

# Preferred citation style

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Axhausen, K.W. and M. Feil (2010) Estimating schedule choice models: First experiences, presentation at *Workshop on Discrete Choice Modelling*, EPF Lausanne, August 2010.

# Estimating schedule choice models: First experiences

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IVT  
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August 2010

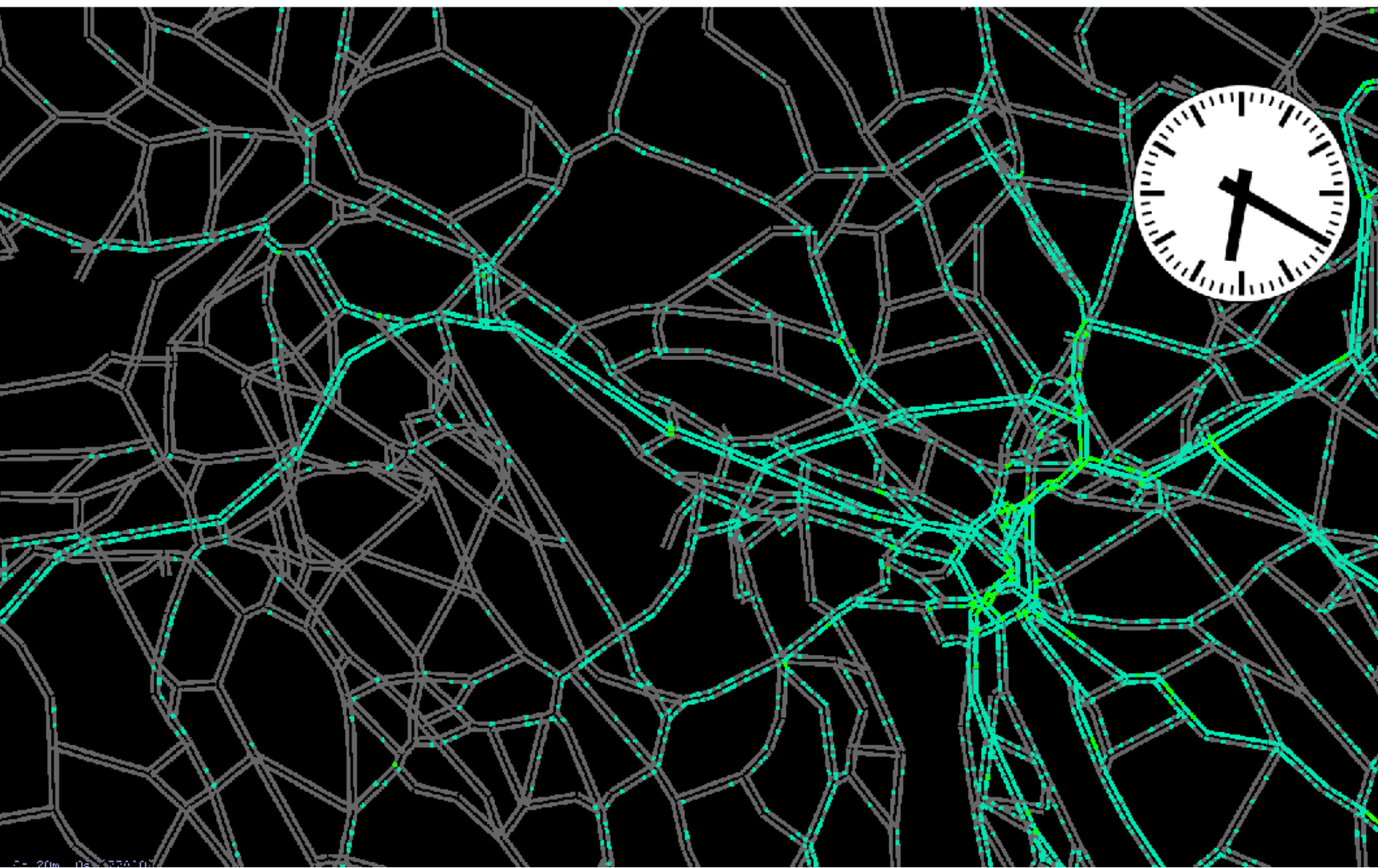
 Institut für Verkehrsplanung und Transportsysteme  
Institute for Transport Planning and Systems

**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

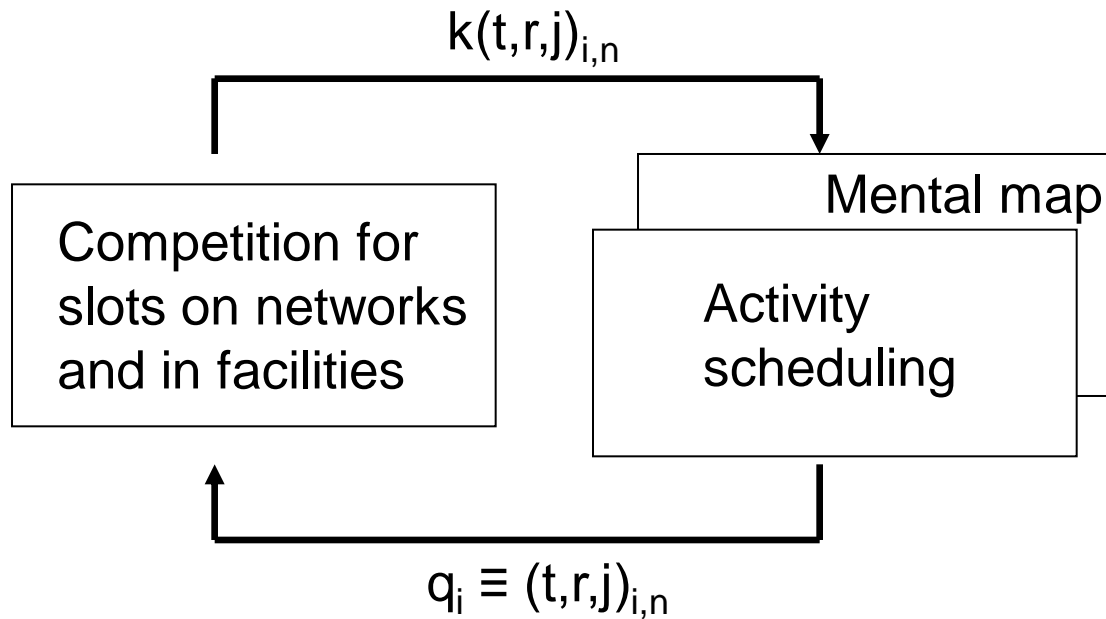
# Simulating a day (with [www.MATSim.org](http://www.MATSim.org))

