Measuring the Socio-economic Benefits of Train Timetables

Application to Commuter Train Services in Stockholm

Abderrahman Ait Ali, Jennifer Warg and Jonas Eliasson

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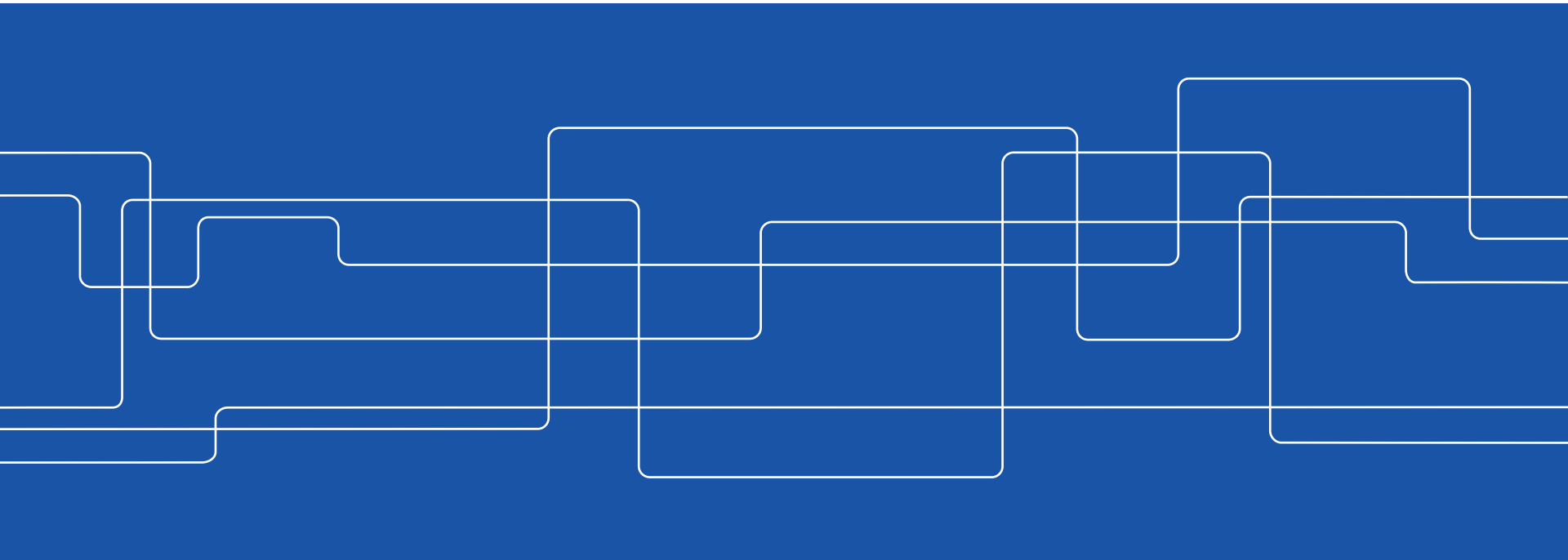
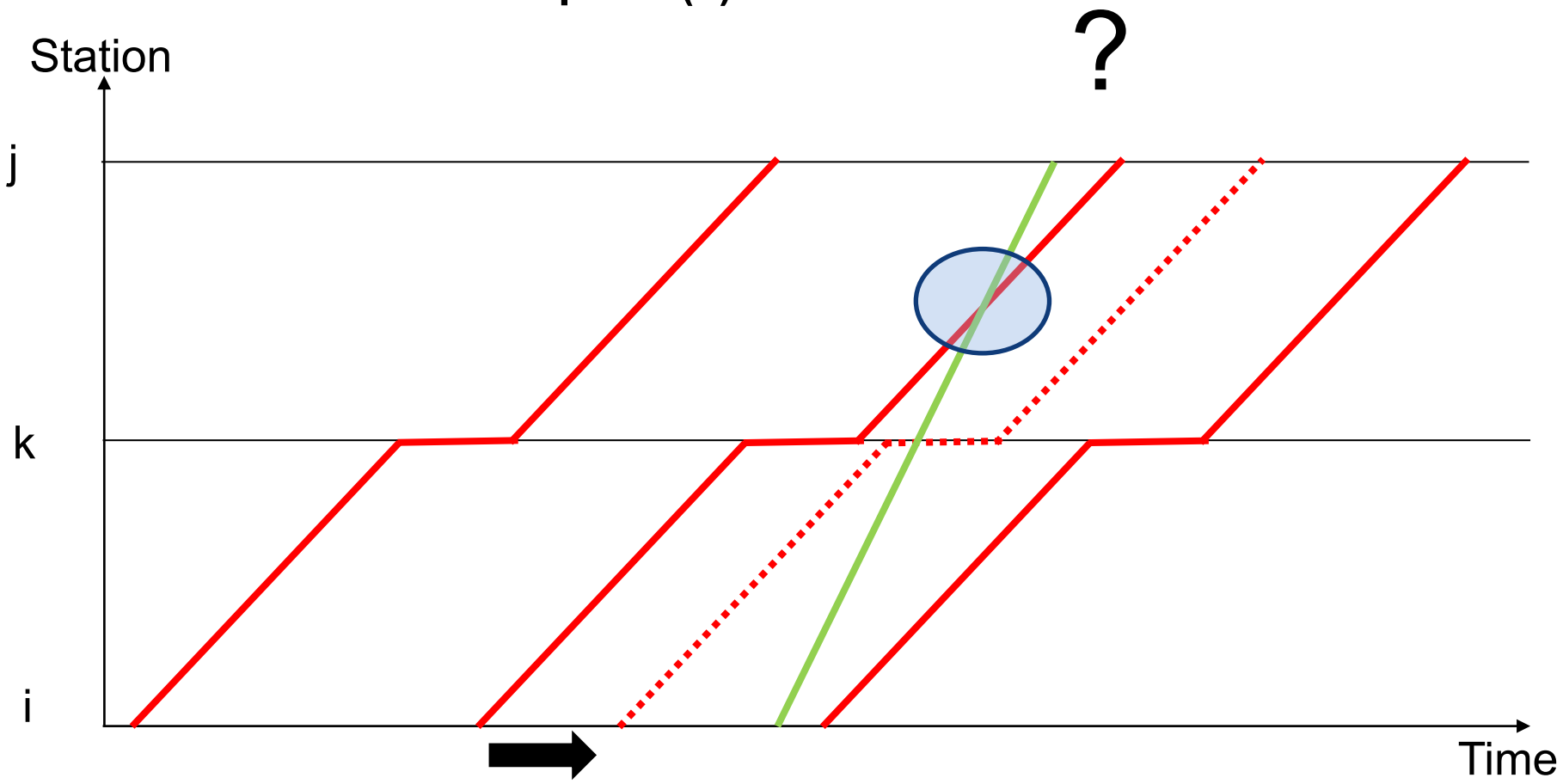


