport infrastructure
  - Transport infrastructure investments might follow demand → Cherry-picking of railroad routing might overestimate growth effect
  - Unique historical setting of the expansion of the railroad network in the Habsburg monarchy allow me to address this issue

Historical setting

- Railroad network was designed by the state
  - Main objective was to create major transport axes across the country (corridor system)
    - Political integration
    - Attraction of trans-European trade flows
    - Strengthen position as trade power
  - Investment beyond demand especially in the east

- Historical Setting and sources allows to implement an inconsequential unit's IV approach
  - Calculating of an exogenous market access
    - Official railroad proposals are used to identify main nodes of the network
    - Information on construction costs are used to draw least costly paths (LCPs) between these nodes

Least-cost path (LCP) network with main nodes and the actual railroad network of 1869



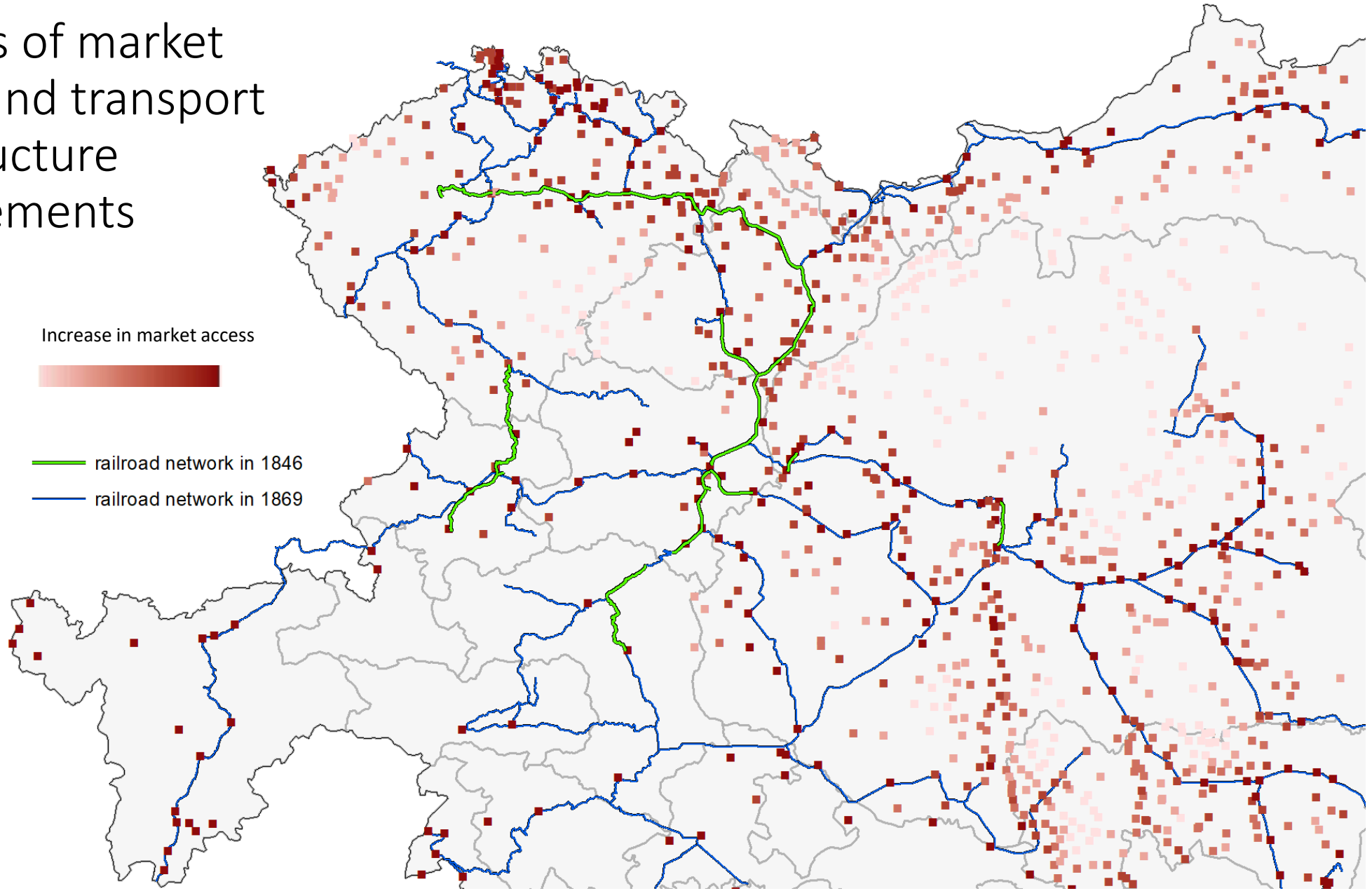
Market access and freight rates

- Transport infrastructure improvements are operationalized by market access, which takes into account that manufacturers can send output to more than one regional market:

