12-1988: High-Resolution Destination Choice in Agent-Based Demand Models

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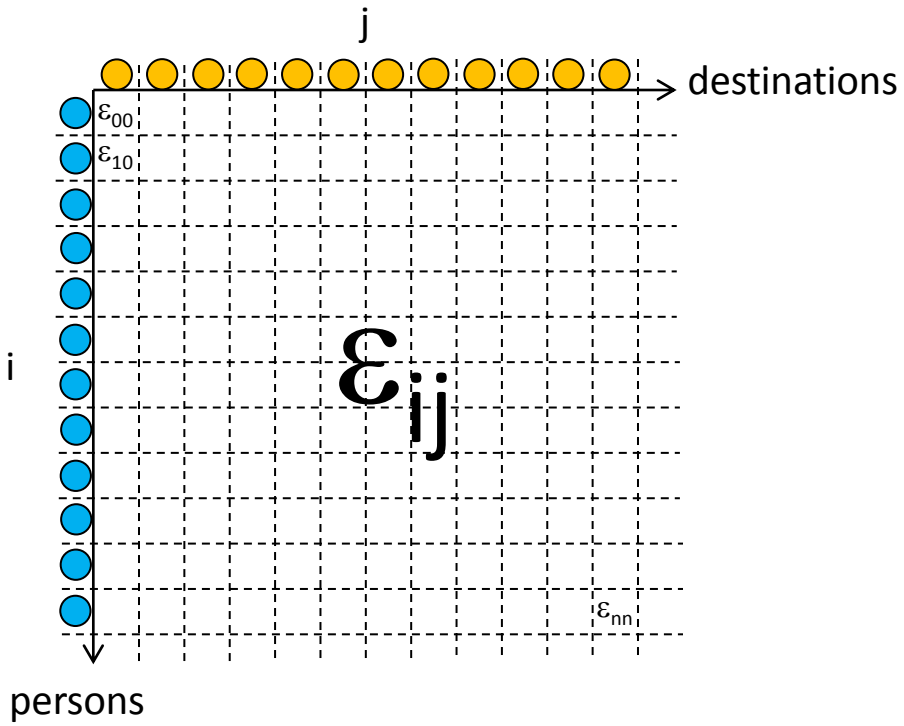
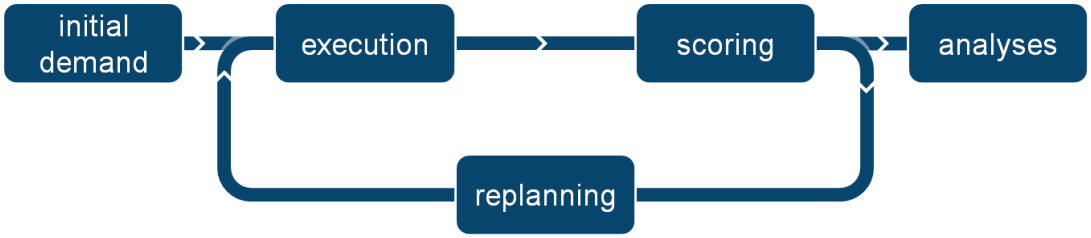


MATSim Shopping and Leisure Destination Choice

Multi-**A**gent **T**ransport **Sim**ulation MATSim

MATSim
utility function
(absolute utilities)



