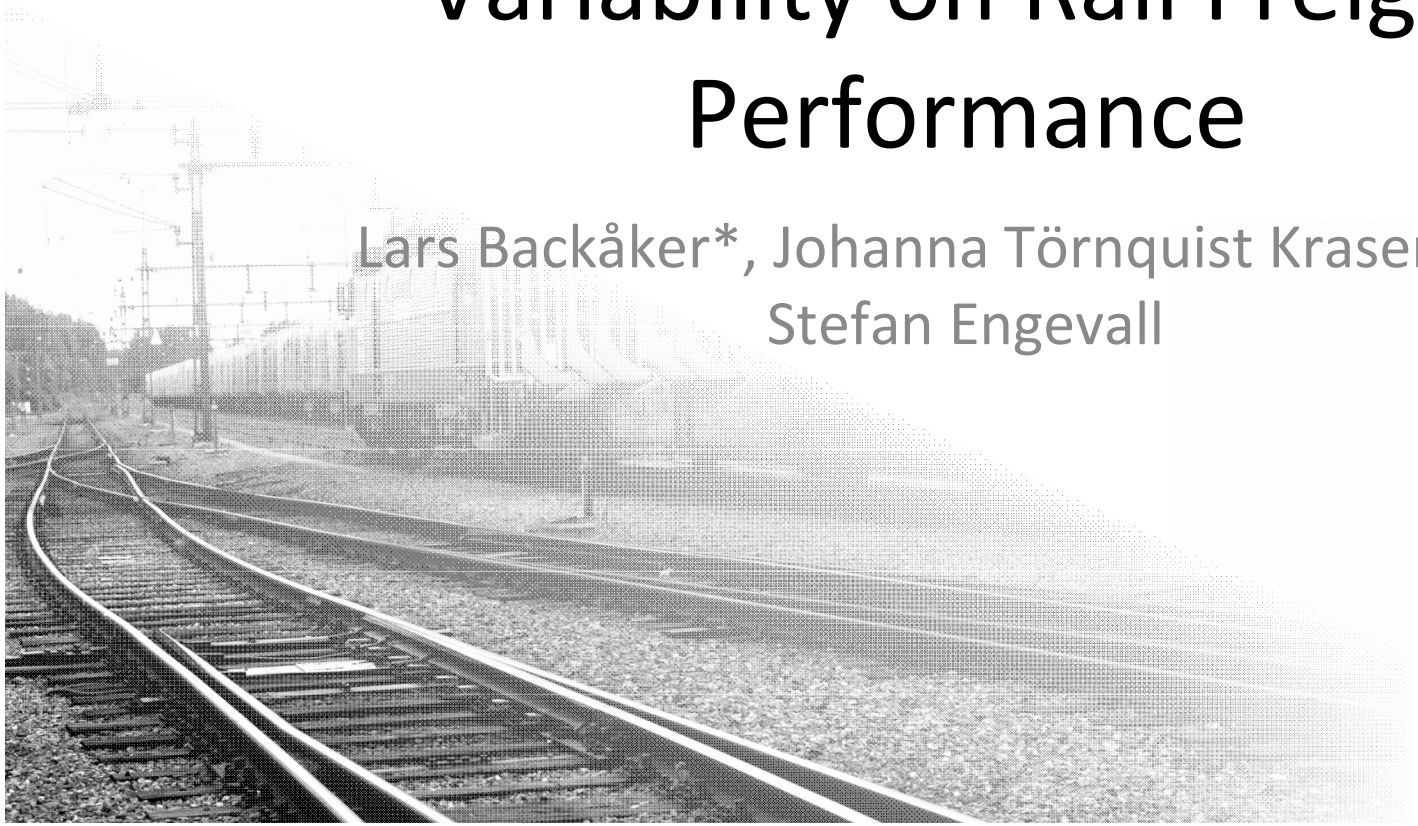
The Impact of Reduced Demand Variability on Rail Freight Performance

Lars Backåker*, Johanna Törnquist Krasemann,
Stefan Engevall



Agenda

- Rail Freight Transportation
- Simulation Study
  - Purpose and motivation
  - Approach
  - Case description
  - Results
  - Concluding remarks
  - Future research