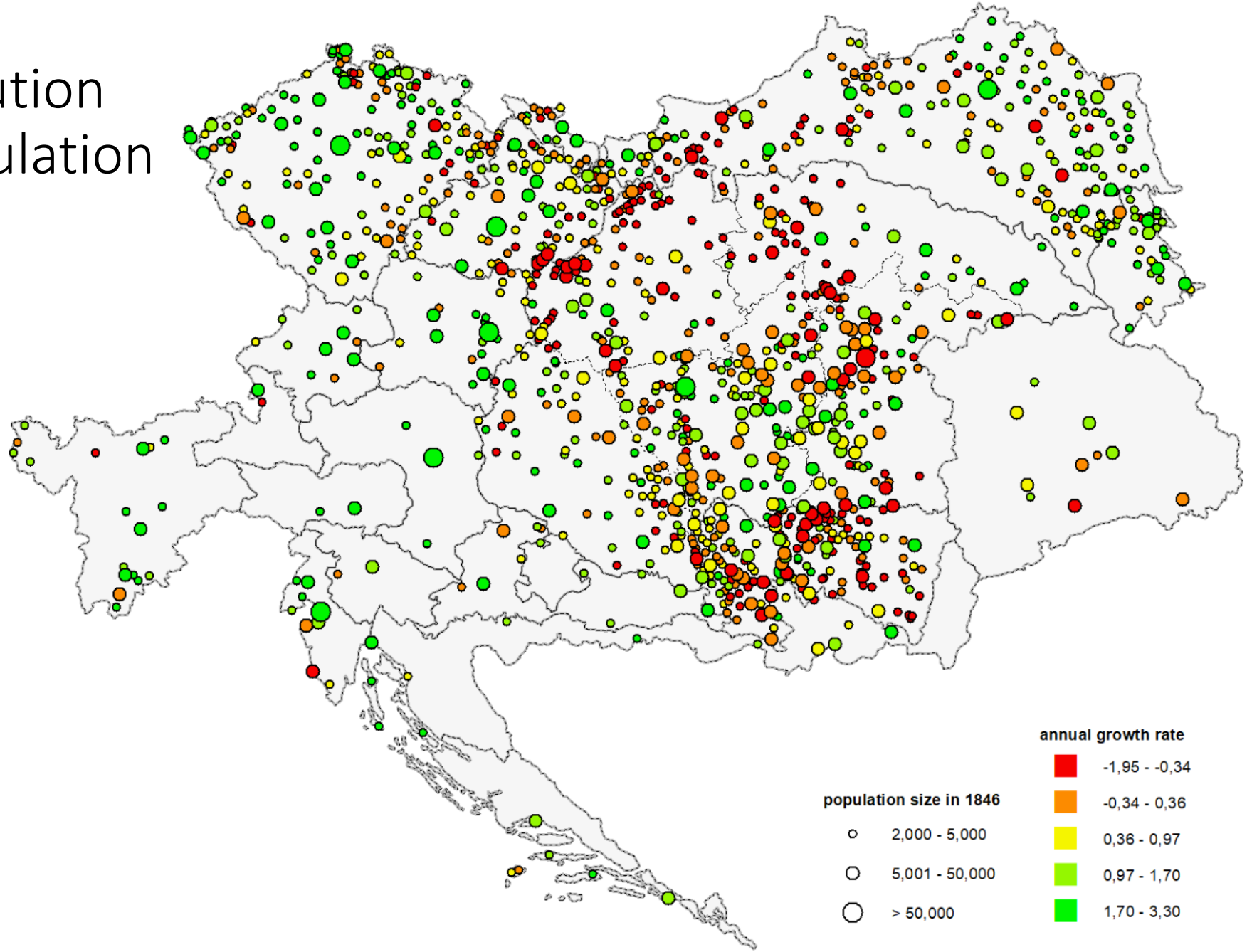
$$MA_{it} = \sum_{j=1}^{J} \frac{1}{Costs_{ijt}} \times Population_{jt}$$