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# Learning approach of the generic one-day transport model

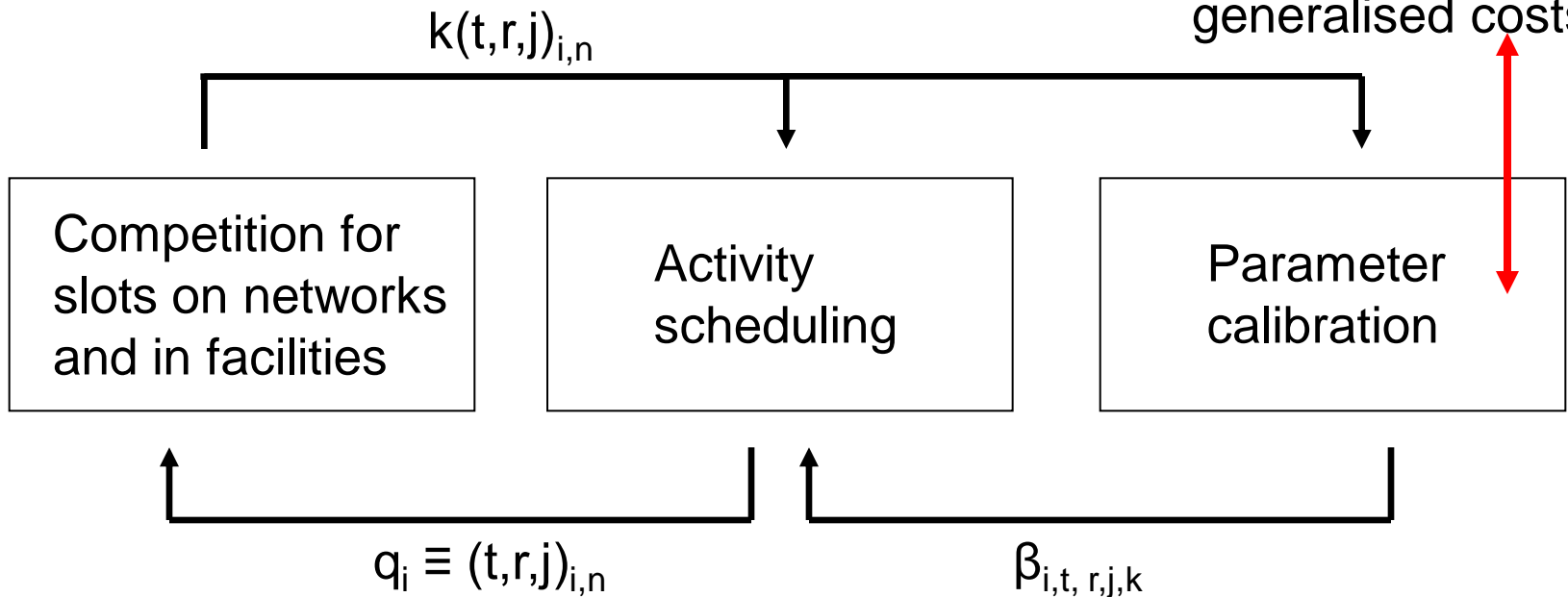
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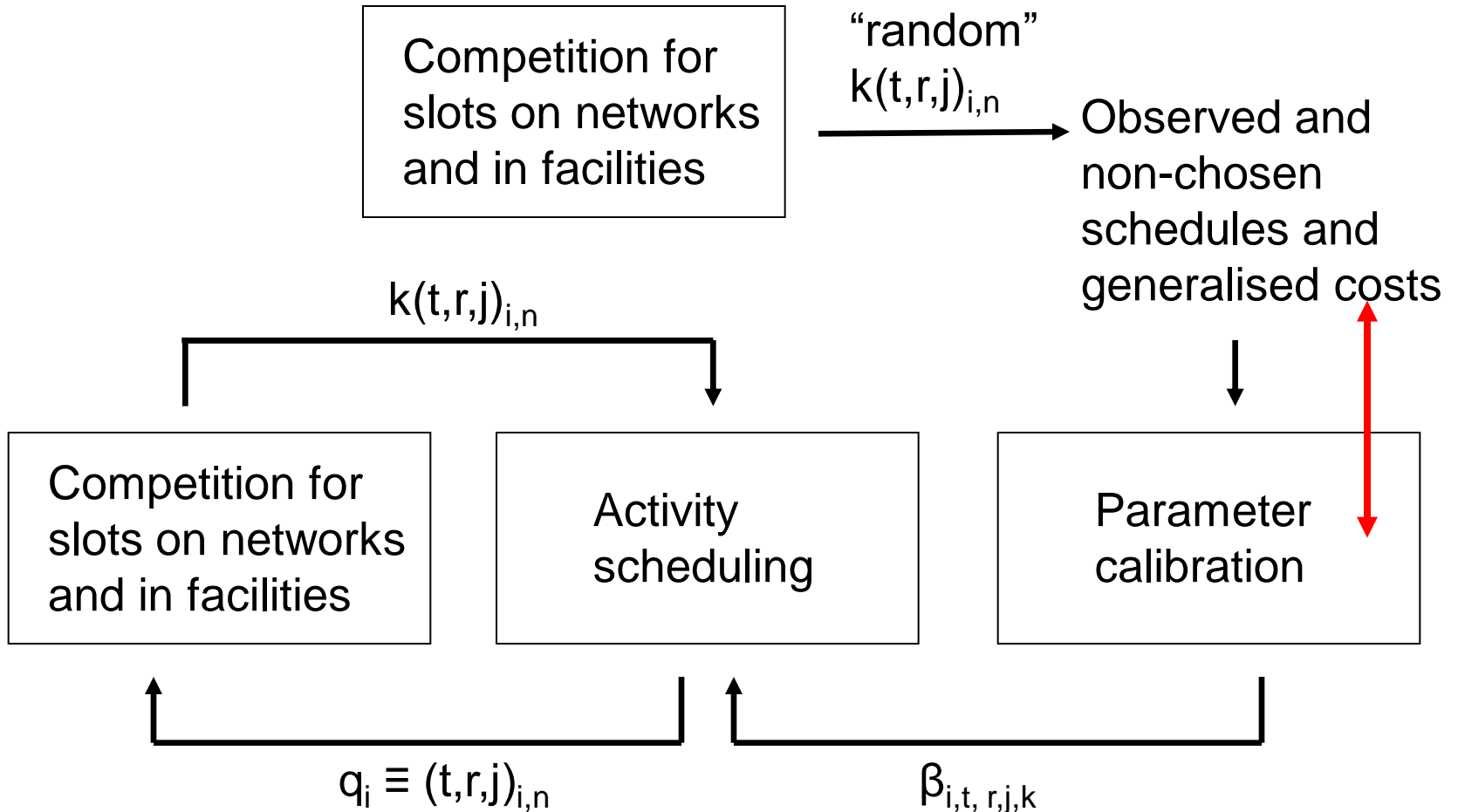
# Which equilibrium ? With parameters ?