destination
choice

Earlier MATSim Destination Choice Approach: Local Search

time geography Hägerstrand

day plans
fixed and discretionary activities

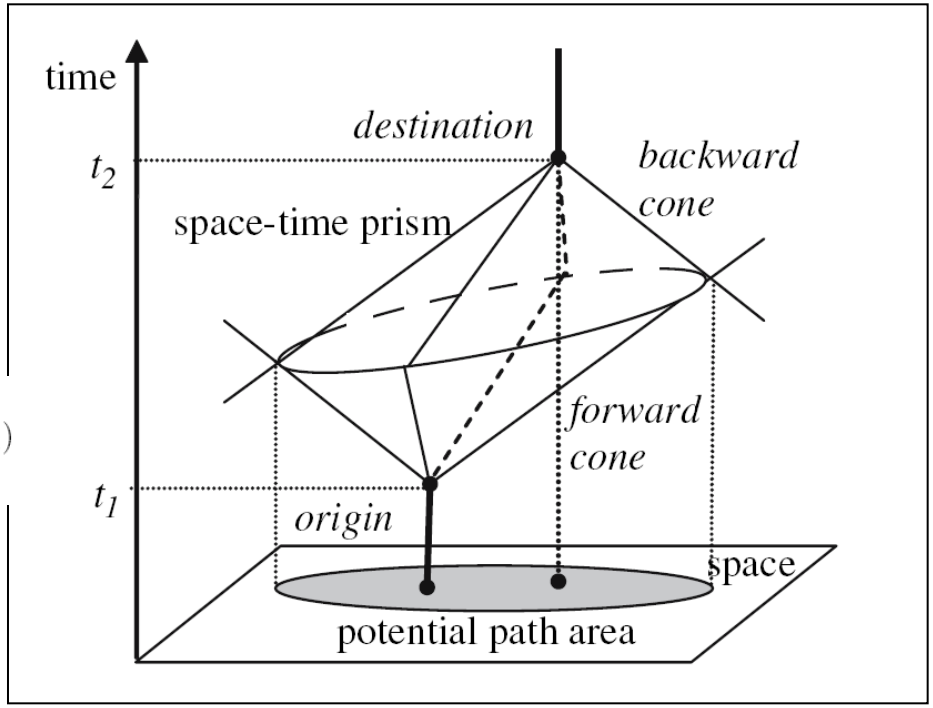
travel time budget

relatively small set of locations per iteration step

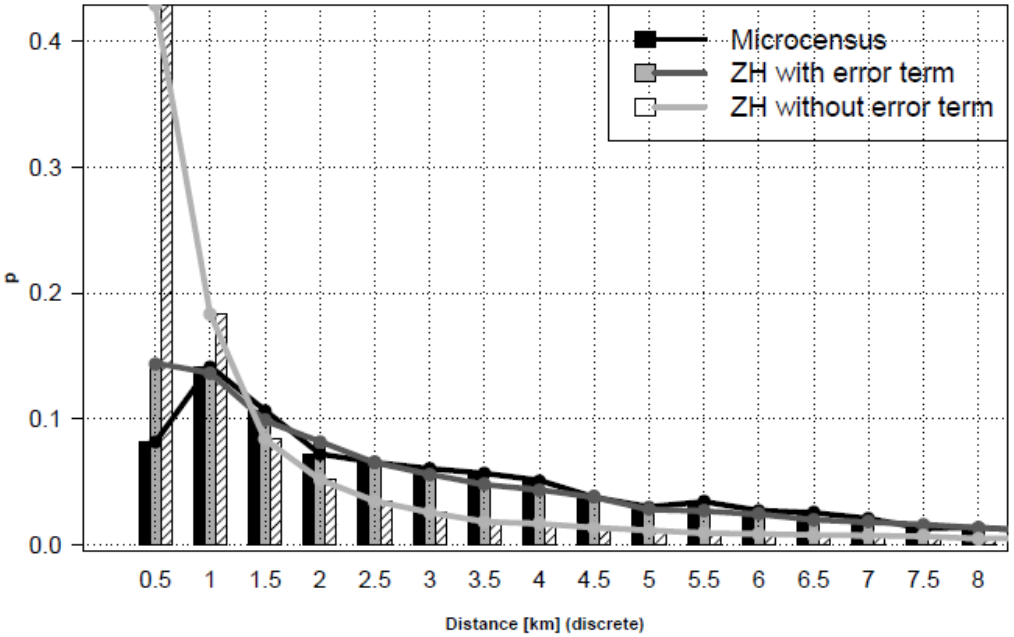
$$F = \sum_{i=1}^{n} U_{act,i}(type_i, start_i, dur_i) + \sum U_{trav,i}(loc_{i-1}, loc_i)$$

+

Competition effects at destinations
-> utility reduction



MATSim and Heterogeneity



$$F = \sum_{i=1}^{n} U_{act,i}(type_i, start_i, dur_i) + \sum U_{trav,i}(loc_{i-1}, loc_i) \quad + \varepsilon_{explicit}$$

$$V + \varepsilon_{implicit}$$

why not only random coefficients?

$$U = \eta_{distance} \times distance \quad , \text{with } \eta \sim N(\beta, \sigma_{tastes})$$