Background

- High demand of traffic on limited railway capacity
- Heterogenous traffic
  - Fast ←→ slow services
  - Freight ←→ passenger services
  - Subsidised ←→ commercial traffic
- Inefficiencies in allocating the available railway capacity

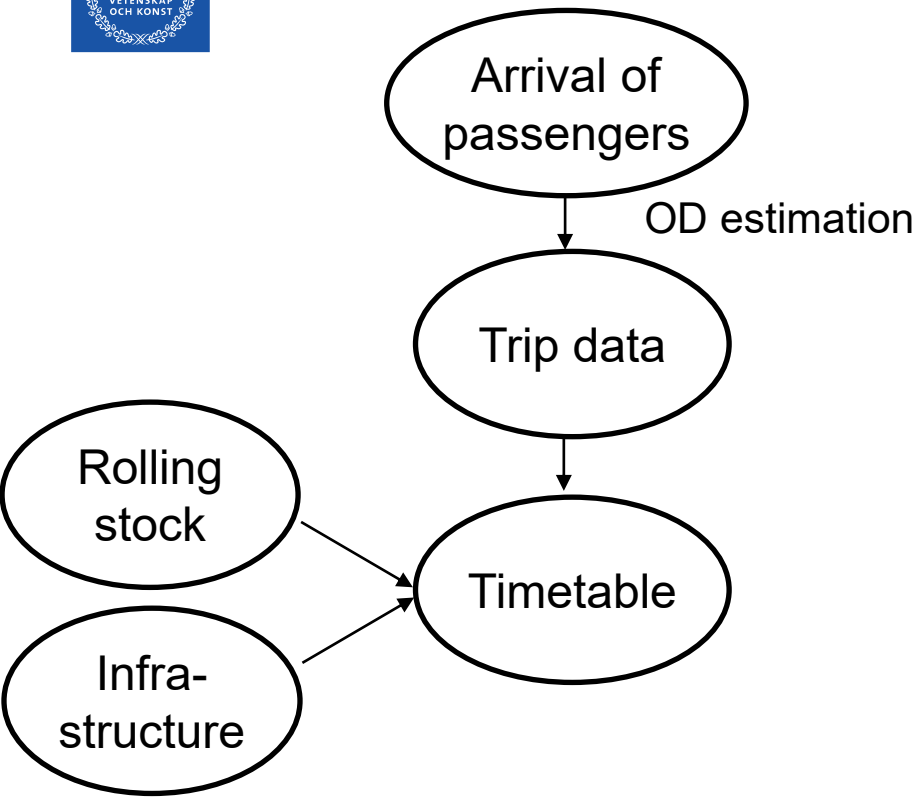
Problem description (1)



