

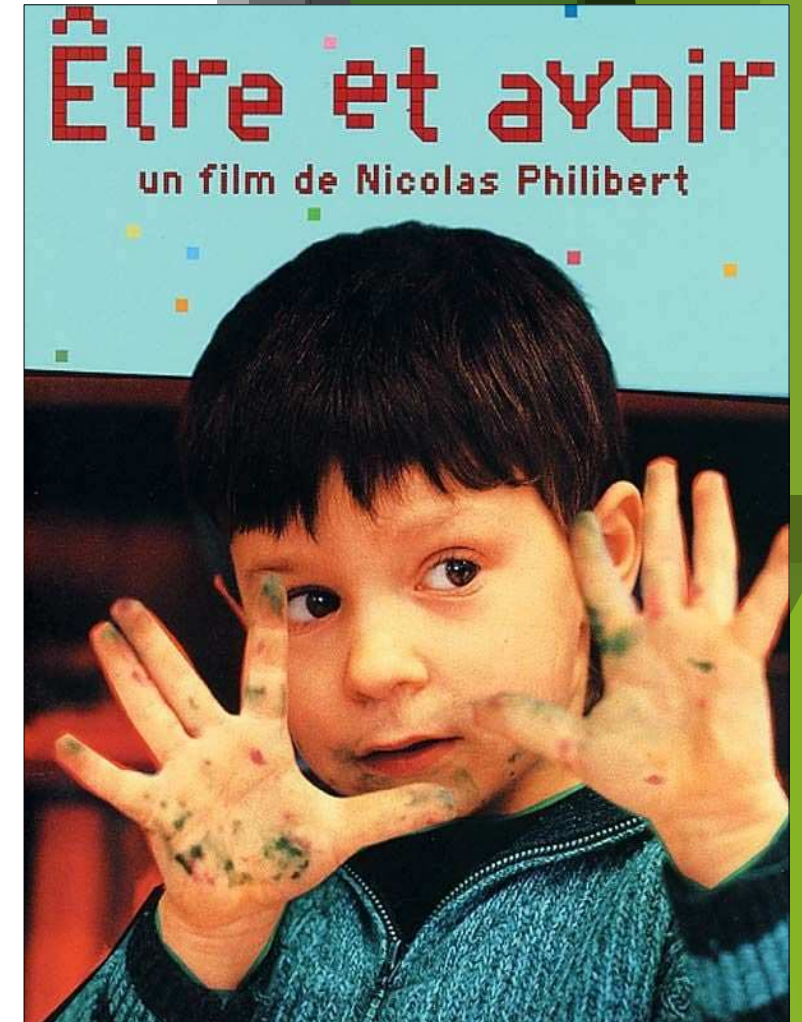
# Service provision in areas with low demand densities

A trilemma

Chris Jacobs-Crisioni (Bureau Jacobs-Crisioni)

Agorantic seminar, 16/4/2016

Project together with European Commission, OECD and Object Vision

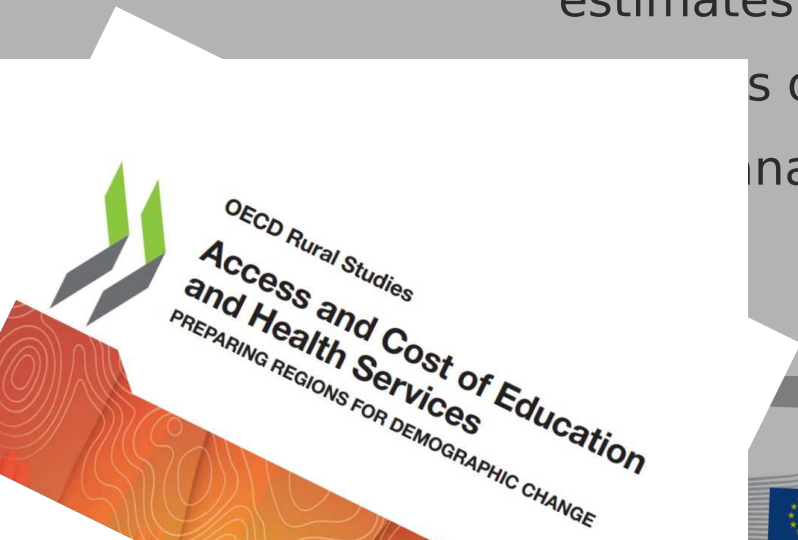


# Work done for the JRC territorial development unit

Some of 'our' work:

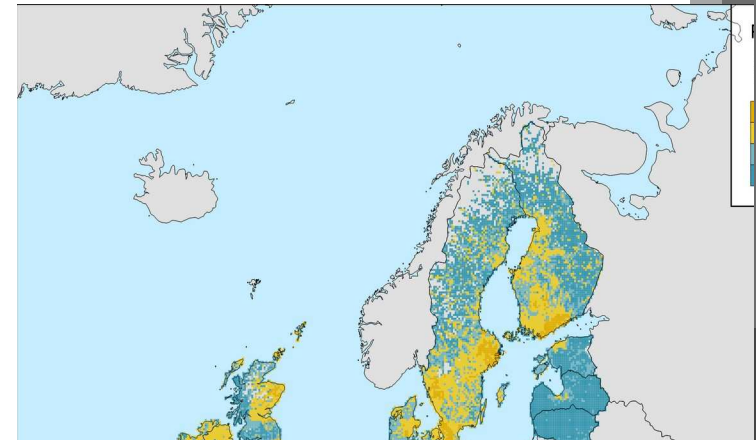
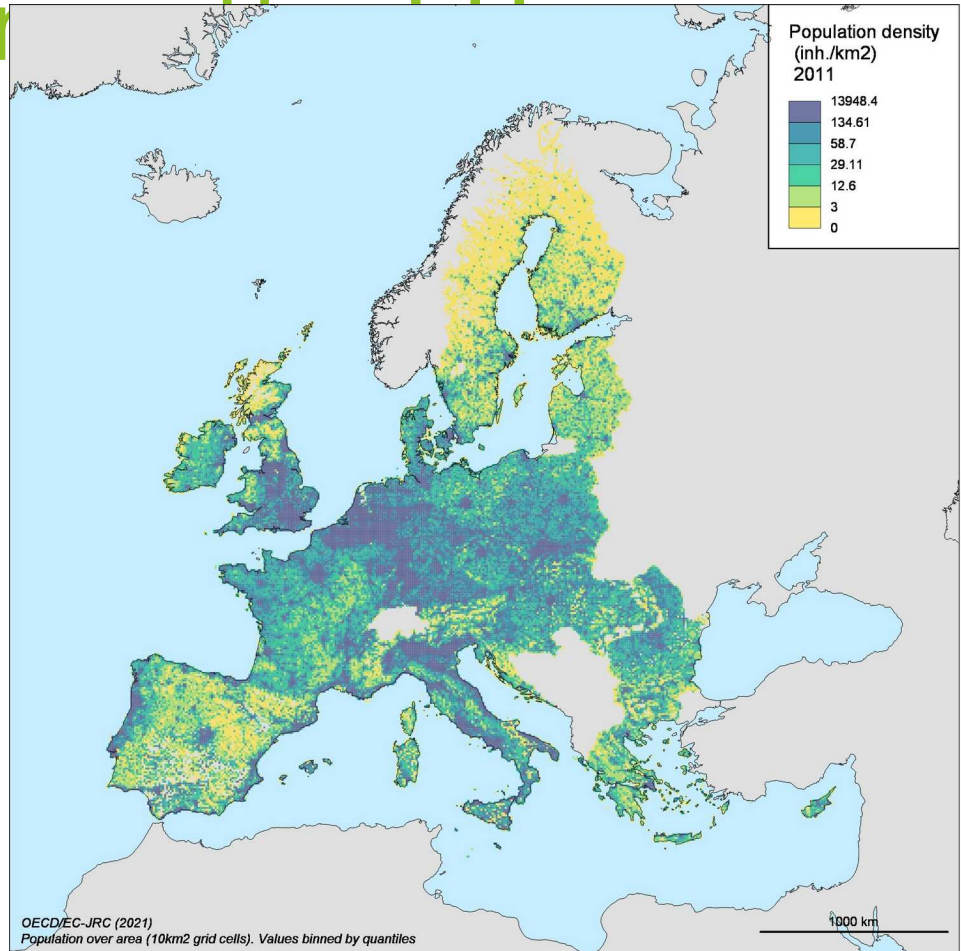
- ▶ Defining degrees of urbanization, agglomerations across time and functional geographies
- ▶ Territorial modelling for fine-resolution projections, accessibility estimates

... of housing prices, trust in institutions, energy poverty  
... analysing current and future service provision in



# Population decline and ageing will thin service demand densities across the EU

across the EU

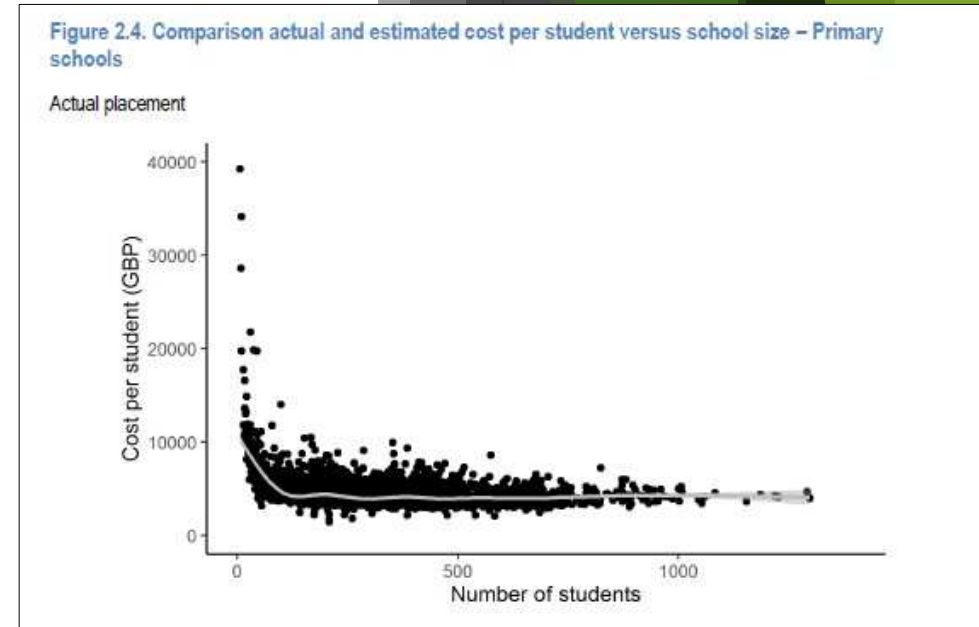


Sources: OECD & EC-JRC (2021) Access and cost of education and health services  
Population trends based on Geostat11 grids, 2018 EUROSTAT regional projections, LUISA+IGOR simulations