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Observed and non-chosen schedules and generalised costs

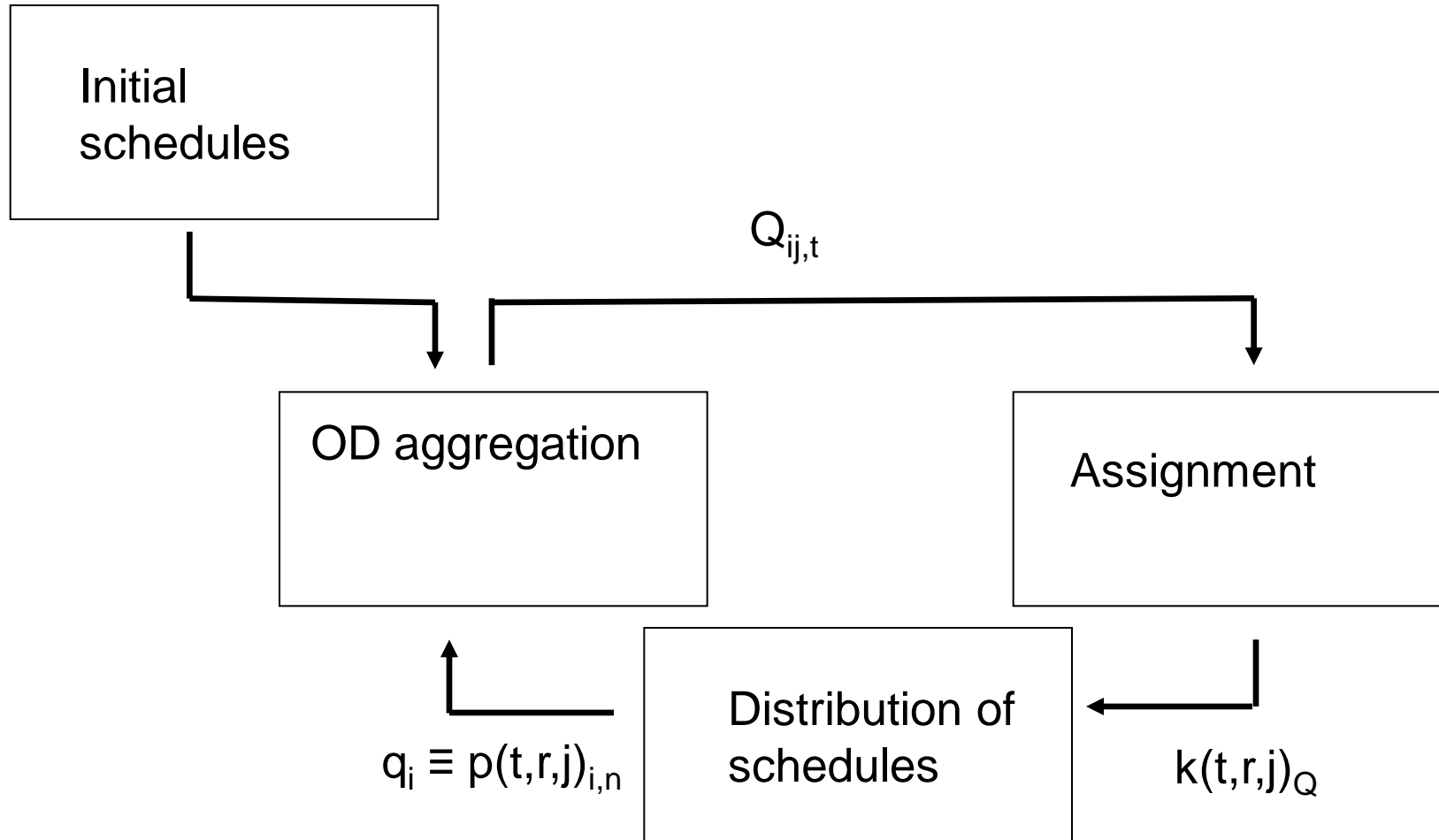


# But what we do



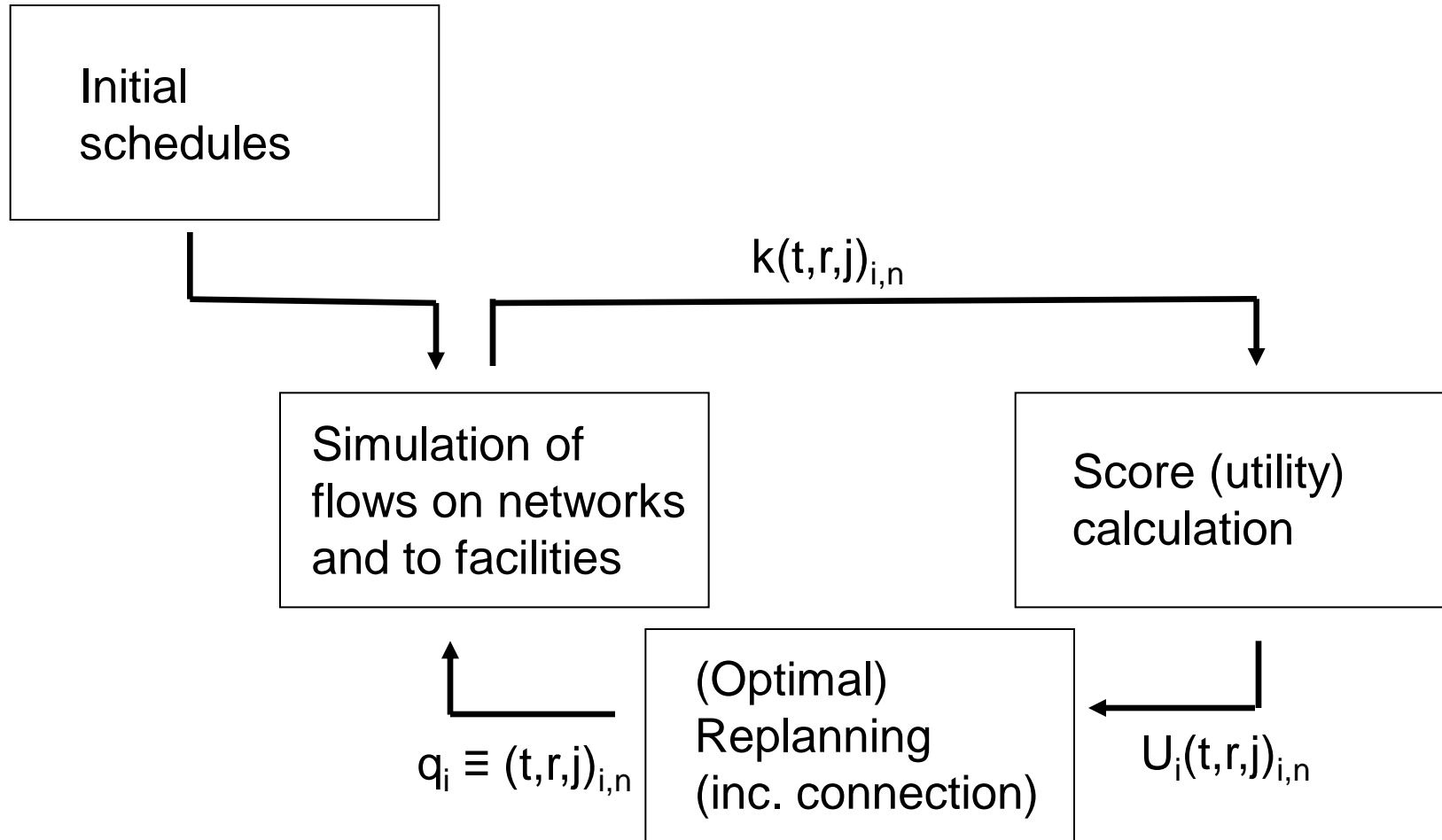
# Equilibrium search in ABM & assignment combinations