Problem description (2)

Here:

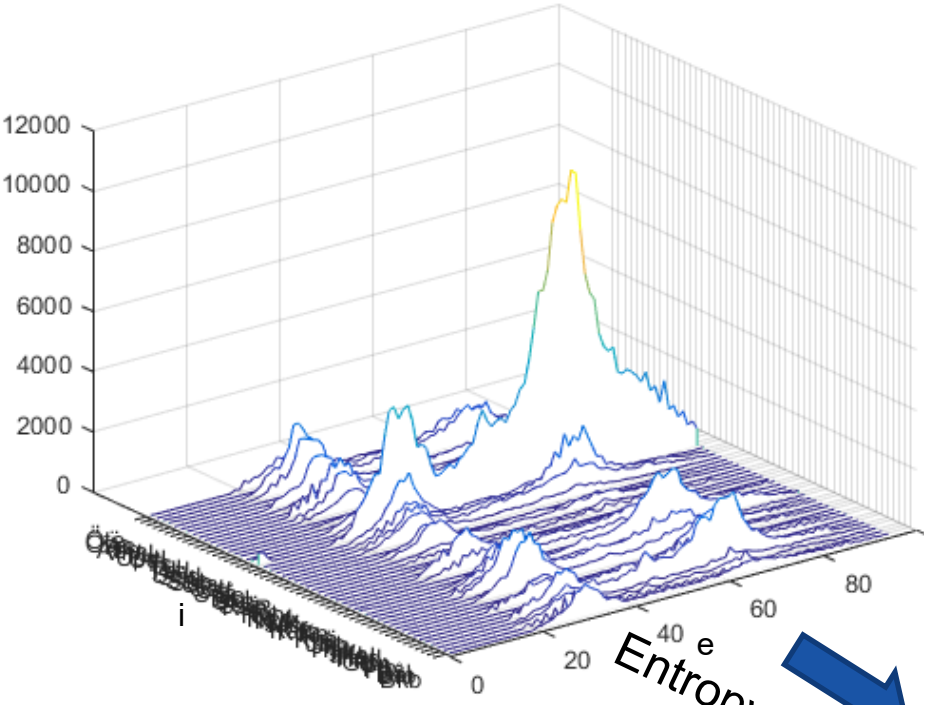
- Focus on the socio-economic effects
  - Passengers: Travel time, waiting time, crowding
  - Train operators: Operational costs
- Timetable adjustments such as
  - Changed departure time
  - Train cancellation
  - Changed frequency


Arrival of passengers
OD estimation
Trip data
Rolling stock
Timetable
Infra-structure