# Public services requiring face-to-face contact

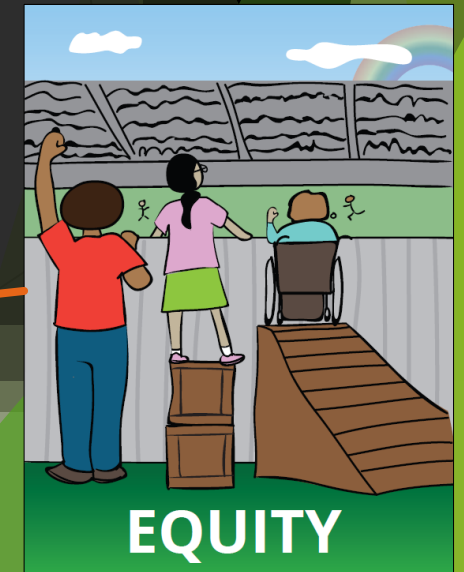
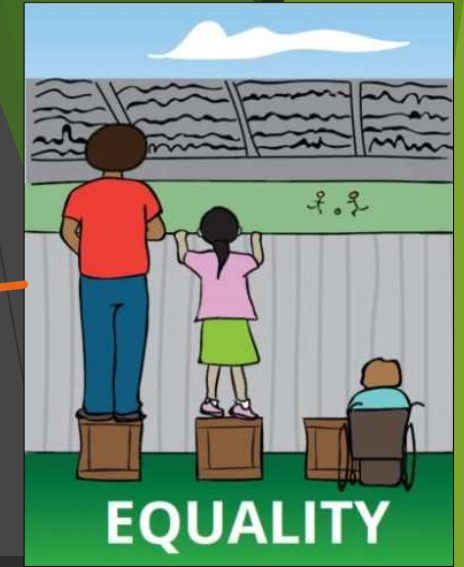
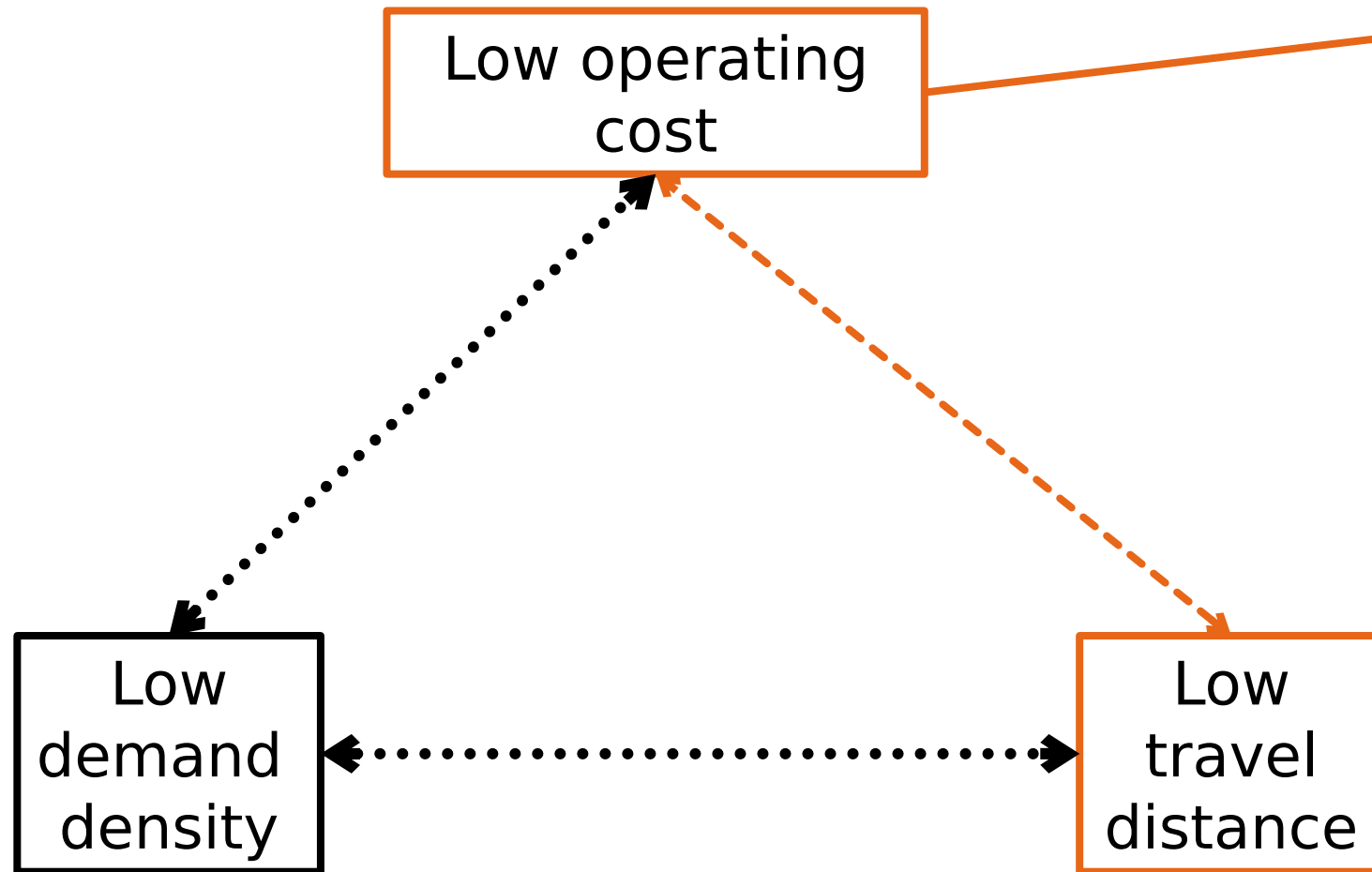
- ▶ Services are subject to agglomeration economies
- ▶ Demand is affected by regional demographics
- ▶ Territories participating in a tug-of-war for scarce public funding

Central question: what are the accessibility challenges for local service delivery, looking beyond administrative boundaries, and looking further than today?