- Railroads and waterways were digitized and information of historical freight rates were collected to calculate lowest-cost municipality-to municipality freight routes

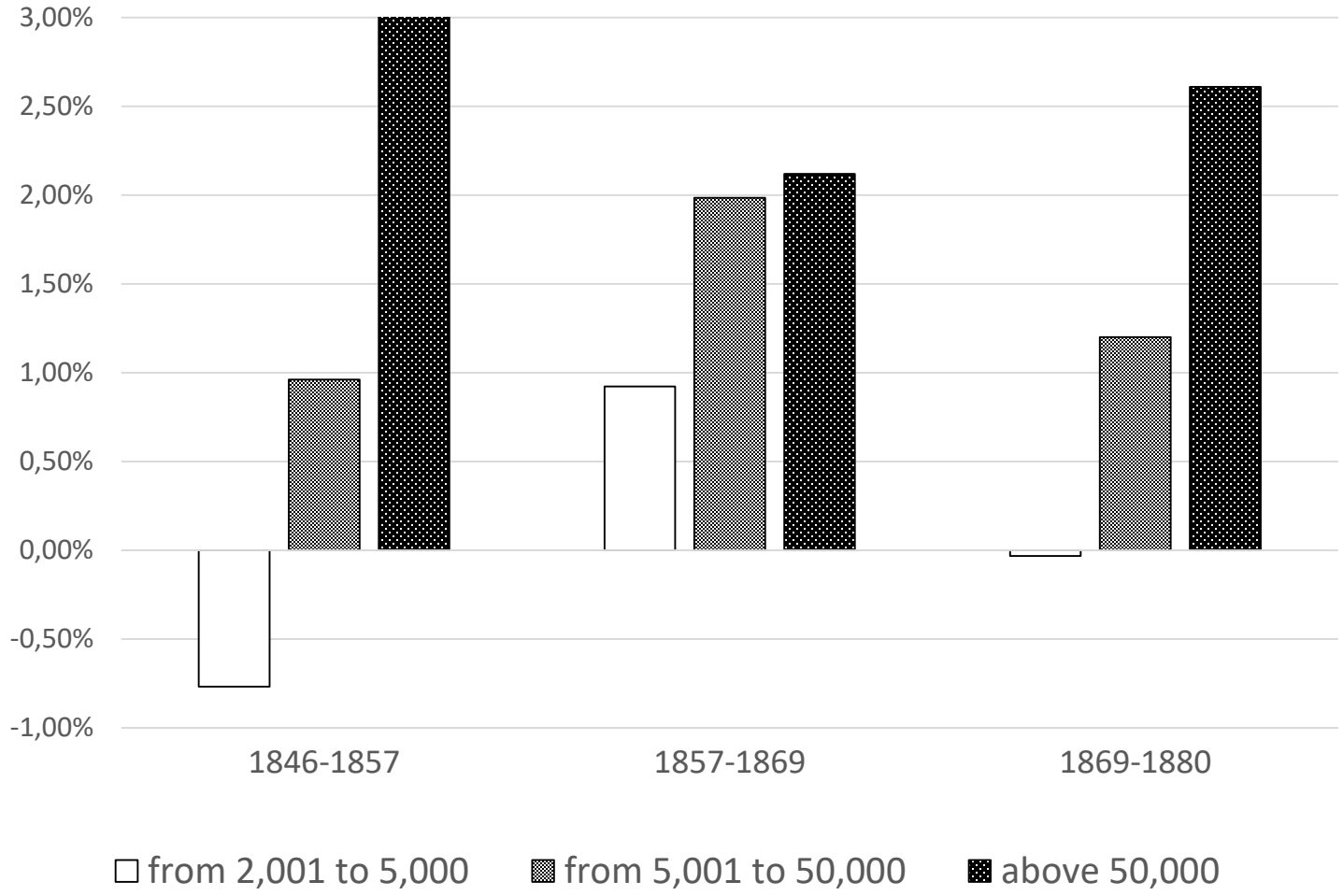
Changes of market access and transport infrastructure improvements



Spatial distribution of annual population growth



Annual growth rates per municipality type and period



Econometric Model

Difference-in-differences estimation

Fixed effects: *time-invariant and municipality-specific factors*

Region-by-period fixed effects: *cycles on a regional level*

$$APG_{ijt+1} = \alpha_i + \lambda_t + \theta_{jt} + +\beta_1 \ln(MA_{ijt}) + \varepsilon_{ijt}$$

