



**Analyzing model uncertainty and economies of scale of the Swedish national freight model to changes in transport demand**

Jonas Westin, Umeå universitet

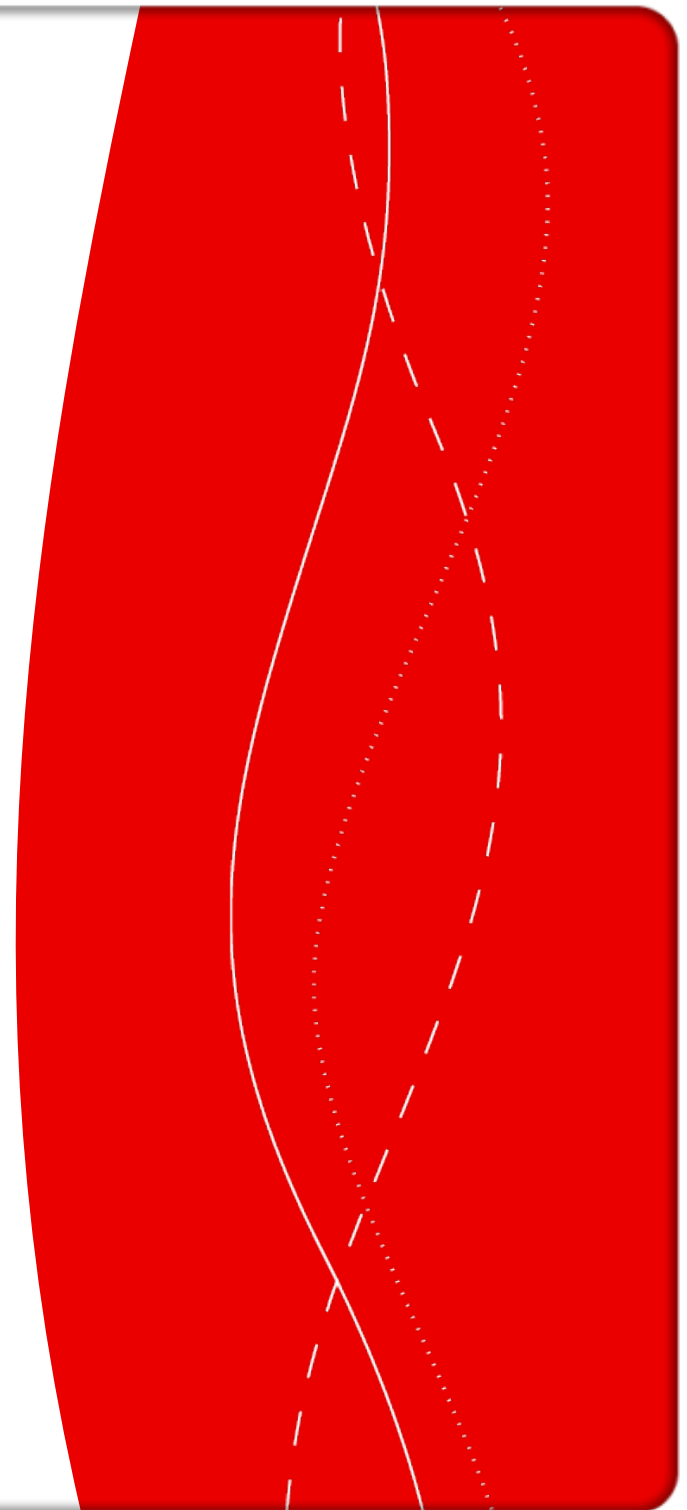
Inge Vierth, VTI

Gerard de Jong, Significance

Rune Karlsson, VTI

Niclas A. Krüger, Örebro universitet

Magnus Johansson, Trafikanalys



## Scope and purpose

- Analyze model uncertainty and economies of scale of the Swedish national freight transport model system Samgods to changes in its zone-to-zone **base matrices**
- Analyze the modelling of sea transports in the (disaggregated) **logistics model** within Samgods system