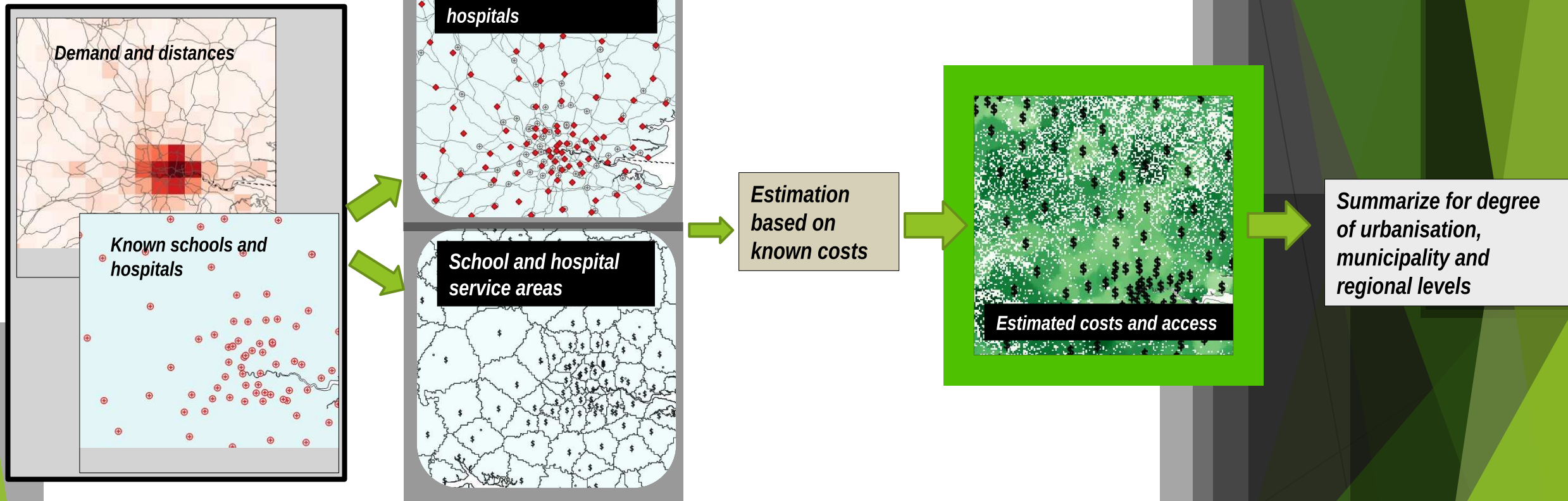


Agglomeration economies in observed school costs (OECD & JRC, 2021).

# Regional service provision is a trilemma (you can have two out of three)



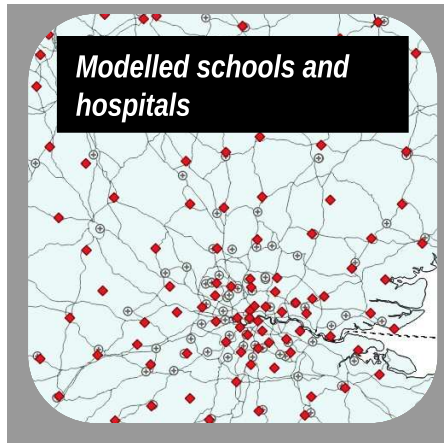
# > Exploring the implications: A model chain to estimate service locations, attendance, access and cost



Jacobs-Crisioni, C., Moreno-Monroy, A.I., Kompil, M. *et al.* (2024) Estimating school provision, access and costs from local pupil counts under decentralised governance. *J Geogr Syst* **26**, 7-46

OECD & EC-JRC (2021) Access and cost of education and health services

# A model chain to estimate service locations, attendance, access and cost

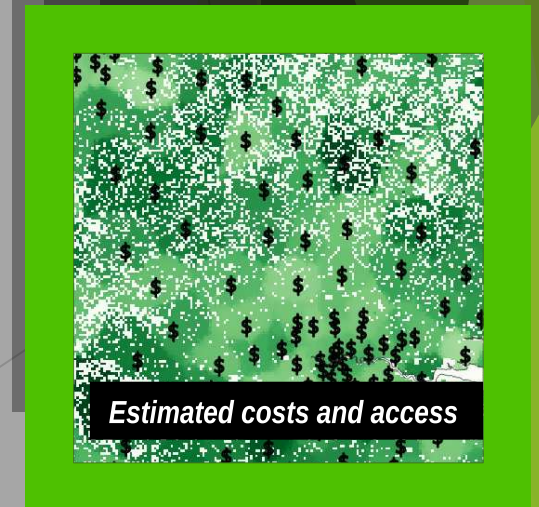


## Decentralized governance

1. Check “free” students in 1km grid cells that are within max. travel time.
2. If nr of free students exceeds minimum threshold, put a service location central between these students.
3. Remove students from the “free” pool

## SIM to distribute and balance attendance

1. Every student gets a choice of five closest schools.
2. Allocate based on  $\text{traveltime}^{-2}$
3. One-pass rebalance school attractiveness for under/overshoot, reallocate students



# Can we maintain access outside cities, given decentralized governance?

Figure 3.16. Travelled road distance to schools, per student and per degree of urbanisation