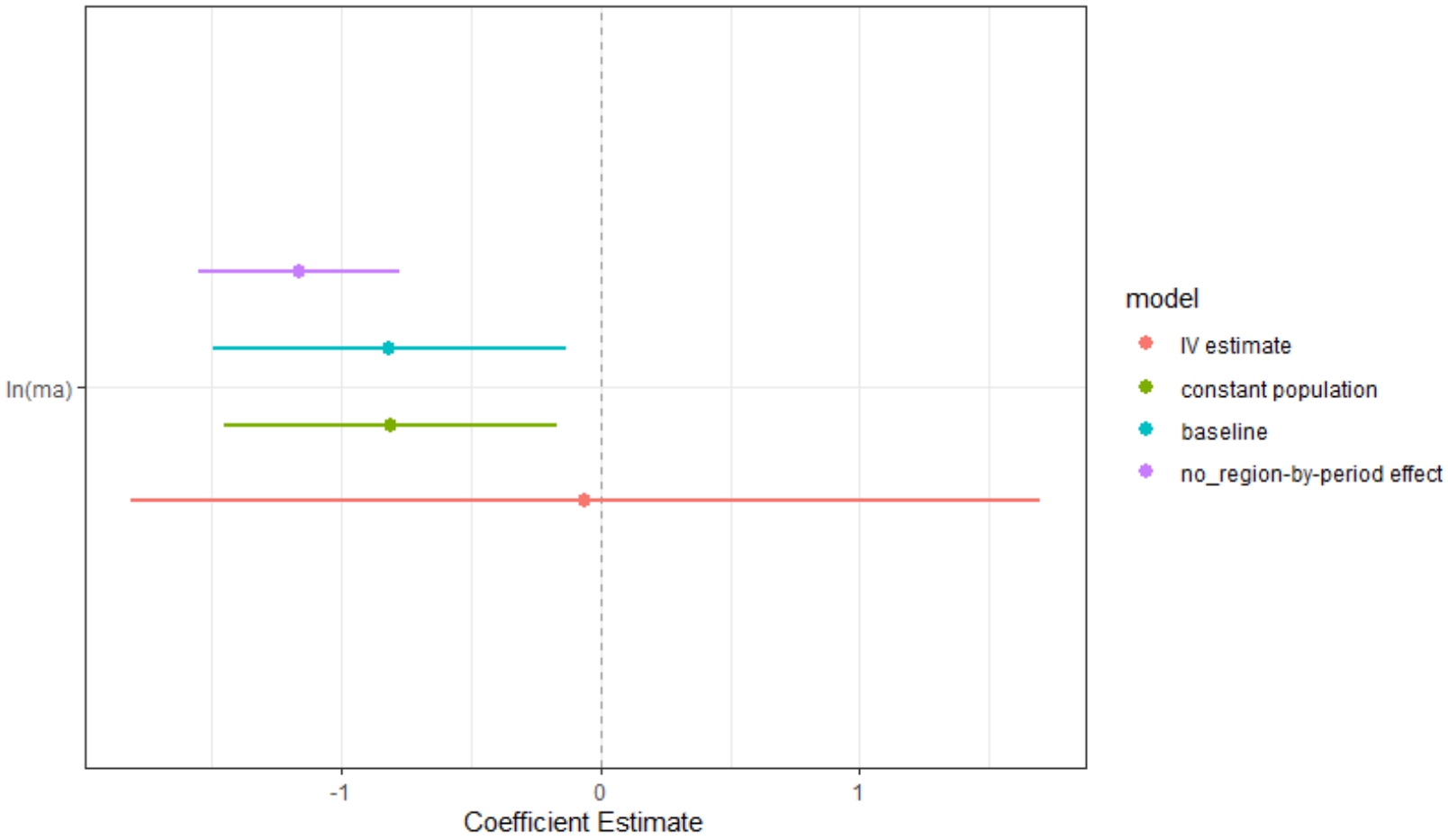
Average annual population growth

Period fixed effects: *time trends*

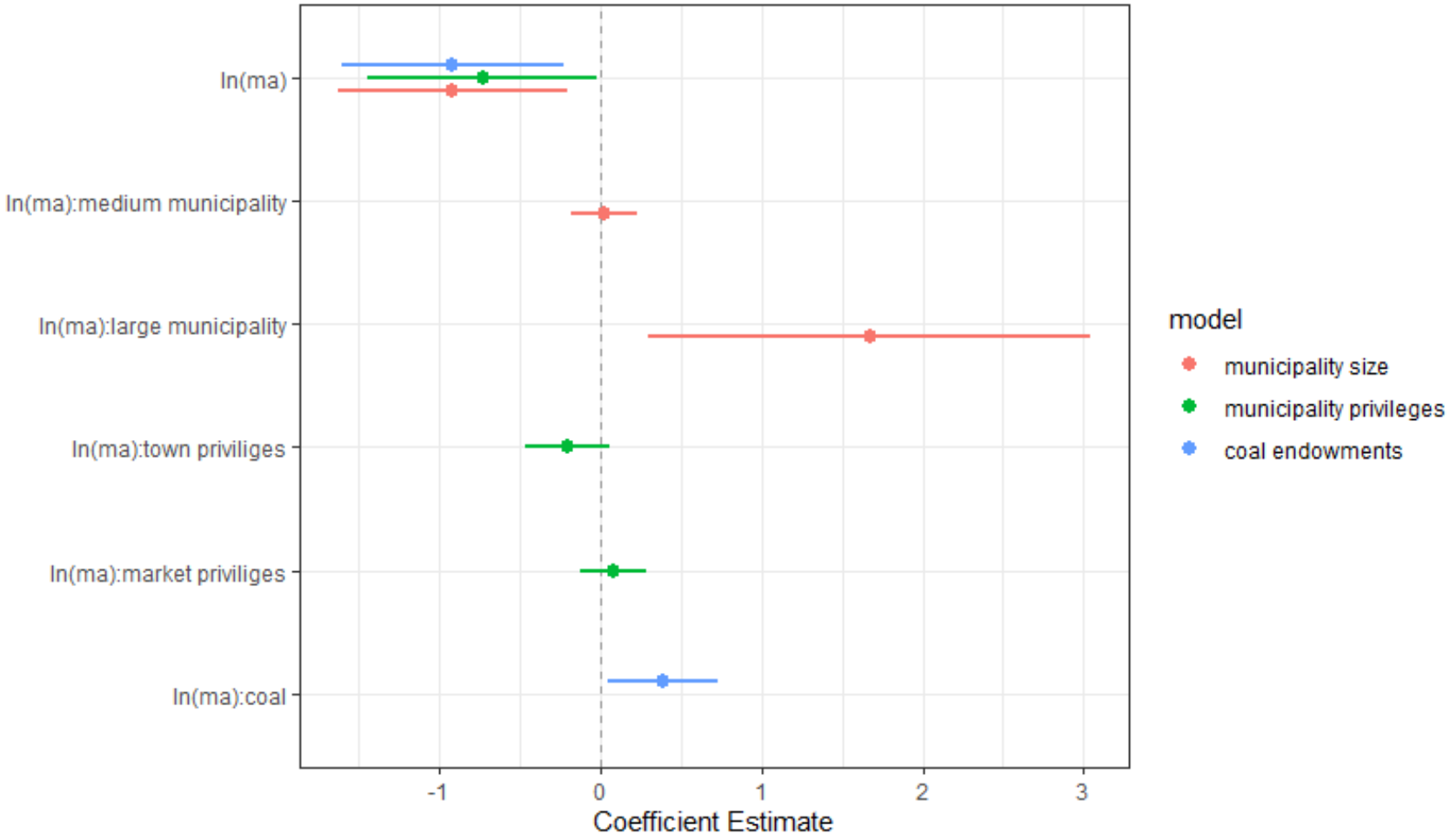
Market access (treatment variable)