# The Swedish national freight transport model system Samgods

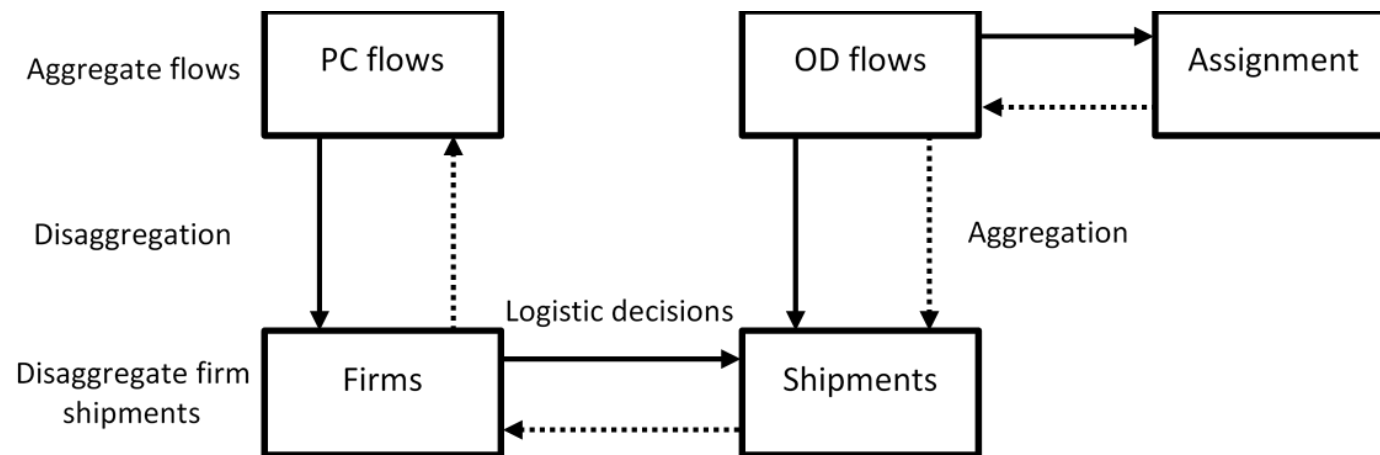
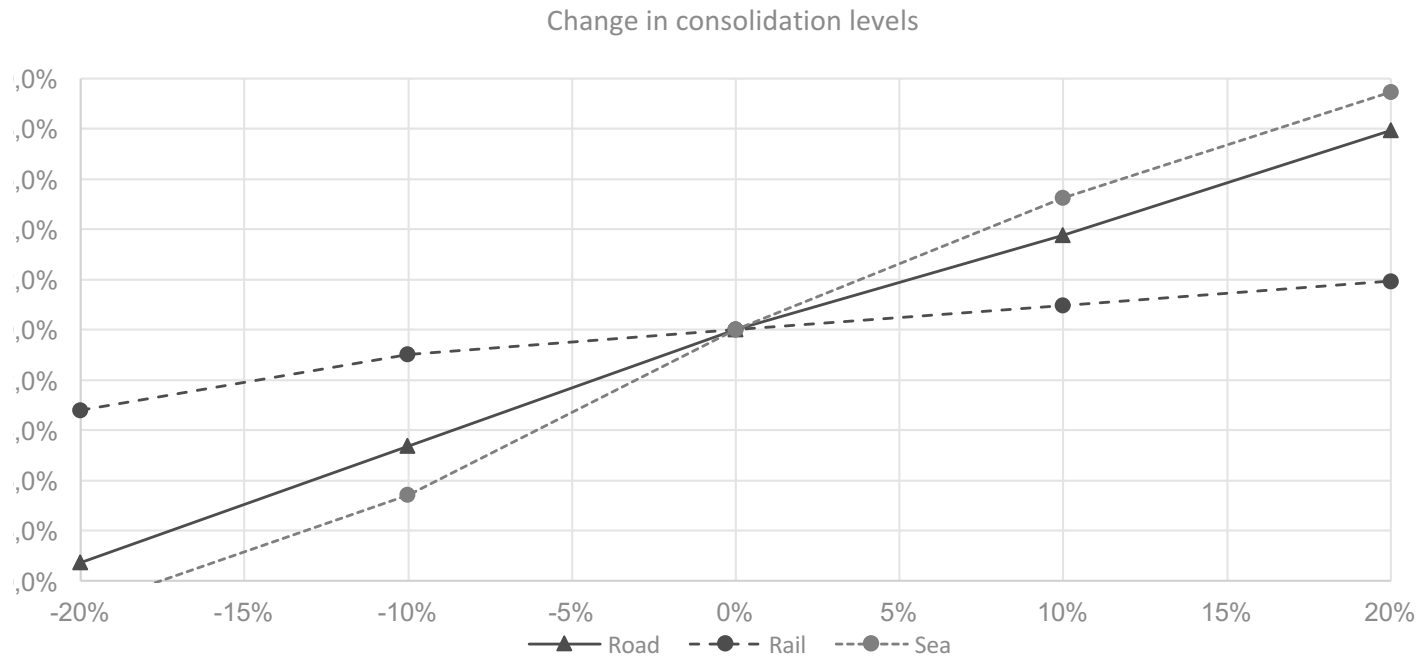