Primary schools

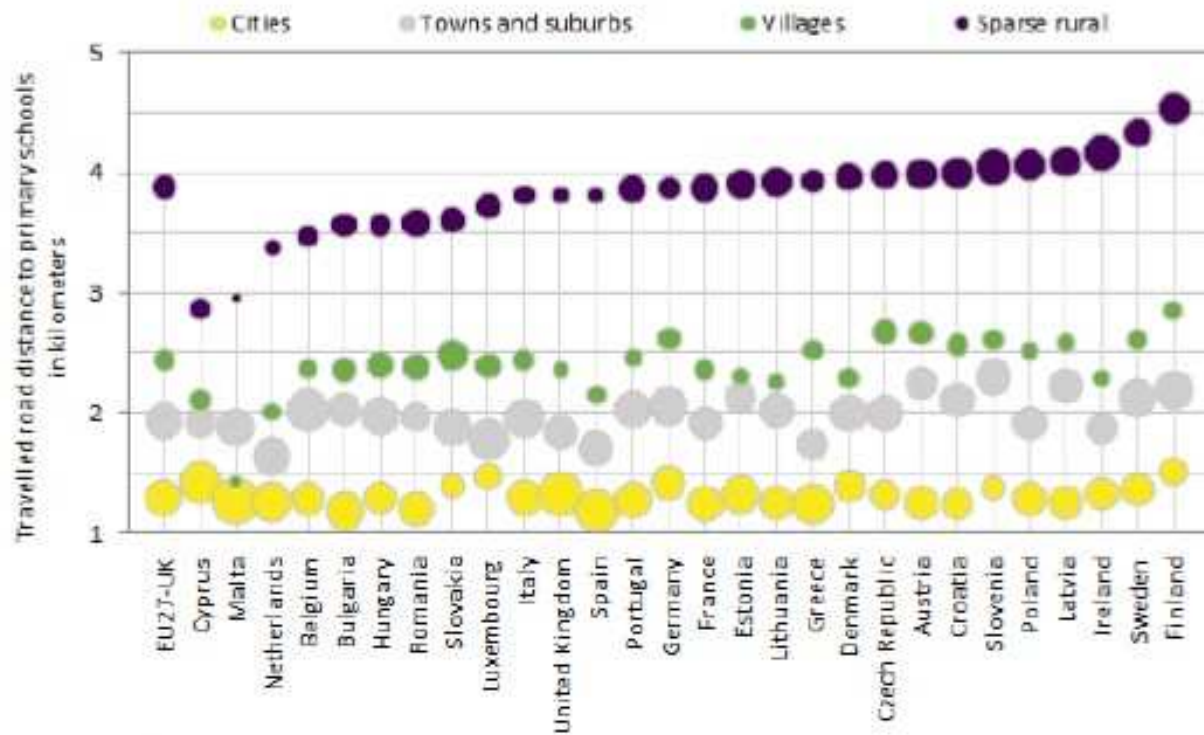
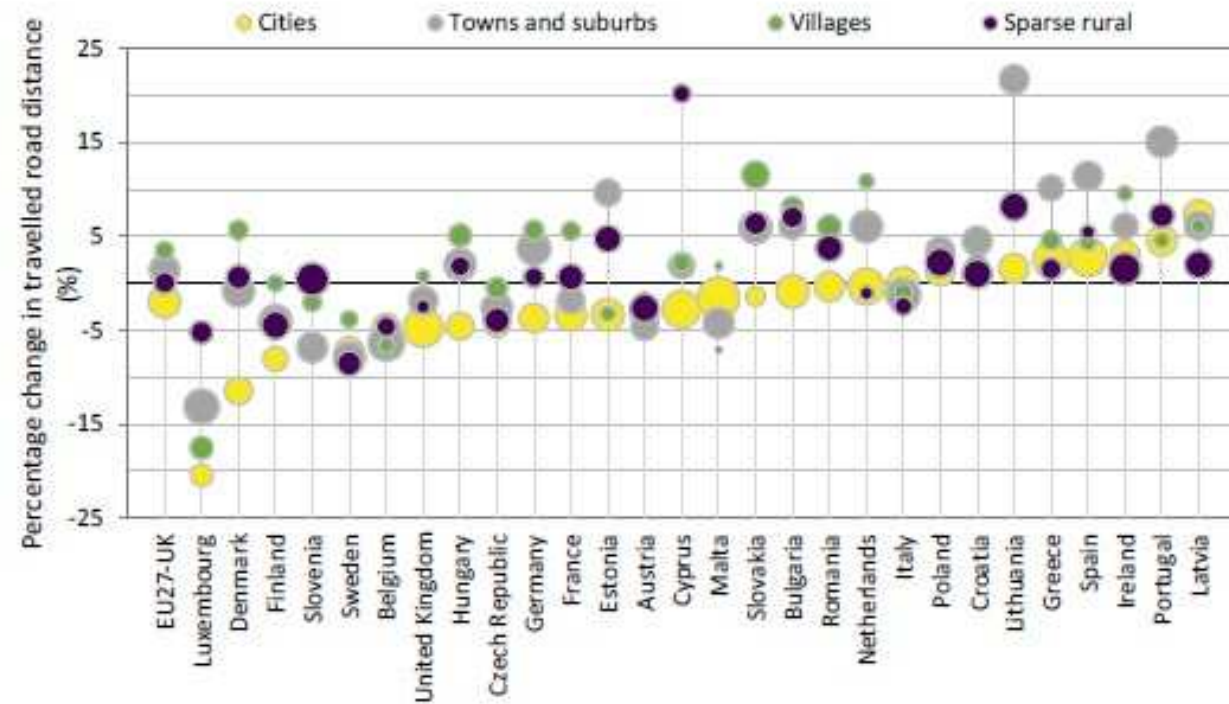


Figure 3.22. Percentage change in travelled road distance to modelled primary schools between 2011 and 2035, per student and per degree of urbanisation (%)

Primary schools



# > Ongoing OECD-JRC study: exploring the outcome of coordinated location strategies

- ▶ How much accessibility can we have? How much accessibility is enough? Can coordination improve equity at low cost?
- ▶ Avoid the normative, and explore costs and access bandwidths given centralized coordination
  - ▶ Minimizing general distances travelled, vs
  - ▶ Applying a maximum travel time allowed, vs
  - ▶ Imposing minimum facility sizes
- ▶ Currently: calibrating coordinated location-allocation methods

# Modelling chain

## Context: GeoDMS

- Travel times and distances
- Demand in 1km nodes
- Locations

Demand: IGOR 1km grids (sex x 5y age cohort), 2021

Distances / times: optimised TomTom networks

Future: EUROCRISP results (sex x 5y age cohort, 2040?)