Model

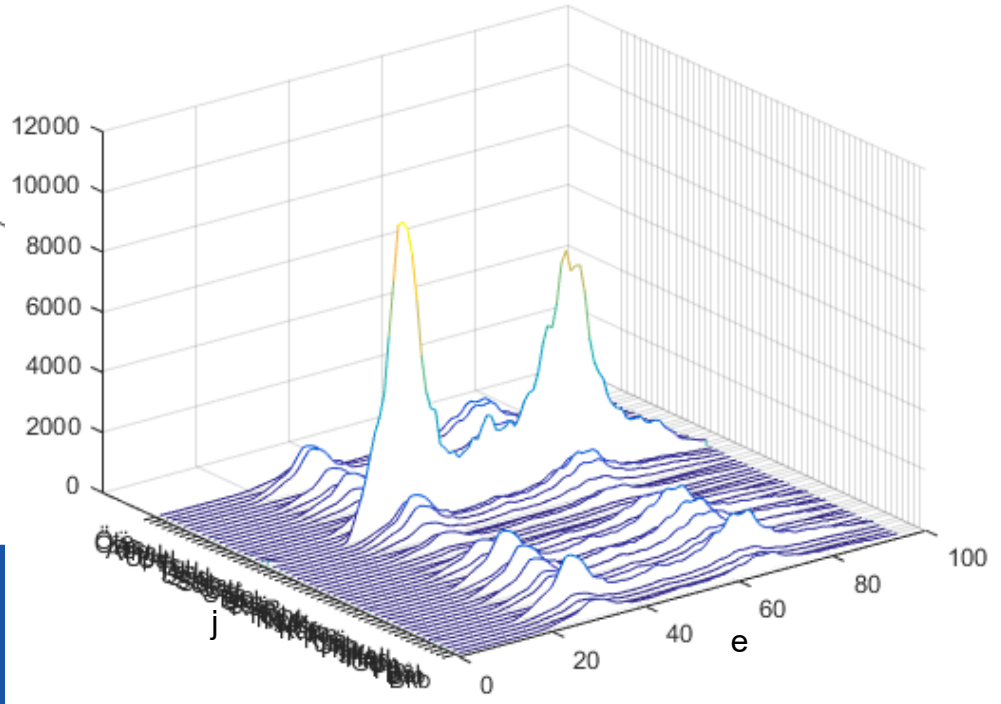
Estimation of trip distribution (1)
OD estimation model

Input: # of passengers boarding at station ”i” at time ”e”