Rail Freight Transportation

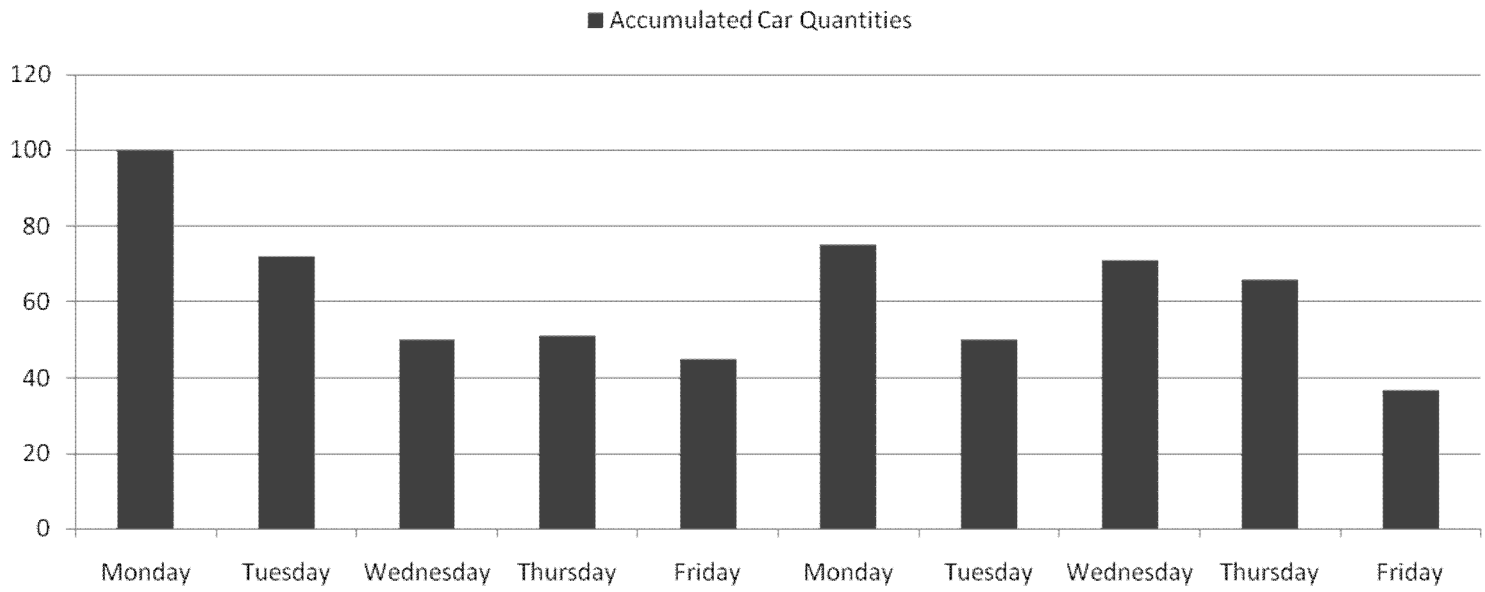
- Characteristics
  - Capacitated and restricted service networks
  - Capital intensive operational resources
  - Exhaustive and complex planning processes
  - Heterogeneous markets and differentiated service segment

Rail Freight Transportation

- Customer agreements
  - Transportation relations
  - Service frequencies
  - Departure times
  - Delivery time windows
  - Car specifications
  - Average periodical demand
  - (Demand fluctuations)

Rail Freight Transportation

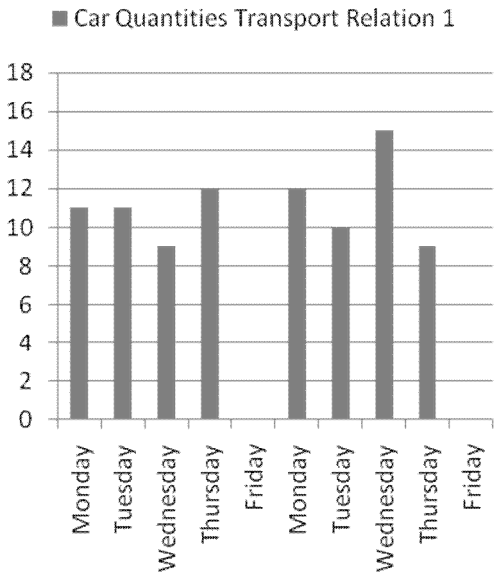
Å Daily Fluctuations in Transport Demand