## Solve: Julia

- Needs cost functions, balancing of access and cost considerations
- Solution through greedy algorithm or linear

Currently: only existing school locations used to search for openings / closures

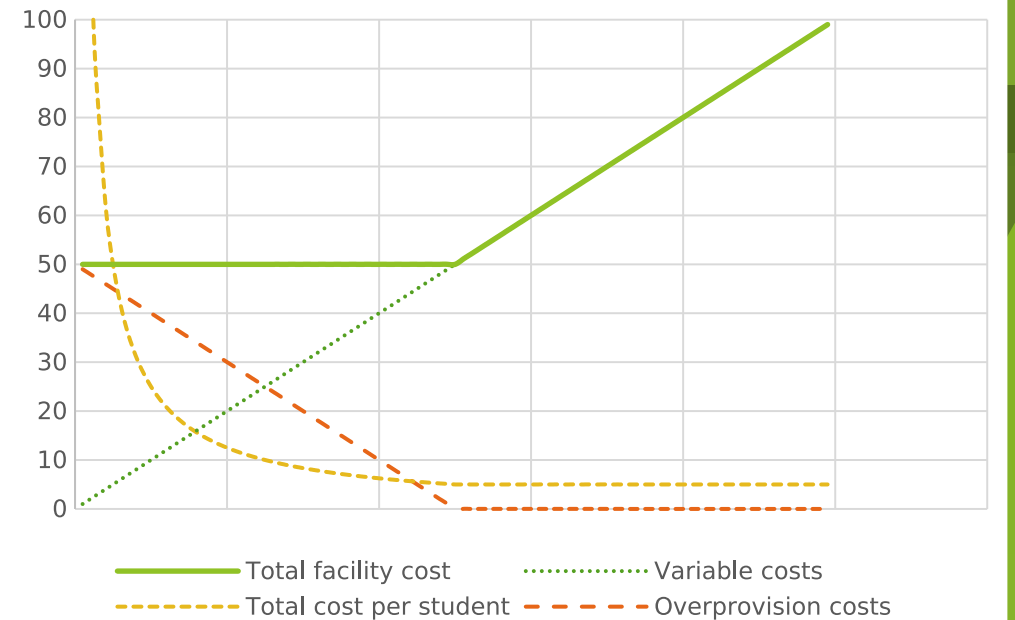
Planned: extend search locations, include all nodes that meet criteria

## Report: GeoDMS

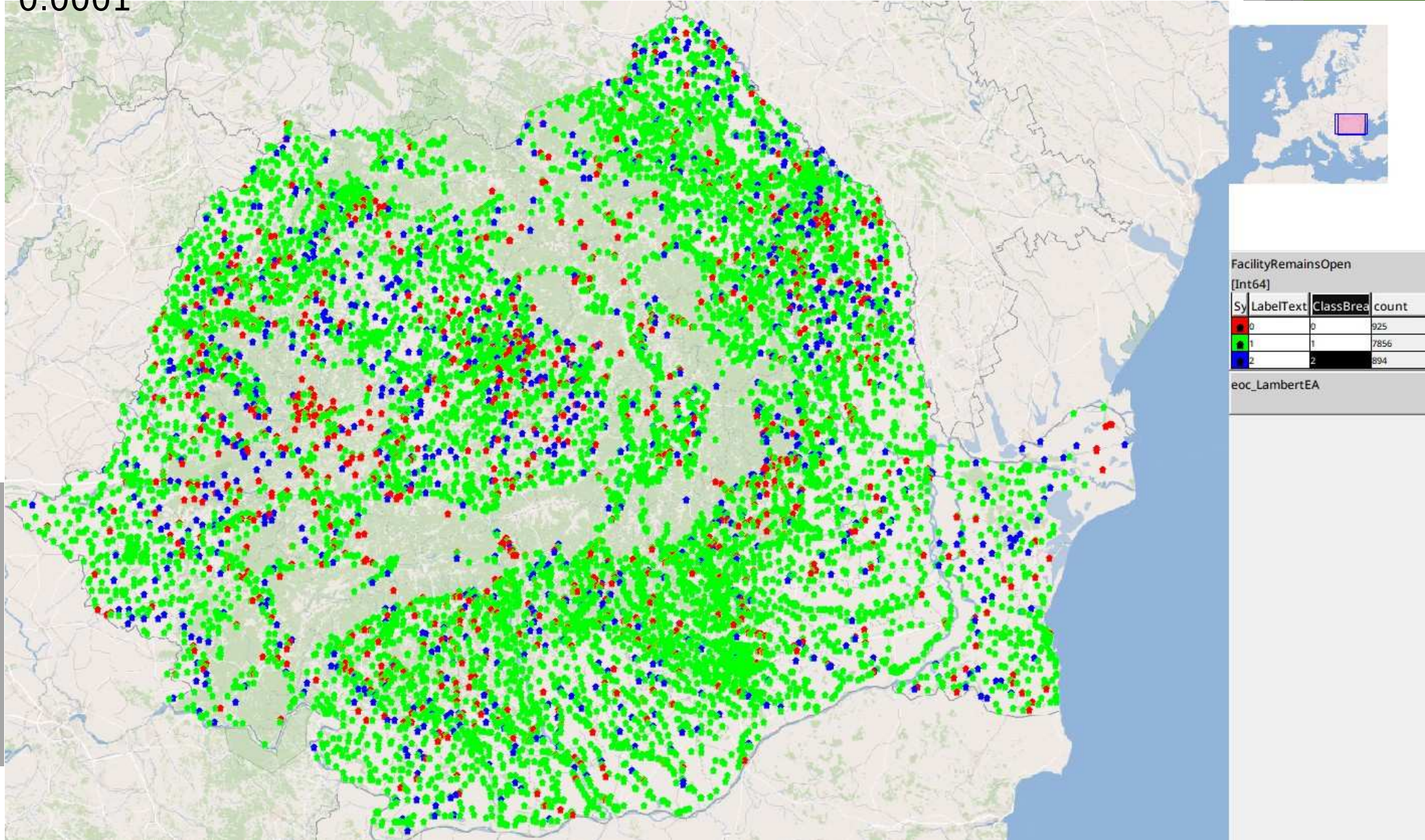
- Geodata with openings / closings
- Estimates of change in cost, accessibility