N = 3,369 t = 3

Regression results

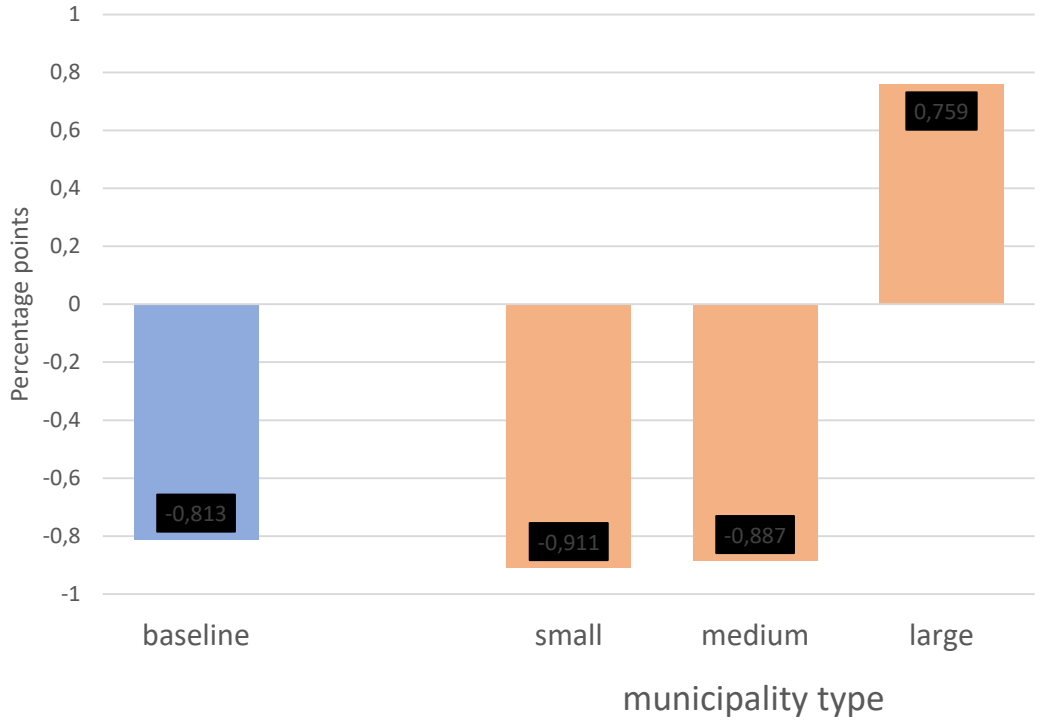


Interaction models

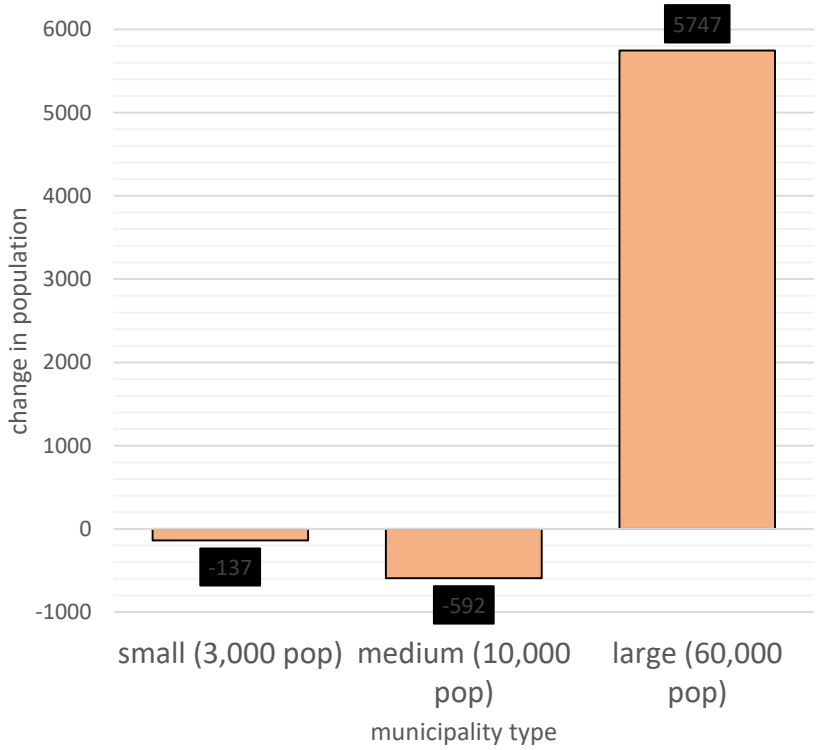


Average marginal effect of a one percent increase of market access on population growth in the subsequent decade

Change in the annual population growth rate



Change in population



Conclusion

- Large scale transport investments can lead to a reduction in economic activity in peripheral regions. Decreasing transport costs strengthens agglomeration forces and relocated economic activity towards the core

- The response to market access might be also dependent on factor endowments. But in the case of the Habsburg monarchy agglomeration forces and access to consumer markets were a much more important determinant for location decisions

- These findings might be relevant for large scale transport infrastructure projects - especially in developing countries - where spatial disparities are particularly pronounced, and rural-urban migration is already a major problem