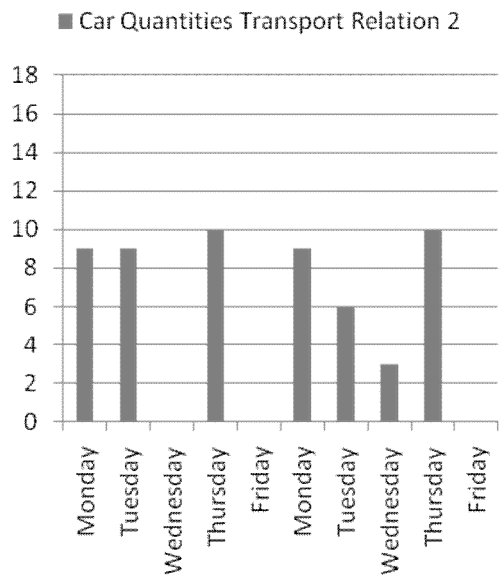
Average: 62 Deviation: 19 Max: 100 Min: 37

Rail Freight Transportation

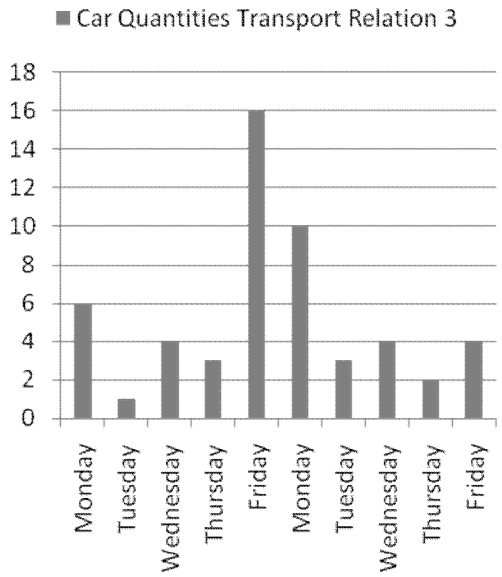
Å Daily Fluctuations in Transport Demand