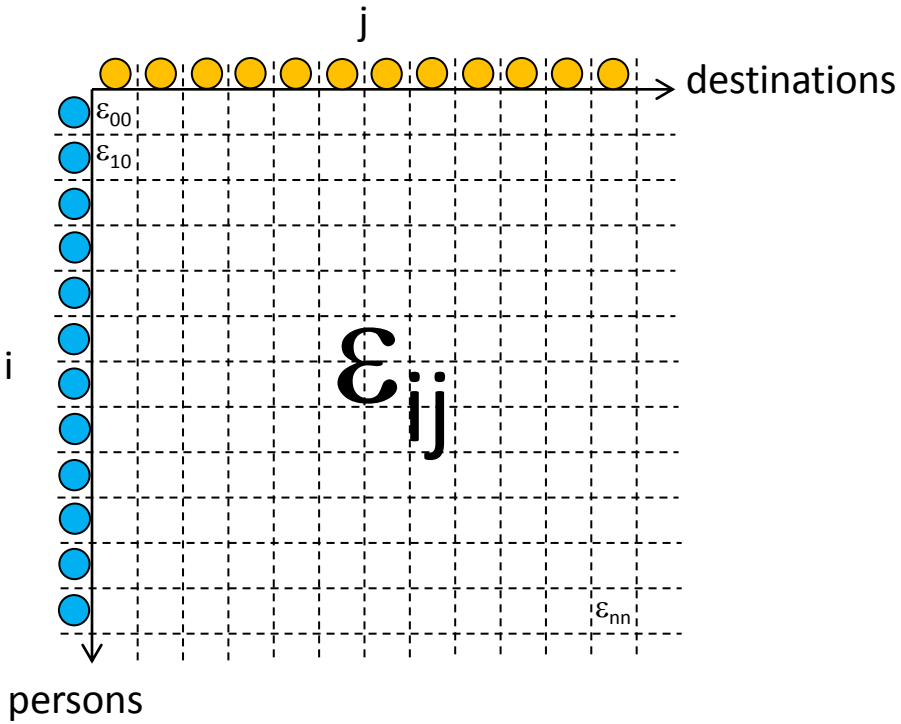
-> bipolar distance distribution due to iterative approach

A Step Back

Adding heterogeneity: conceptually easy, full compatibility with DCM framework

But: technically tricky for large-scale application

Repeated Draws: Quenched vs. Annealed Randomness

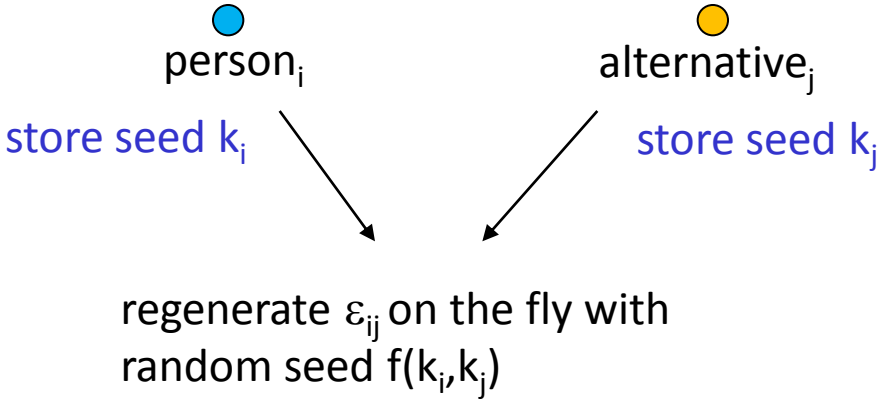


- fixed initial random seed
- freezing the generating order of ε_{ij}

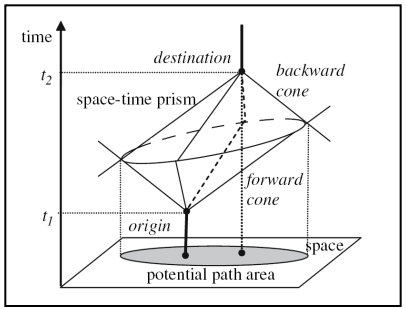
one additional random number can destroy «quench»