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# Equilibrium search in MATSim

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# Activity scheduling with Vickrey-style utility function

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- Number and type of activities
- Sequence of activities
  - Start and duration of activity
  - Composition of the group undertaking the activity
  - Expenditure division
  - Location of the activity
    - Movement between sequential locations
      - Location of access and egress from the mean of transport
        - Parking type
      - Vehicle/means of transport
      - Route/service
      - Group travelling together
      - Expenditure division

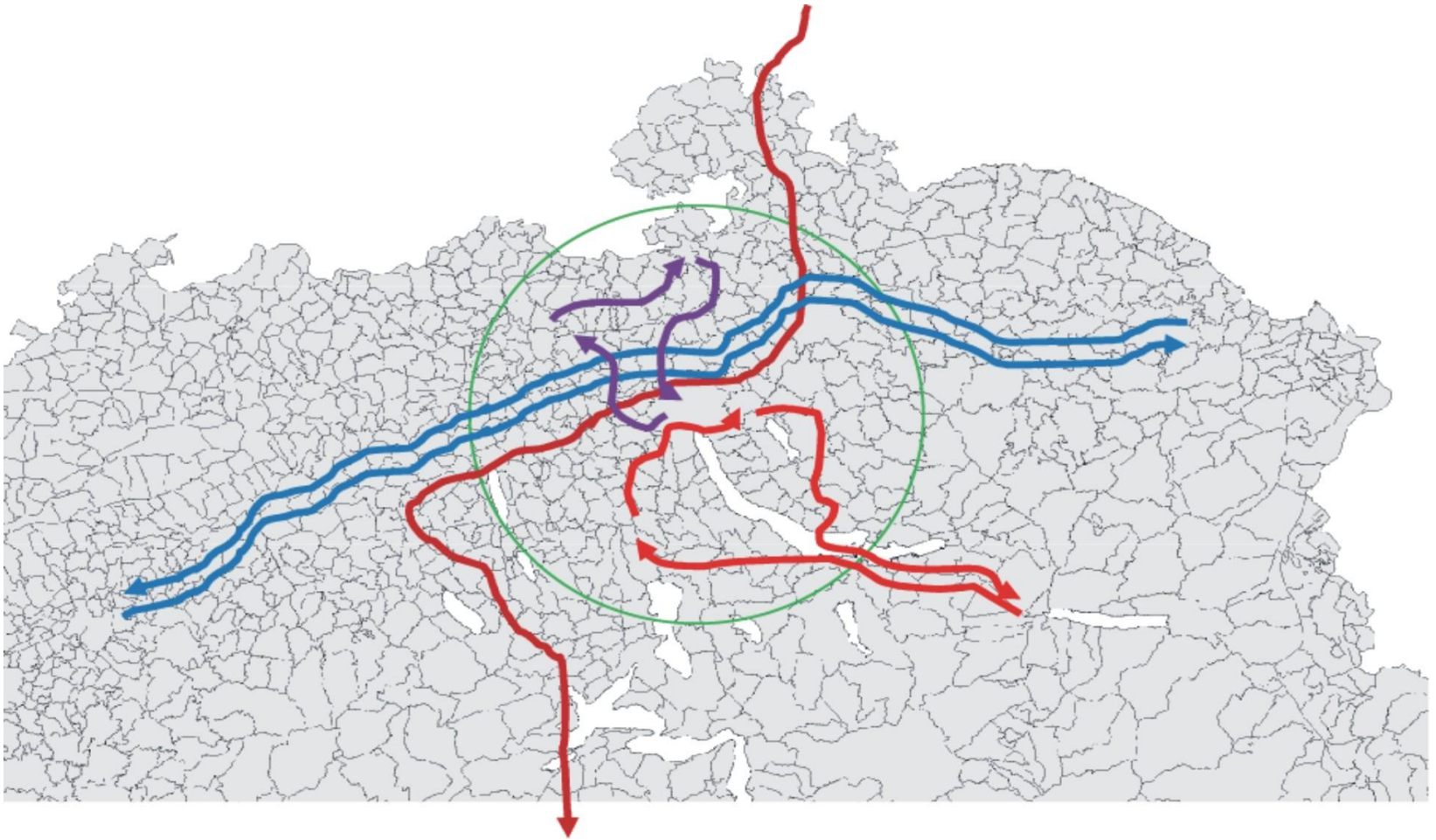
# Activity schedule with Joh-style utility function

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- **Number and type of activities**
- **Sequence of activities**
  - **Start and duration of activity**
  - Composition of the group undertaking the activity
  - Expenditure division
  - **Location of the activity**
    - Movement between sequential locations
      - **Location of access and egress from the mean of transport**
        - Parking type
      - **Vehicle/means of transport**
      - **Route/service**
      - Group travelling together
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# Case study area: 10% sample with NPVM network