Average:	9
Deviation:	5
Max:	15
Min:	0



Average:	6
Deviation:	5
Max:	10
Min:	0

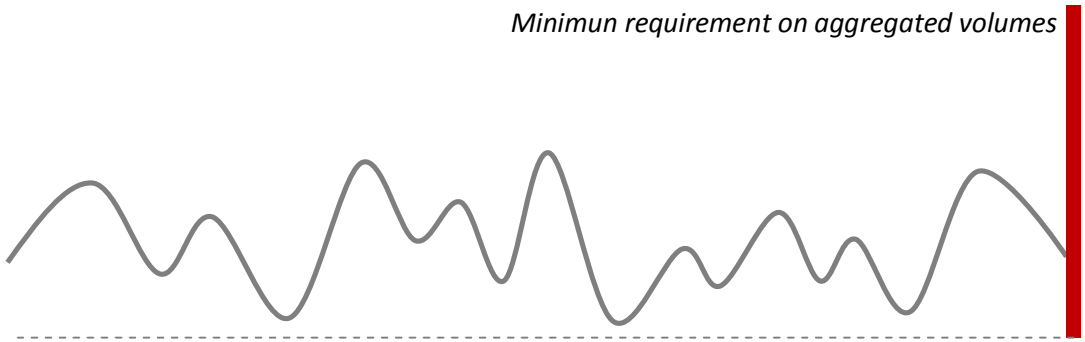


Average:	5
Deviation:	5
Max:	16
Min:	1

Simulation Study

Å Motivation

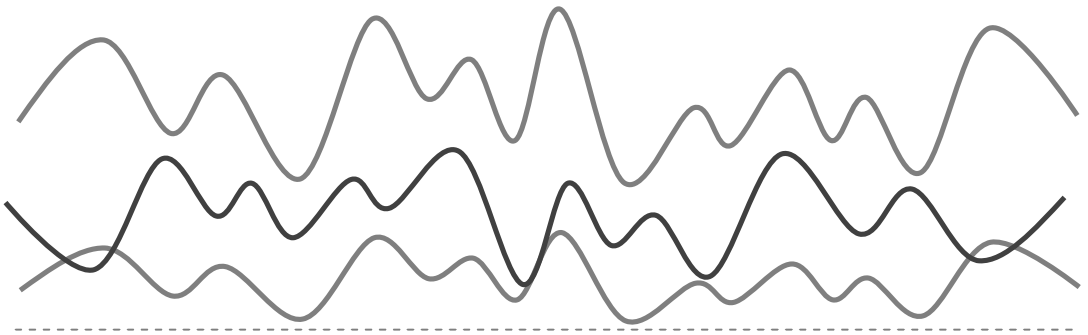
- ï Daily fluctuations (variability) in transport demand
- ï Currently available customer agreements for reduced variability



Simulation Study

Å Purpose

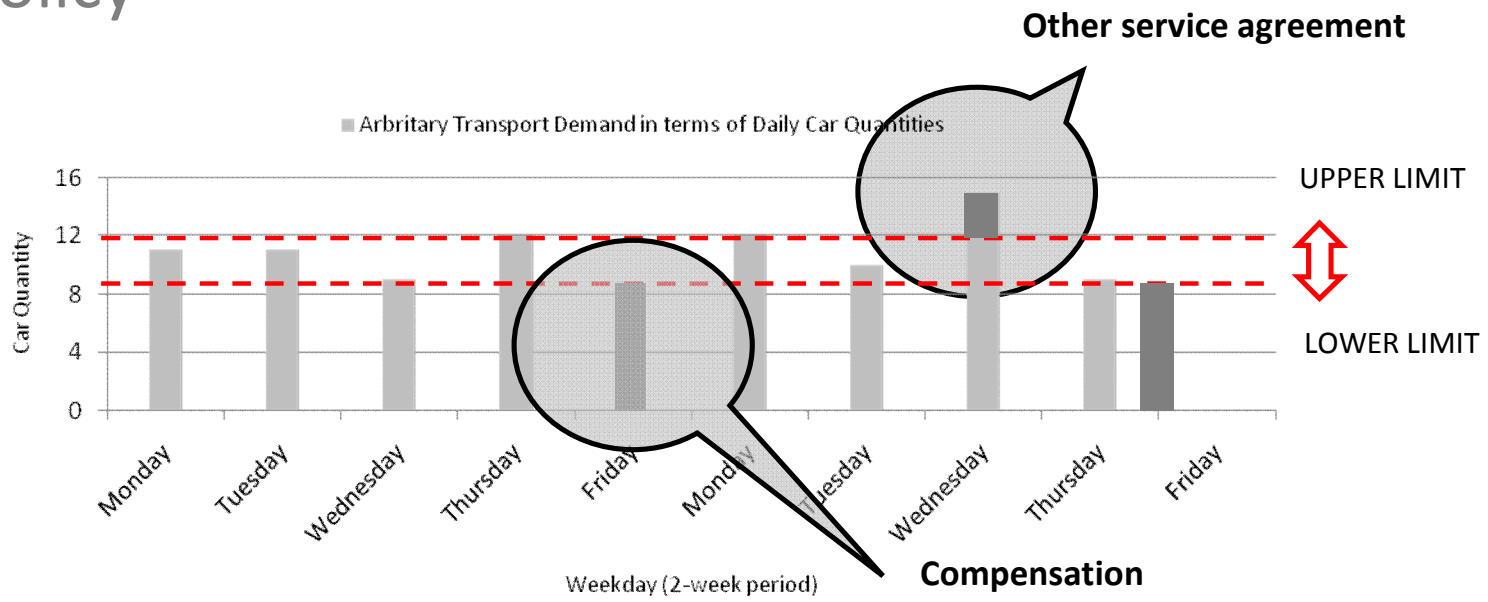
- ï We set out to assess the impact of reduced demand variability on rail freight performance