# Ongoing: grid search of parameters

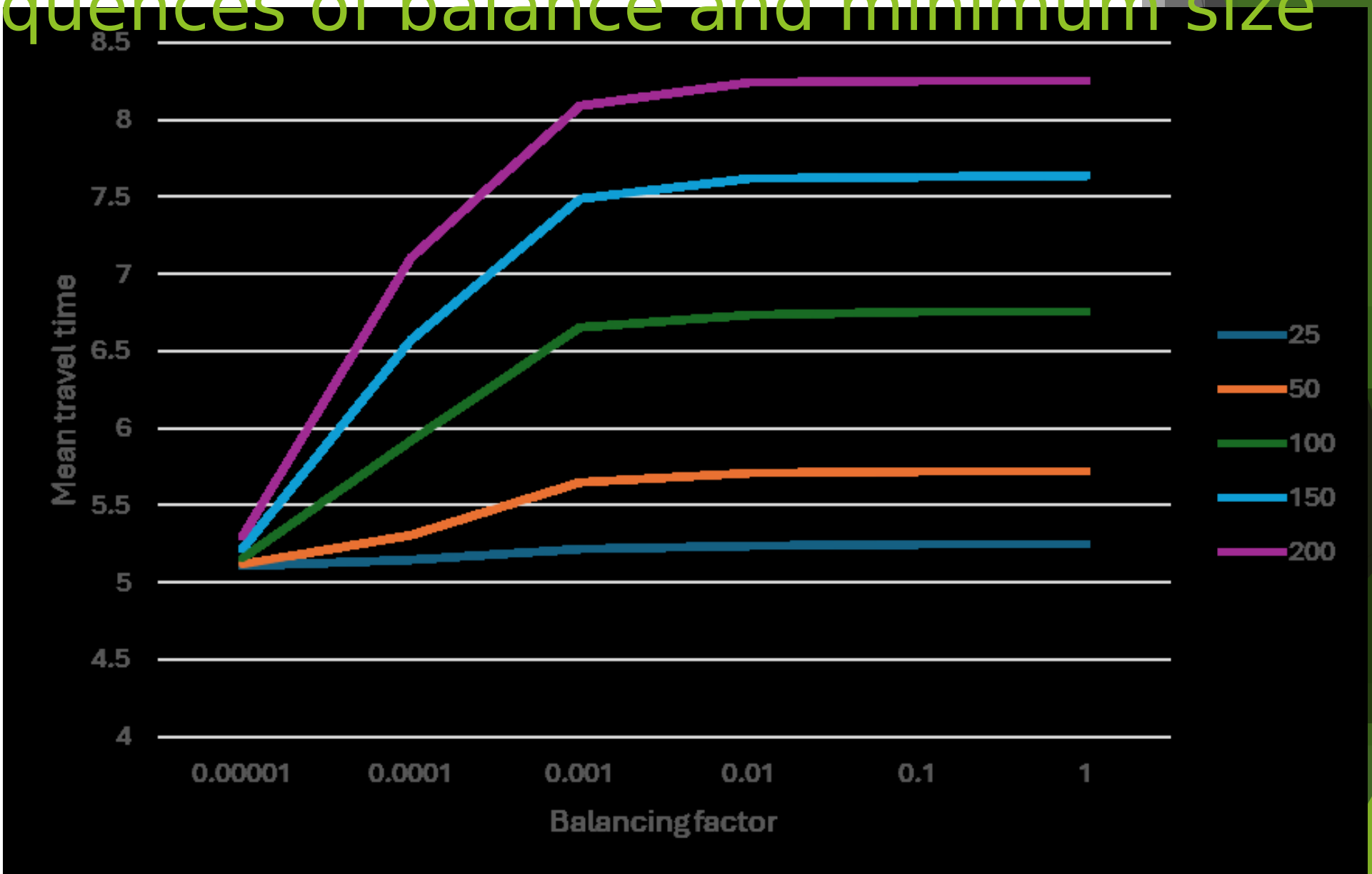
- ▶ With **linear** or quadratic travel cost functions
- ▶ Facility cost function depends on the degree of under-enrollment (e.g., if a school has many students, we don't care about its cost.)
- ▶ Students are assigned to the **nearest** open school
- ▶ If a school has less than a specified number of students (*min\_students*), we consider a linear overprovision cost that decreases with number of  $1 \leq \text{students} \leq \text{min size}$