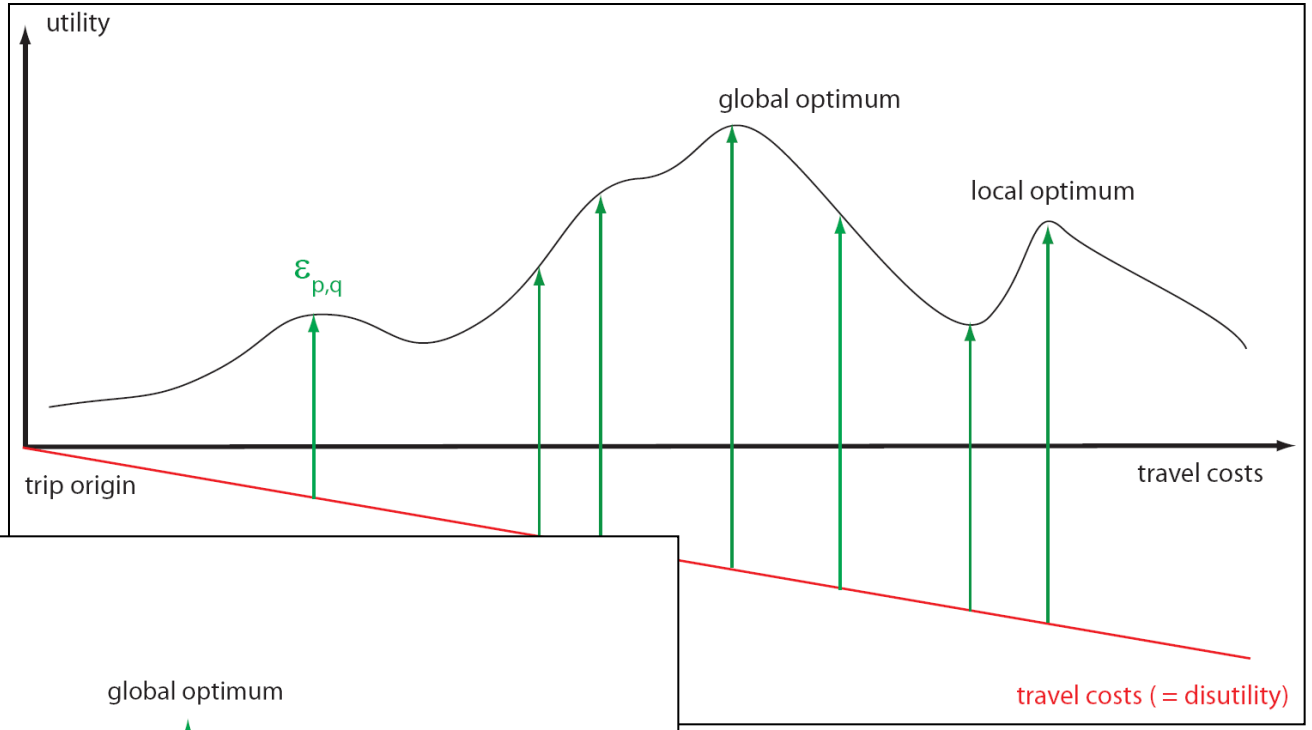
- storing all ε_{ij}

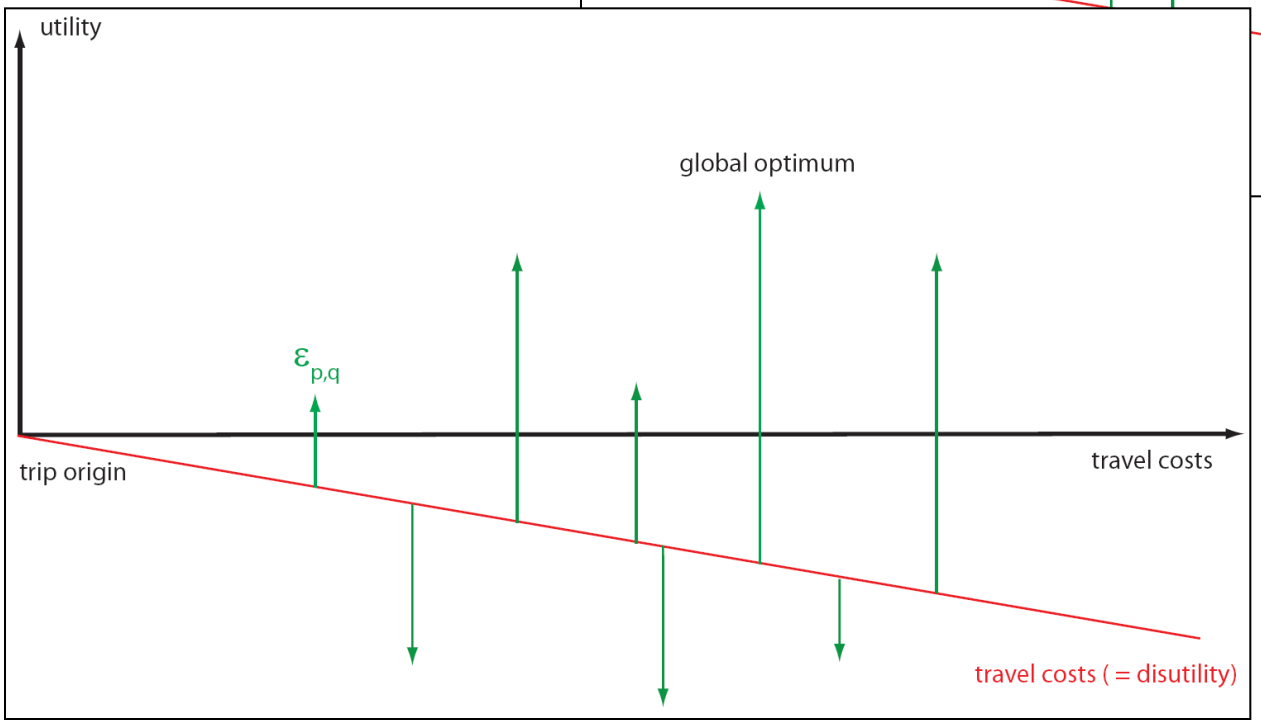
$i,j \sim O(10^6) \rightarrow 4 \times 10^{12}$Byte (4TByte)