Simulation Study

Å Approach

- ï Introduce a volume Variation Allowance (VVA) policy



Simulation Study

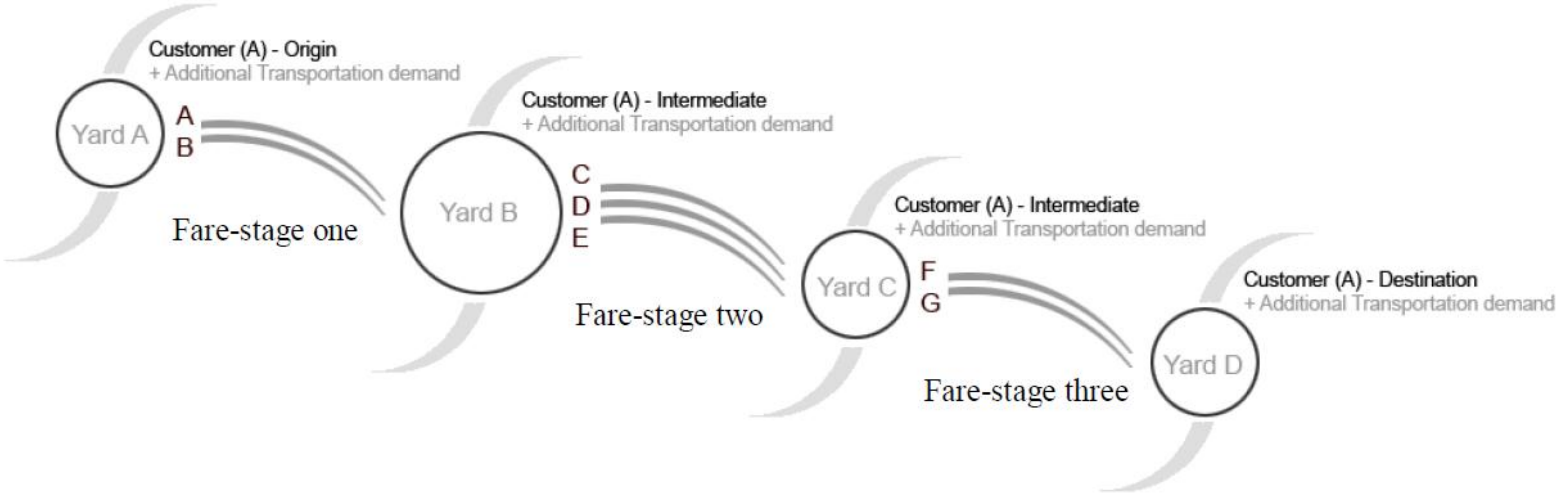
Å Approach

- ï Develop two main scenarios based on transport demand from one large customer in the carload service segment
- ï Adopt three key performance measures for evaluation
- ï Perform simulations in co-operation with Green Cargo using MultiRail and real data

Simulation Study

Å Case description

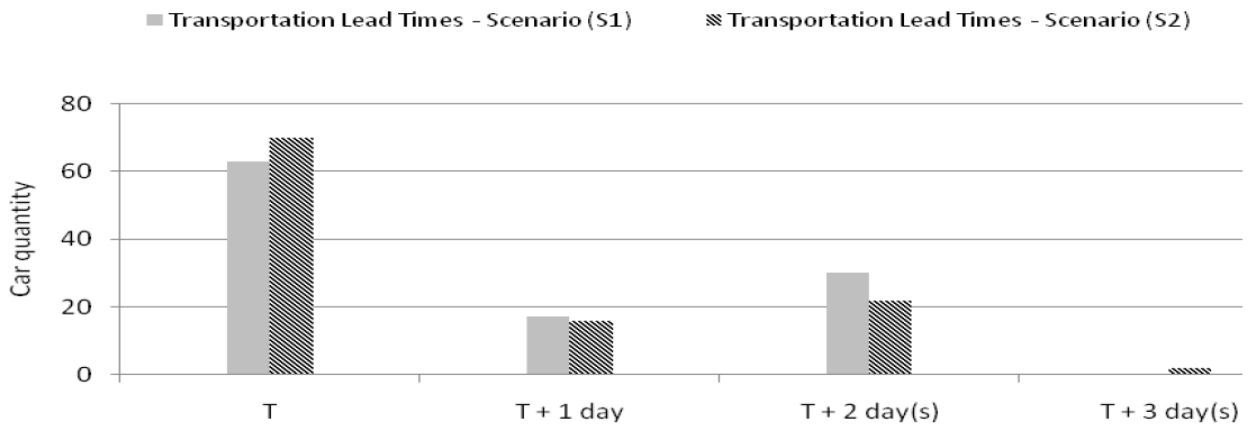
- ï Transport relation consisting of four shunting yards, seven trains and 45 active customers