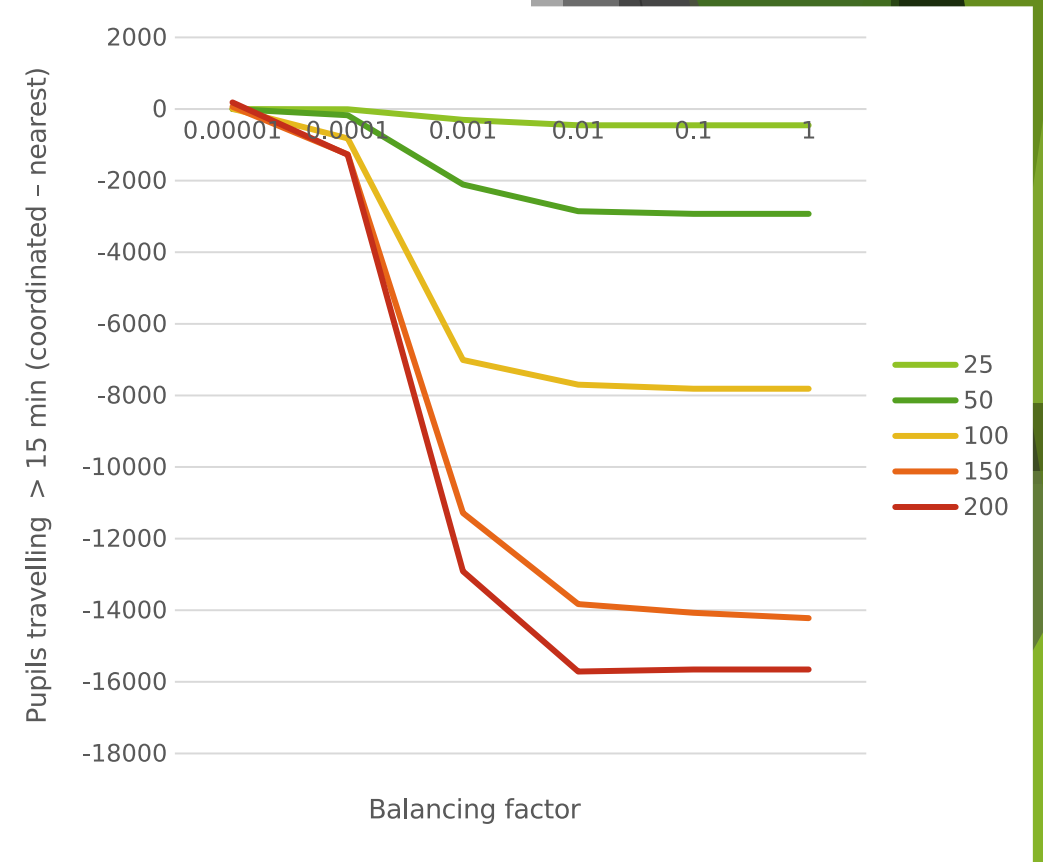
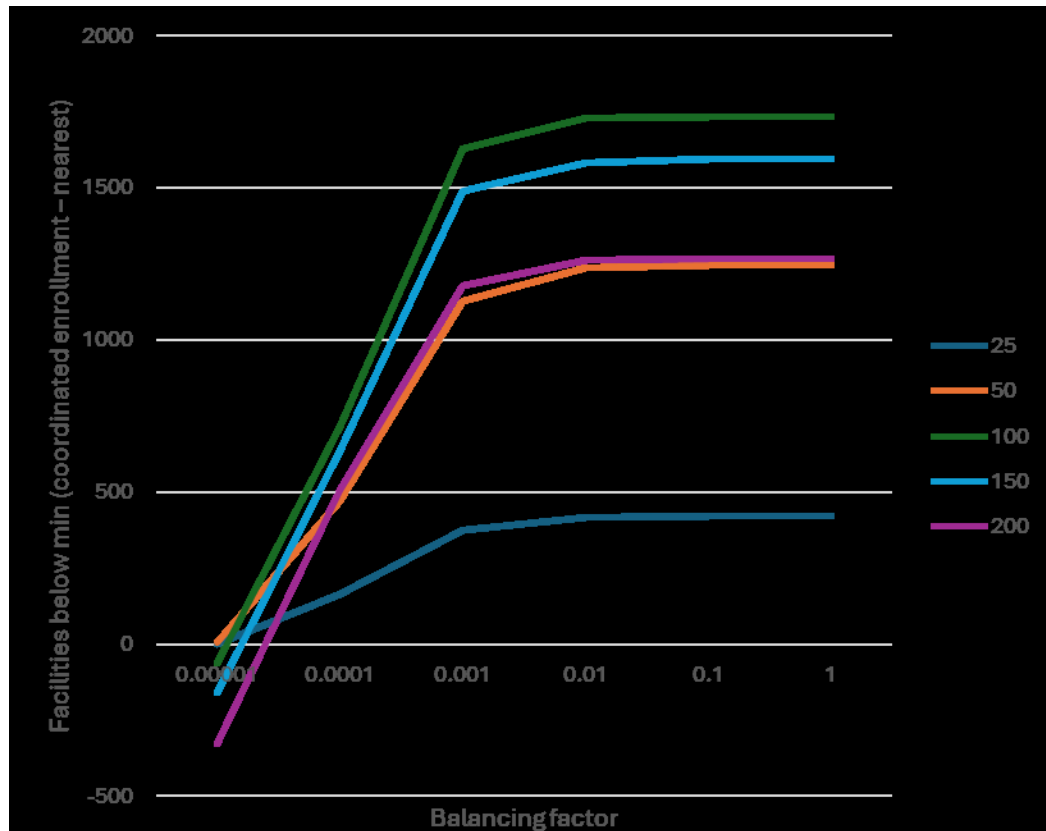
Scenario 1a, using a linear travel cost function for min\_students = 50, policy\_weight = 0.0001



# Mean travel time: consequences of balance and minimum size



# What if we coordinate pupil enrollment?



# Conclusions

- ▶ Demand for public services is affected by ageing and population decline
- ▶ Published work shows that, with decentralised governance, access to public services will decline substantially in many of Europe's rural areas
- ▶ Ongoing work to quantify:
  - ▶ How much central coordination can improve outcomes versus decentralised decisions?
  - ▶ The 'elasticity' of equitable accessibility to subsidies?

# Thank you!

Stay in touch:  
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