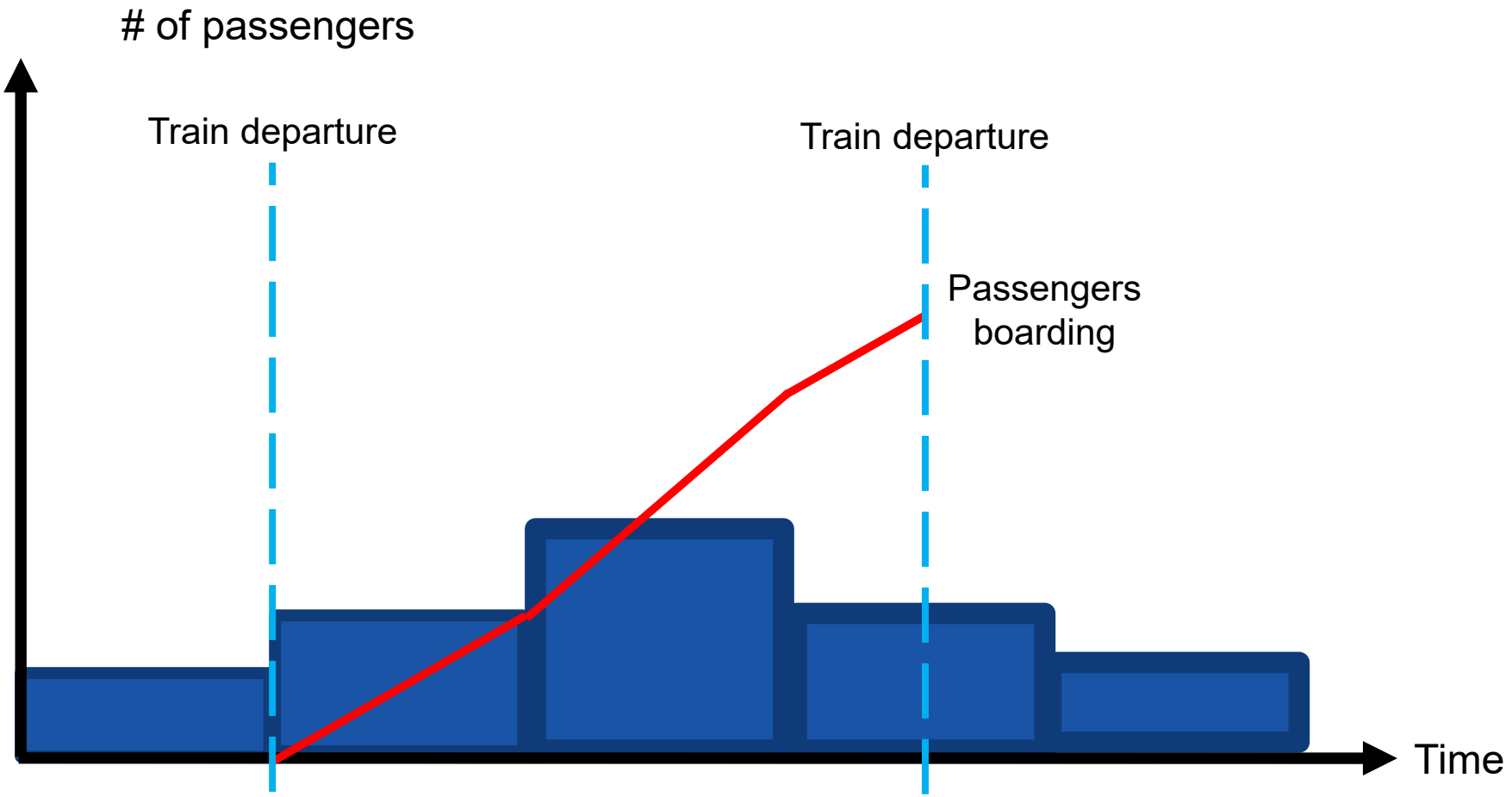


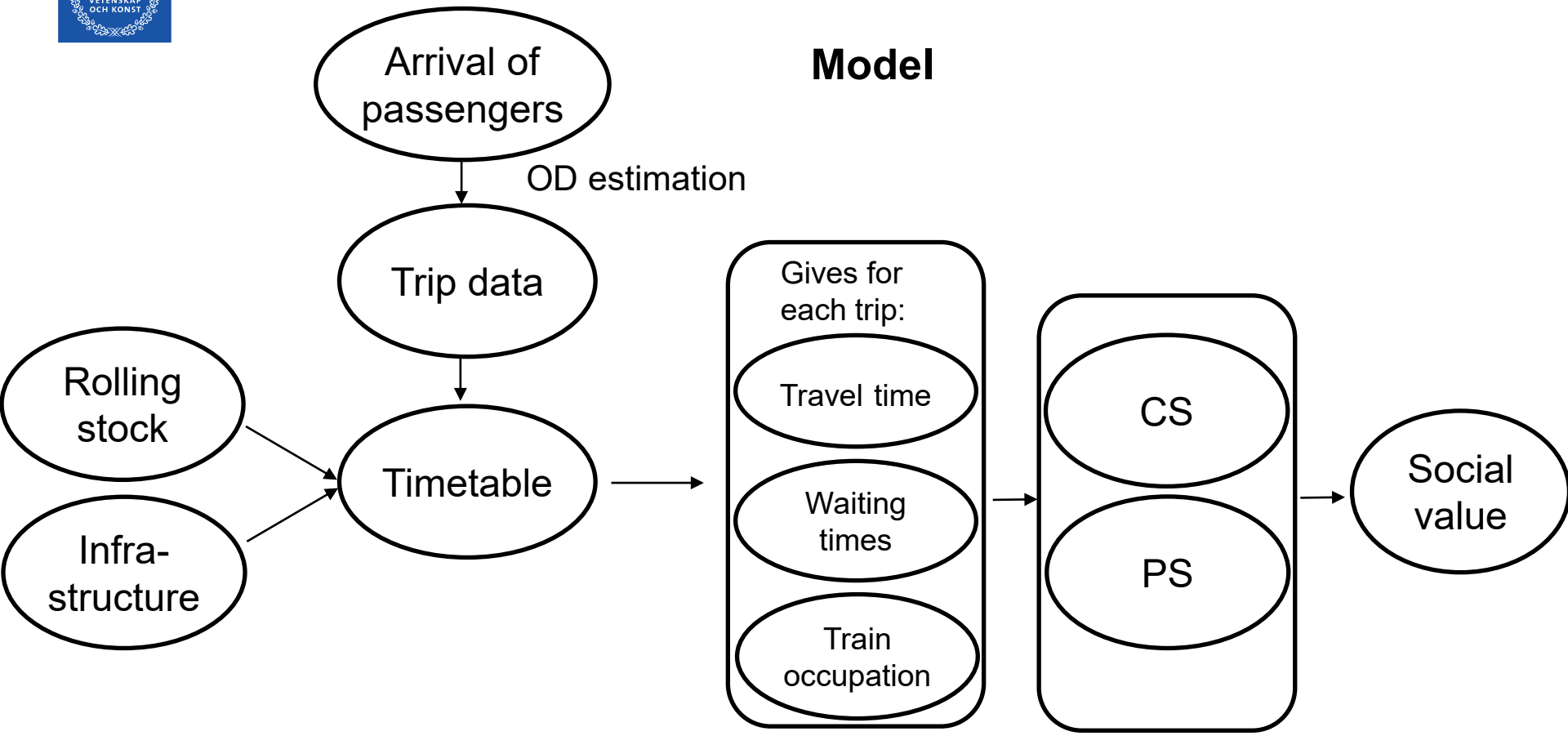
Entropy maximization model

Output: # passengers traveling from “i” to “j” at time “e”



Estimation of trip distribution (2)