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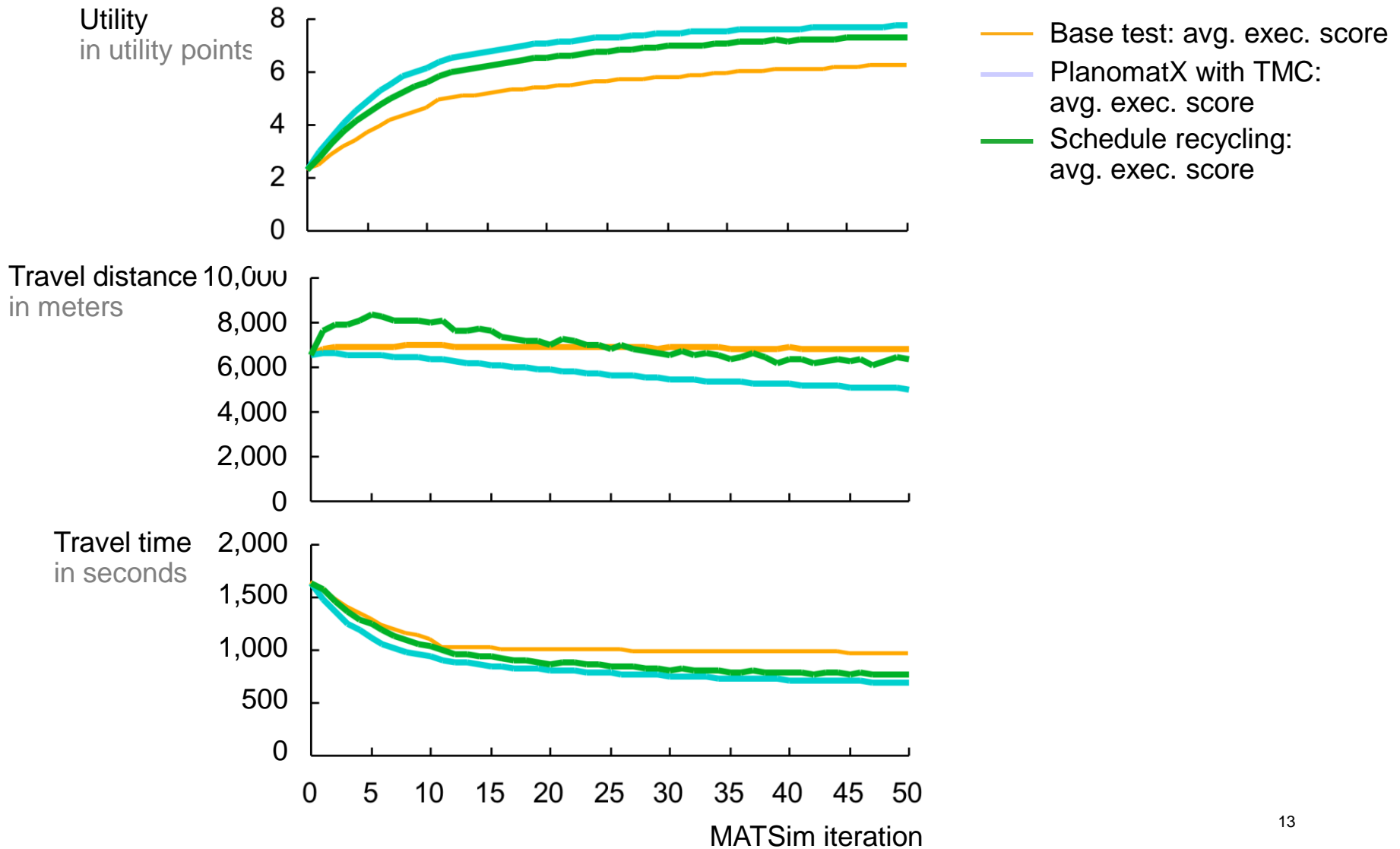


# Case study, but

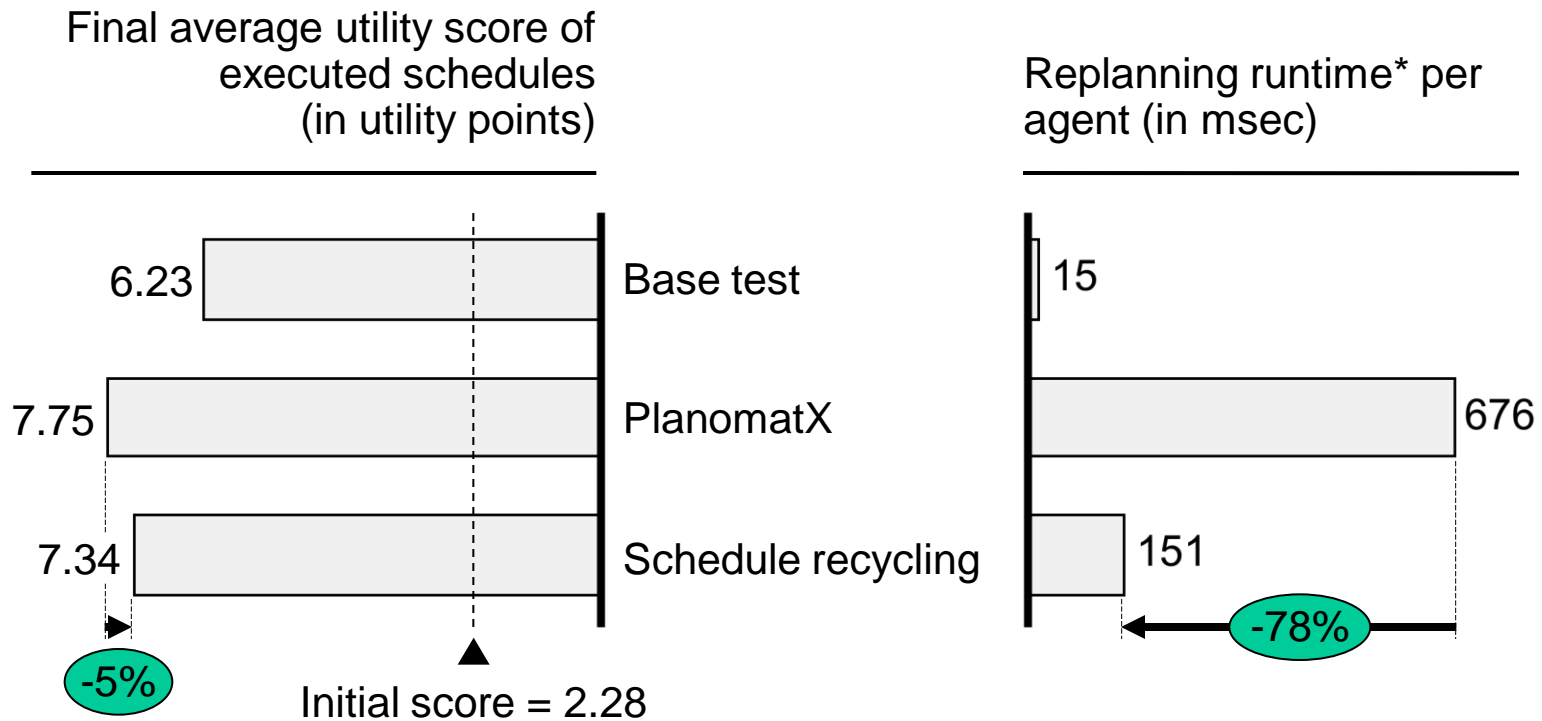
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- 170'000 agents travelling in and through 30 km radius
- NPVM – planning network
- 1'300'000 home locations, 300'000 facilities
  