Simulation Study

Å Results

- ï Minor reductions in train fill rate and shunting yard work load variability
- ï Significantly improved transportation lead times



Simulation Study

Å Concluding remarks

- ï Reduced variability in train fill rates and slightly increased capacity in single resources could enable resources elimination
- ï Customers are provided shorter lead times than contractually agreed upon
- ï Throughput on major shunting yards tend to make effects of single VVA-policy deployments negligible

Simulation Study

Å Concluding remarks

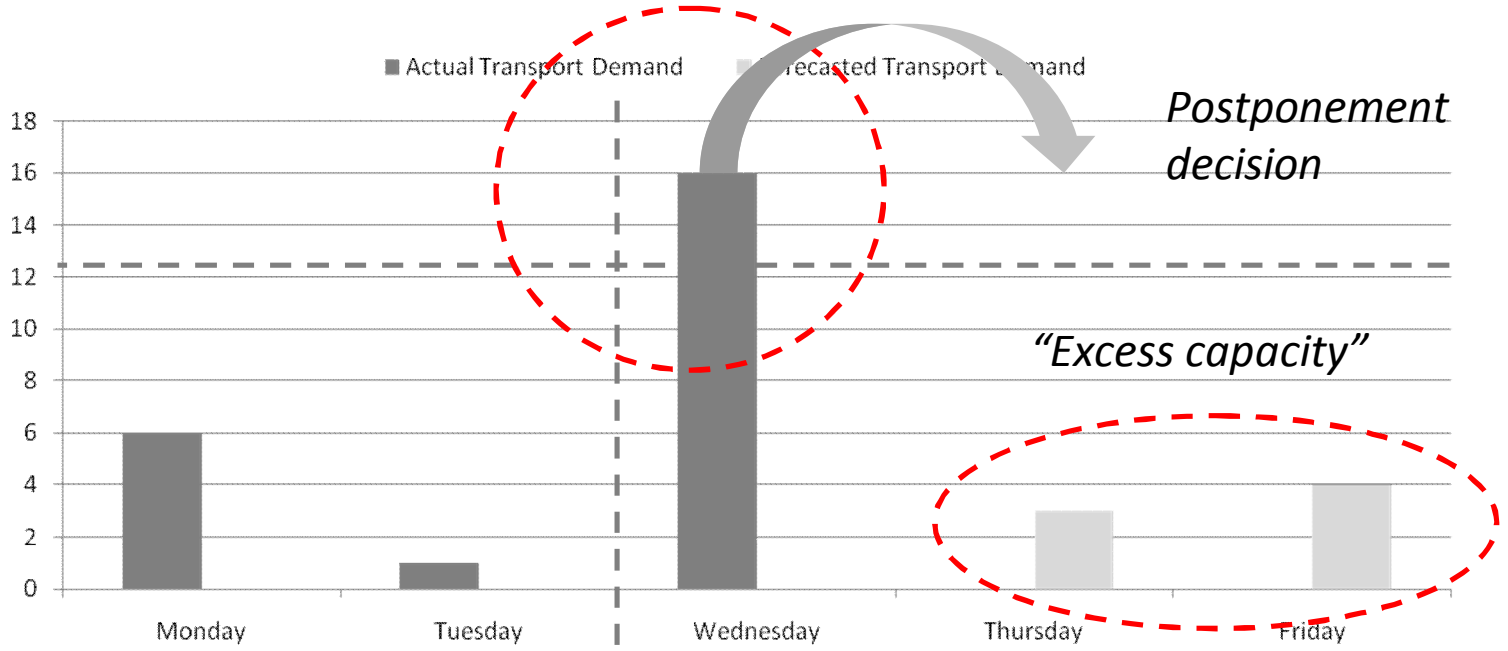
- ï VVA-policy deployments could lead to improved planning capabilities considering transport demand of single customers
- ï There is an improvement potential in how transport demand is currently assigned to resources (FBFS-booking principle)

Simulation Study

- Future research
  - Explore on the possibilities of increased planning capabilities provided the advancement of booking information
  - Consider customer acceptance and suitable restriction levels for practical implementations
  - Assess the performance of the FBFS-principle compared to the use optimization algorithms while assigning transport demand to resources

Simulation Study

Å Future research



Current state