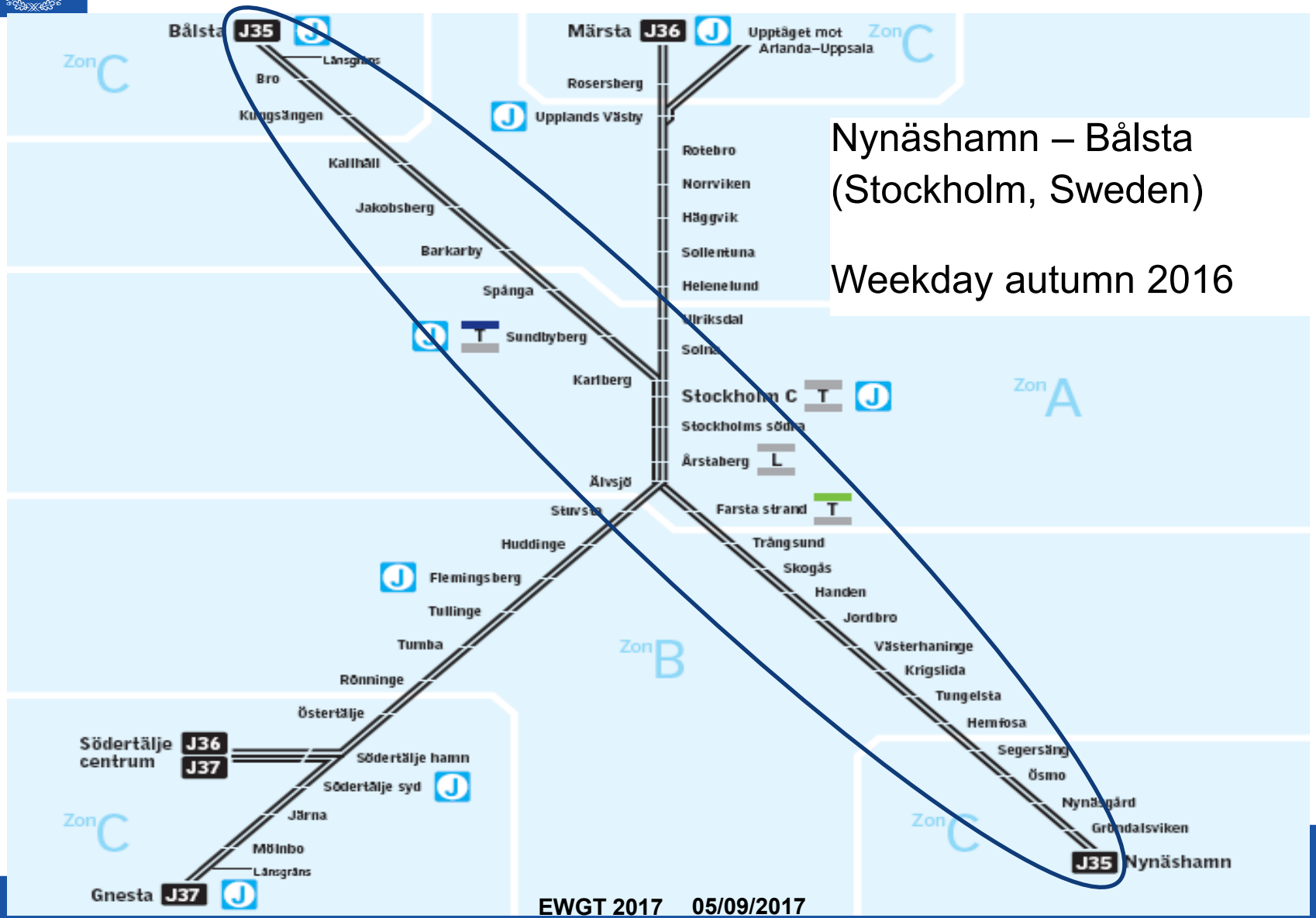

Model
Arrival of passengers
OD estimation
Trip data
Rolling stock
Infra-structure
Timetable
Gives for each trip:
Travel time
Waiting times
Train occupation
CS
PS
Social value

Econometric Assessment (cf. ASEK 6.0)

Socio-economic cost

- **Consumer/passenger cost**
  - In-vehicle time cost incl crowding
  - Waiting time cost
- **Producer/operator cost**
  - Operation
  - Overhead