Search Method: Local vs. Best Response







Search Space Boundary

search space boundary d_{max} = …

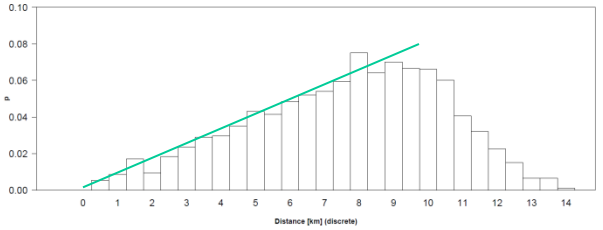
costs(destination(ε_{max}))

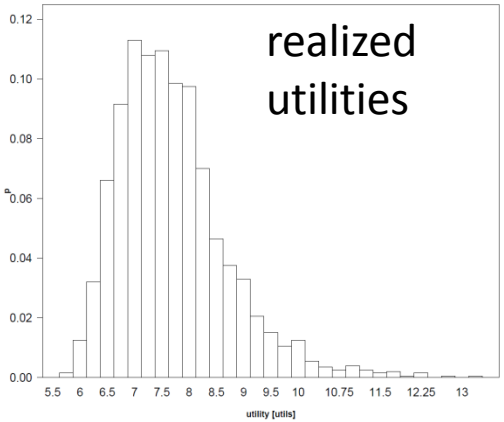
$\varepsilon_{max} - \beta t_{travel} = 0$