- No freight traffic
- No border crossing traffic
- Rule of thumb - public transport travel times
- Rule of thumb – marginal cost estimates (accounting for mobility tool ownership)
  
- Undifferentiated closing times for leisure facilities
- Leisure only out-of-home

# Planomat-X with schedule recycling

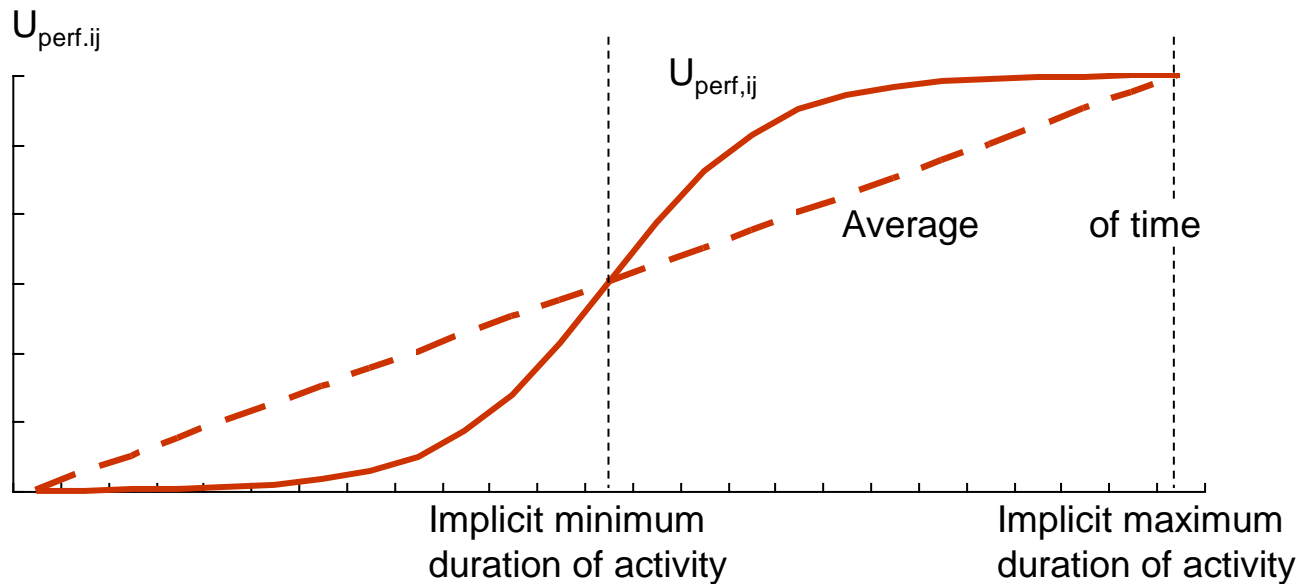


# Planomat-X with schedule recycling



# Joh's 2004 utility function for activities

$$U_{perf,ij}(t_{perf,ij}) = U_{ij}^{min} + \frac{U_{ij}^{max} - U_{ij}^{min}}{(1 + \gamma_{ij} \cdot \exp[\beta_{ij}(\alpha_{ij} - t_{perf,ij})])^{1/\gamma_{ij}}}$$



# Choice set for estimation

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- 19 randomly selected sequences
- Personalised with Planomat-X (locations, mode, timings)
- “dissim” based Joh’s multi-dimensional similarity measure (sequence, mode, location)