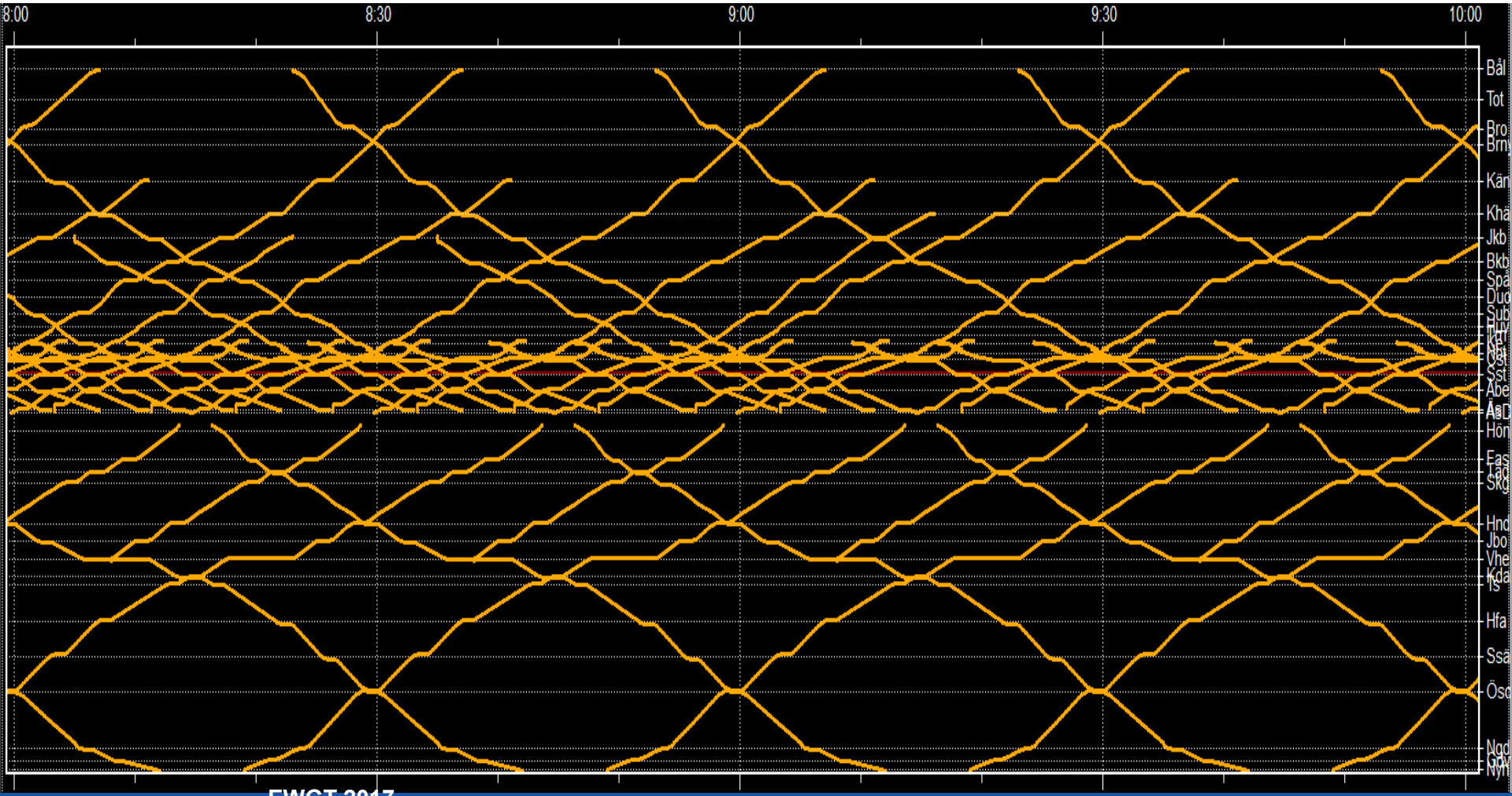
Application



Nynäshamn – Bålsta
(Stockholm, Sweden)

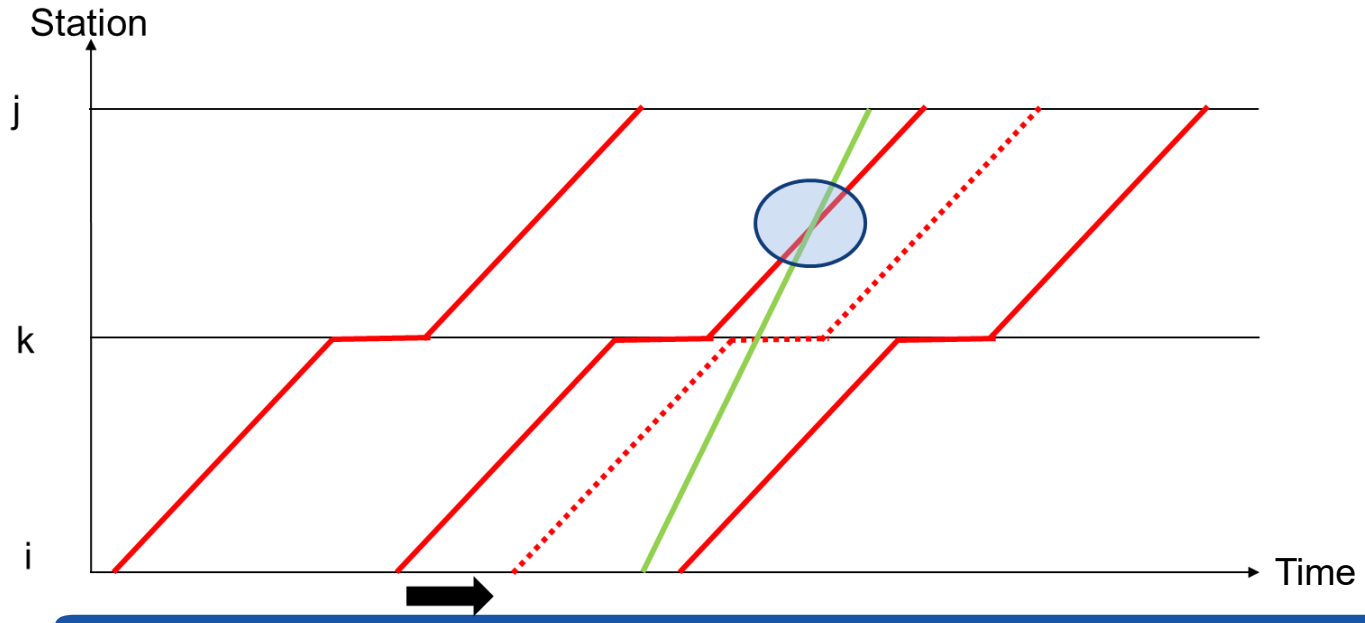
Weekday autumn 2016

Timetable



Scenarios

- Different headways between train departures of one line
  - 30 min (original)
  - 60 min
  - 120 min
- Changed departure time for one service



Conclusions

- Analysis of major adjustments → adequate for model development
- Reasonable results
- Development of a model that
  - considers real timetables
  - takes capacity constraints into account
  - includes effects for travelers and operators

→Adequate for estimating benefit of changes in a timetable

Further development needed!

Future work

- Further development and validation of the model
- Increased network
- Add transfers to the model
- Analyze new timetabling aspects such as skip-stop services
- Optimization of service supply

Thank you for your attention!

Questions?

Abderrahman Ait Ali
abde@kth.se

Jennifer Warg
jwarg@kth.se

Jonas Eliasson
jonas.eliasson@abe.kth.se