pre-process once for every person

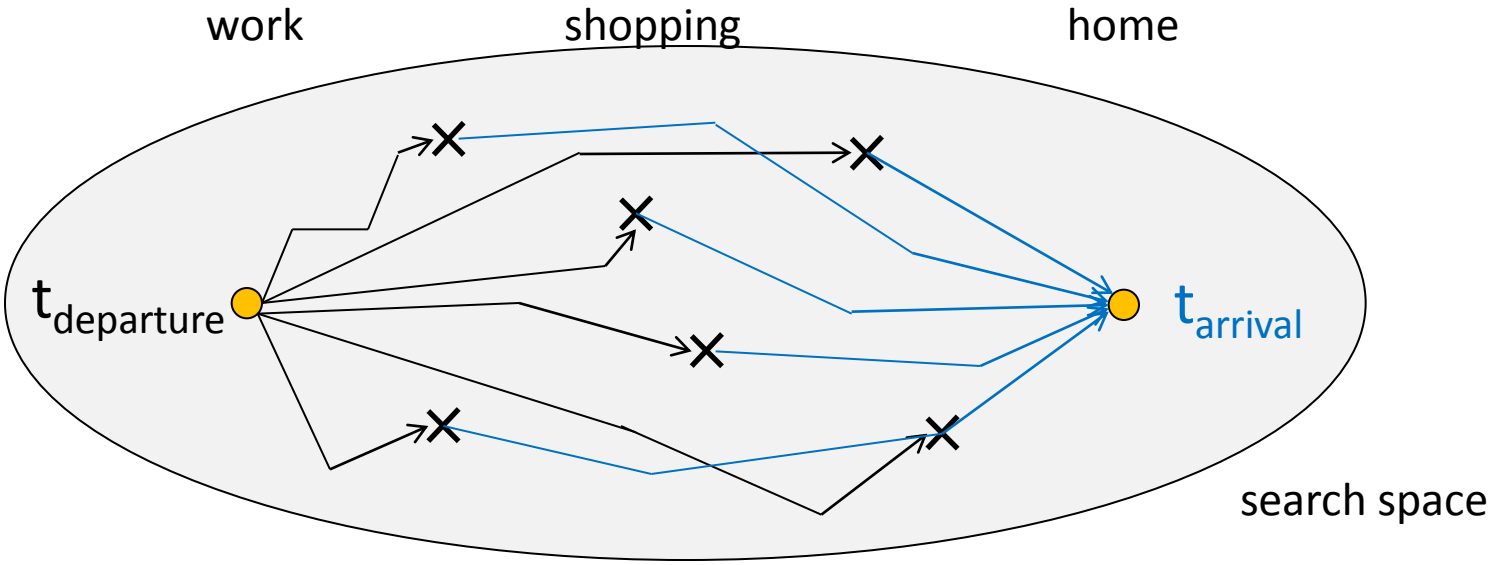
estimate by distance

distance to dest with ε_{max}





Search Space Optimum



Dijkstra forwards 1-n

Dijkstra backwards 1-n

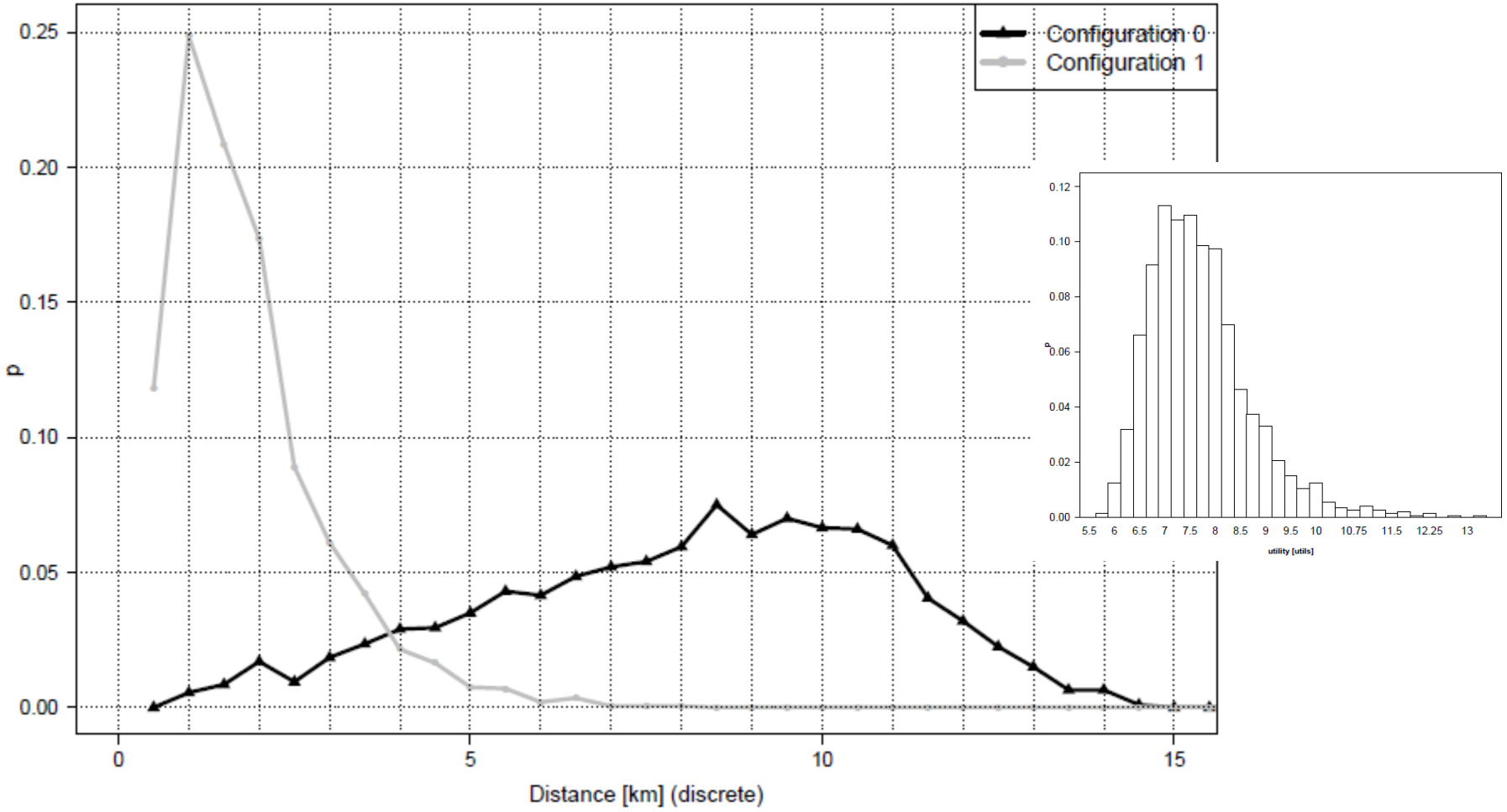
↓

approximation

↓

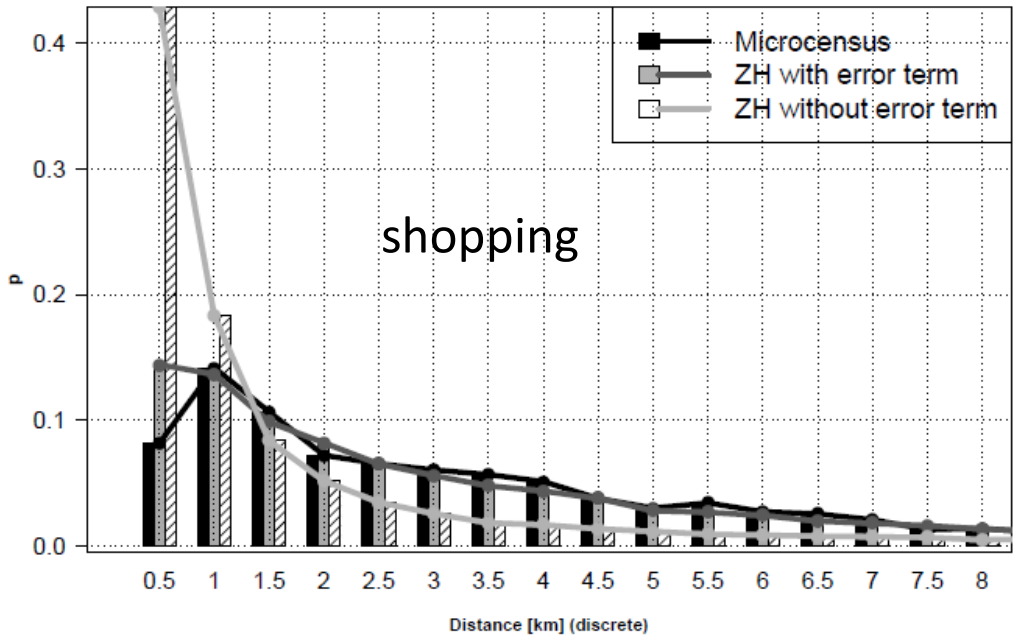
probabilistic choice