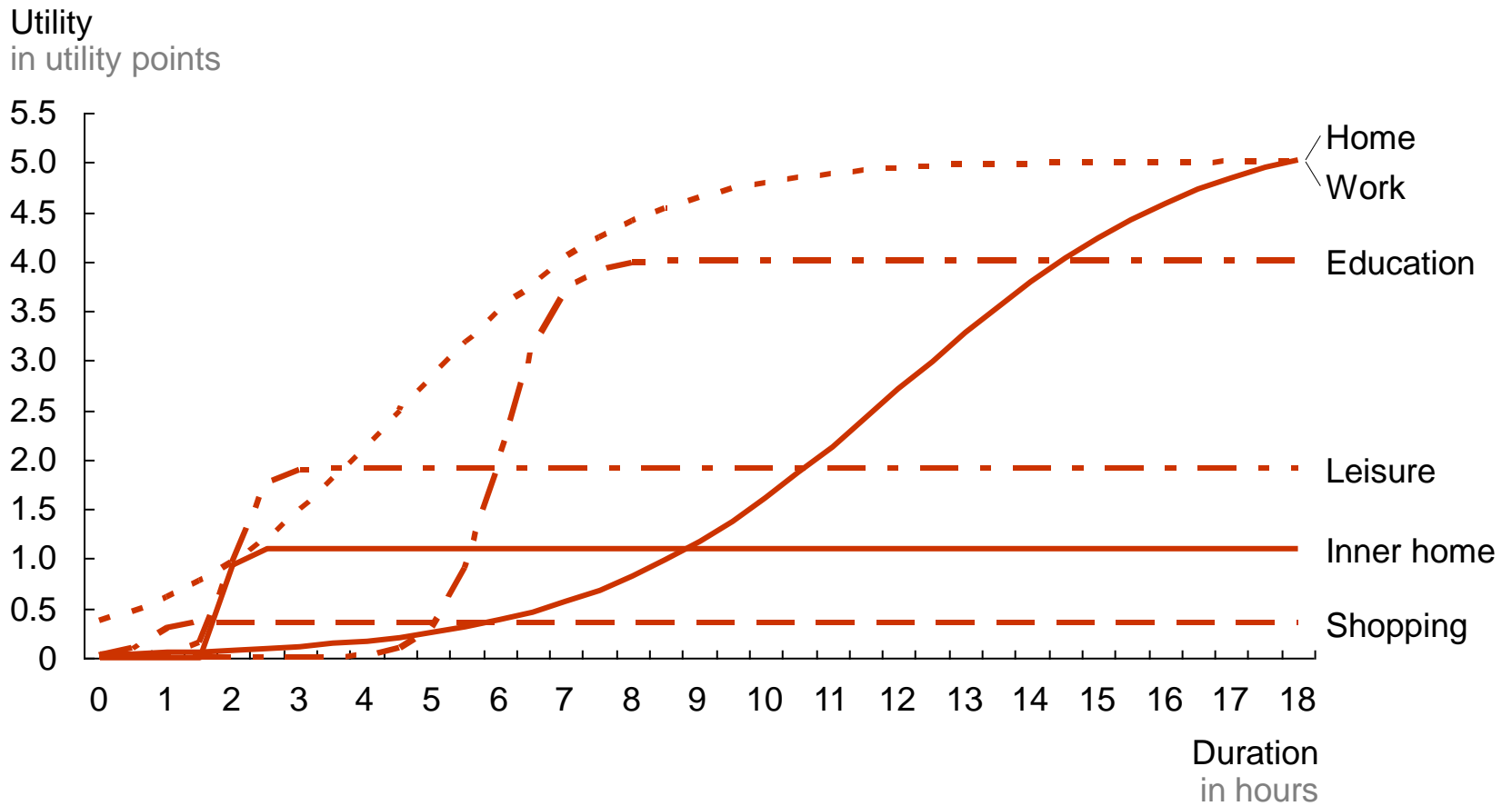
# Estimates and corrections

Parameter	Estimated parameters		Manually calibrated parameters	
	Value	t-test	Value	
home	$\alpha$	5.32	9.72	<b>12.00</b>
	$\beta$	0.249		<b>0.429</b>
	$\gamma$	1.00		1.00
	V min	0.00		0.00
	V max	9.58	14.49	<b>5.41</b>
innerHome	$\alpha$	0.249	8.5	<b>1.90</b>
	$\beta$	15.2		<b>17.80</b>
	$\gamma$	1.00		1.00
	V min	0.00		0.00
	V max	1.92	26.38	<b>1.10</b>
work	$\alpha$	3.86	26.24	<b>4.50</b>
	$\beta$	0.491		<b>0.568</b>
	$\gamma$	1.00		1.00
	V min	0.00		0.00
	V max	4.97	19.09	<b>5.00</b>
education	$\alpha$	1.49	11.54	<b>6.00</b>
	$\beta$	2.29		<b>2.50</b>
	$\gamma$	1.00		1.00
	V min	0.00		0.00
	V max	5.09	18.83	<b>4.00</b>
leisure	$\alpha$	0.0488	6.91	<b>2.00</b>
	$\beta$	100.0		<b>5.00</b>
	$\gamma$	1.00		1.00
	V min	0.00		0.00
	V max	1.92	30.88	<b>1.90</b>
shopping	$\alpha$	0.0453	5.22	<b>0.70</b>
	$\beta$	100.0		<b>5.00</b>
	$\gamma$	1.00		1.00
	V min	0.00		0.00
	V max	1.94	25.49	<b>0.35</b>