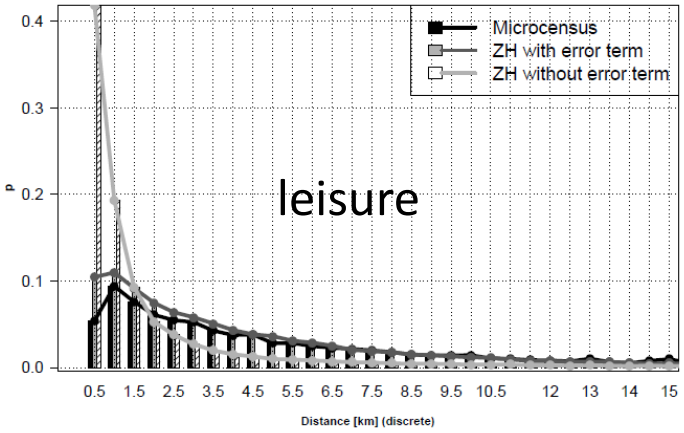
Results: Synthetic Small-Scale Scenario

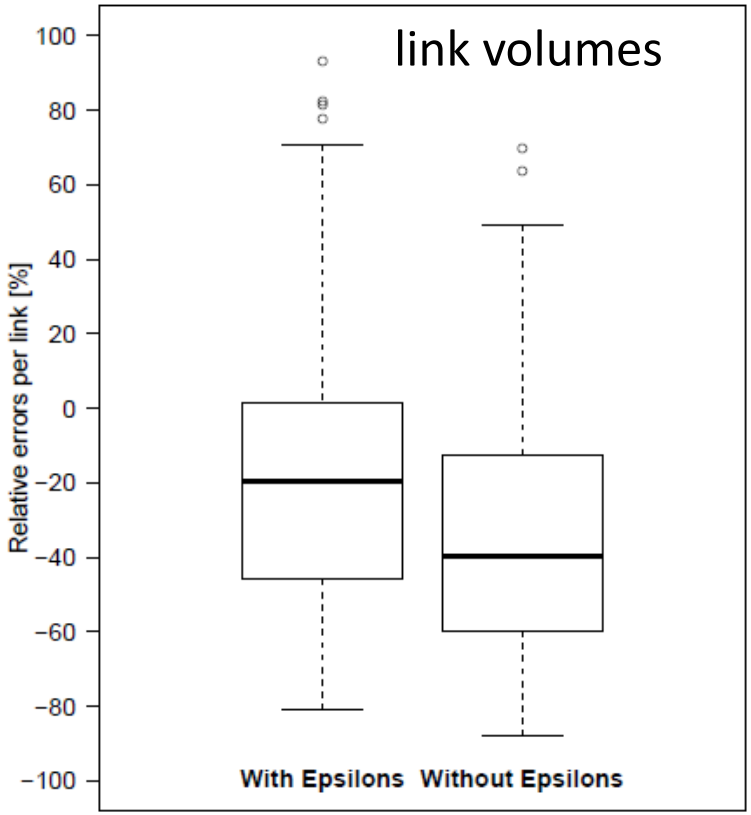


Results: 10% Zurich Scenario

70K agents
25min/iteration
100 iterations

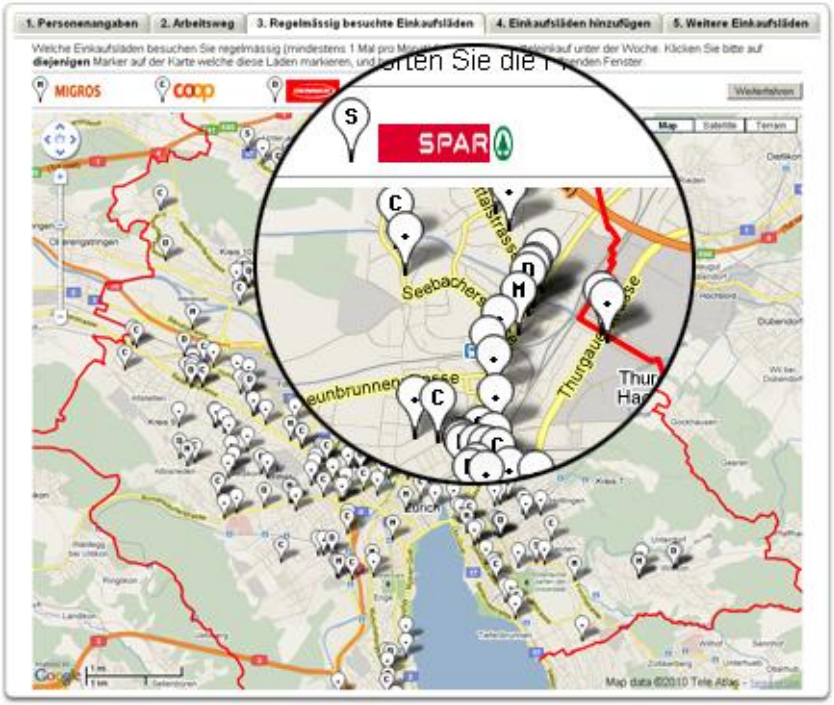






Next Steps

- **utf estimation:**
  - running survey
  - probabilistic choice set generation approaches (-> search space)

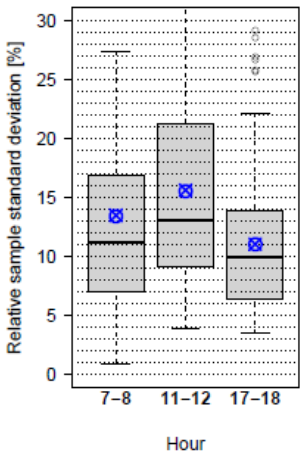


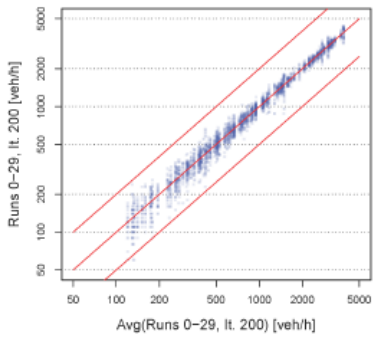
- **variability analysis:**

person$_i$ → seed

alternative$_j$ → seed

Random draws from DCM → ε_{ij}





microsimulation results = random variables X

estimation of parameters for X (=statistic) with random sampling

-> microsimulations are a sampling tool