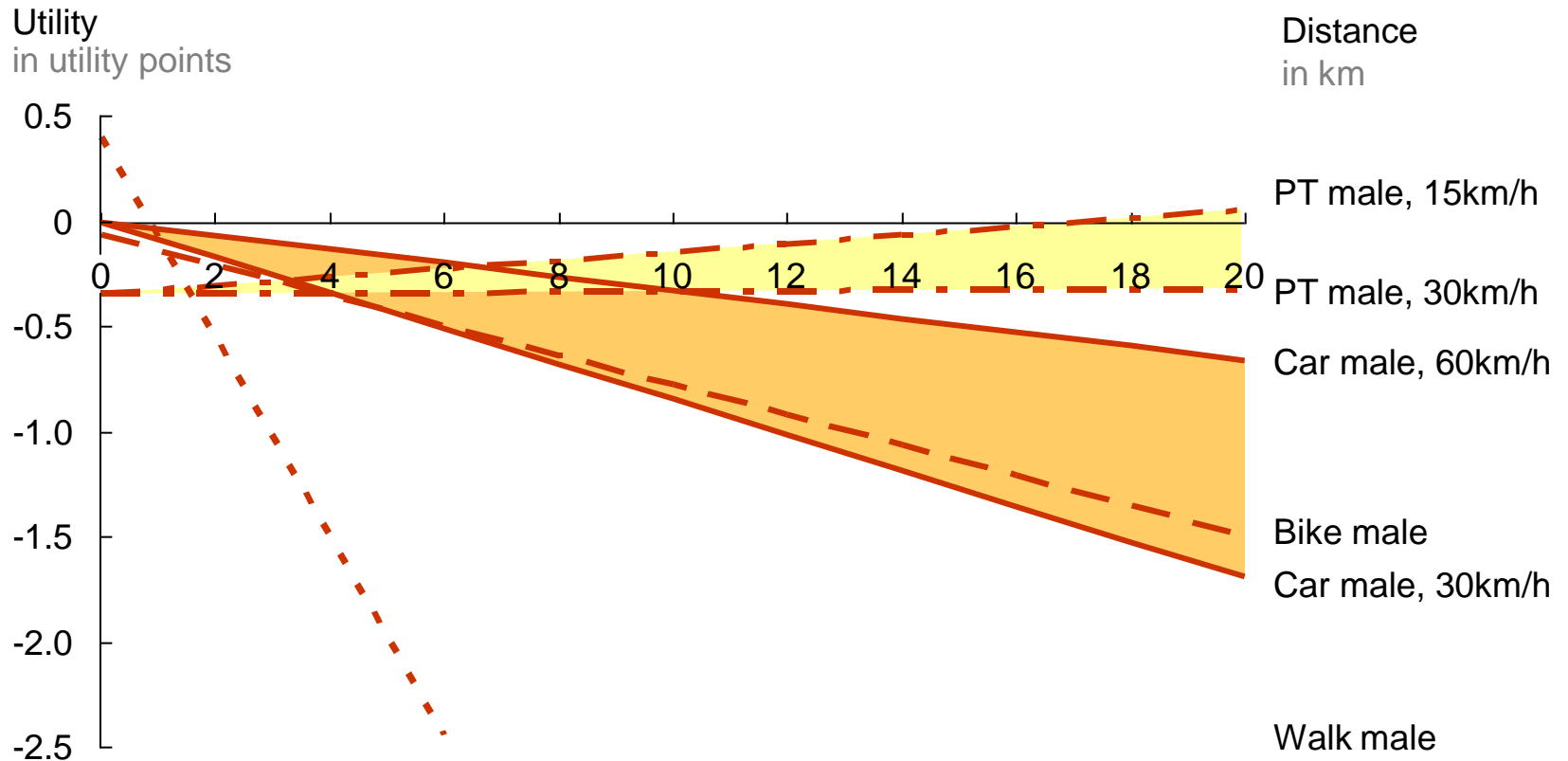
# Estimates and corrections

Parameter	Estimated parameters		Manually calibrated parameters	
	Value	t-test	Value	
car	$\beta$ travelTime	-3.77	-15.33	<b>-3.10</b>
	$\beta$ travelCost	0.0374	6.83	0.0374
	$\lambda$ income	0.185	2.67	0.185
pt	constant	-0.578	-16.17	<b>-0.35</b>
	$\beta$ travelTime	0.563	8.77	0.563
	$\beta$ travelCost	-0.117	-9.7	-0.117
	$\lambda$ income	-0.27	-3.88	-0.27
bike	constant	0.145	3.21	<b>-0.07</b>
	$\beta$ travelTime	-1.07	-10.49	-1.07
walk	constant	0.854	19.34	<b>0.40</b>
	$\beta$ travelTime	-1.48	-18.83	<b>-1.90</b>
$\beta$ female_act	-0.0577	-2.35	-0.0577	
$\beta$ female_travel	0.0797	4.13	0.0797	
$\beta$ age_education	-0.0146	-16.08	-0.0146	
$\beta$ age_work	-0.00664	-11.49	-0.00664	
$\beta$ license_car	-0.537	-15.11	<b>-0.25</b>	
$\beta$ dissim	-139.0	-3.63	-139.0	
$\lambda$ dissim	-0.949	-8.47	-0.949	
$\beta$ repeat	-	-	<b>-0.50</b>	

# Utility profiles for activities

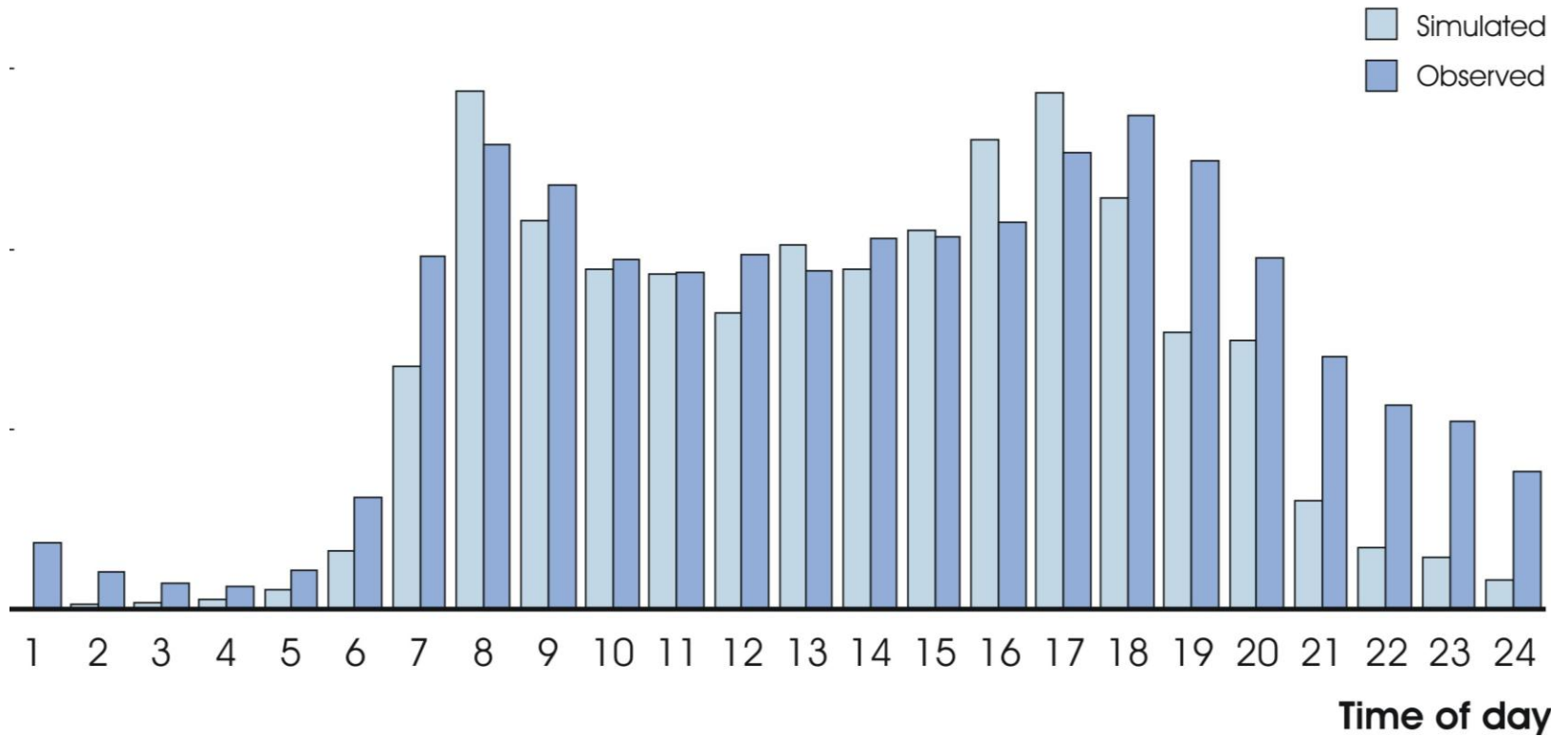


# Modal utilities by distance



# 110 counting stations in the study area

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# Disconnect from choice situation

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- (Implicit) full-factorial choice set across all dimensions
- Random selection from exhaustive choice set
  
- No on-the-spot change during the day
- No history variables
- No social content variables
- No quality of location variable(s)
  
- “dissim” not verified
  
- No iteration between generalised cost estimation and parameter estimation

## More information

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[www.ivt.ethz.ch](http://www.ivt.ethz.ch)

[www.matsim.org](http://www.matsim.org)