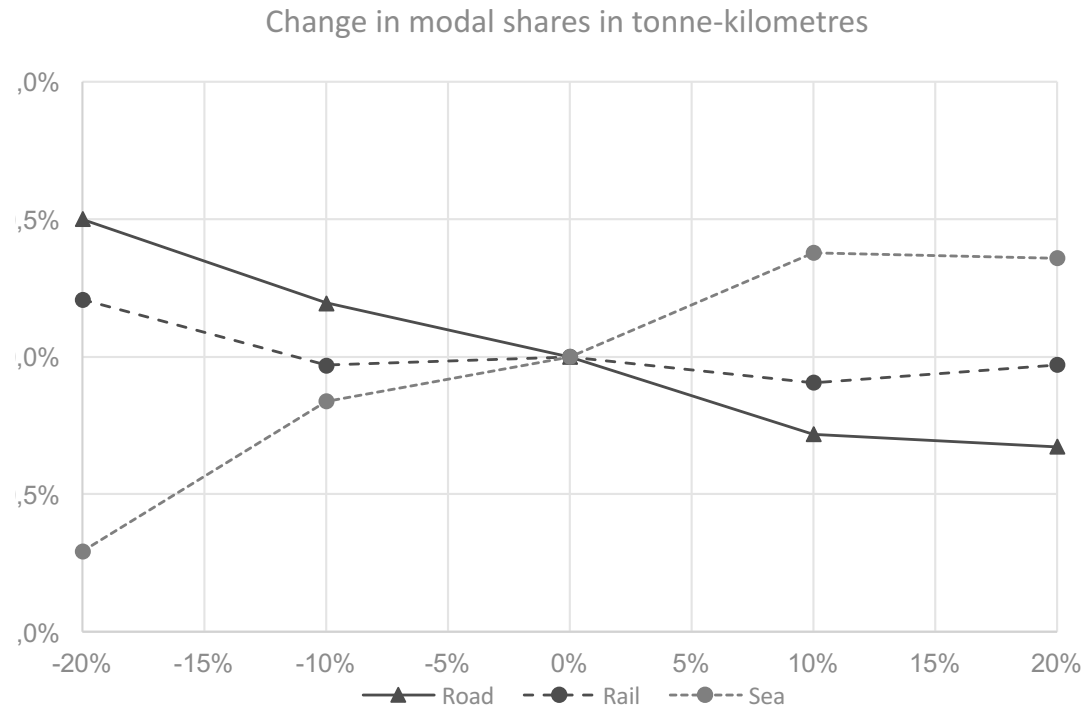
Figure. ADA structure of the national freight transport model system (de Jong et al., 2011)

# Change in consolidation levels as a function of change in transport volume



Change in average consolidation levels per mode in, to and from Sweden as a function of change in total transport volume

# Change in modal split (in tonne-km and vehicle-km) as function of change in transport volume



Change in modal shares in tonne-kilometres per mode inside and outside Sweden as a function of change in total transport volume

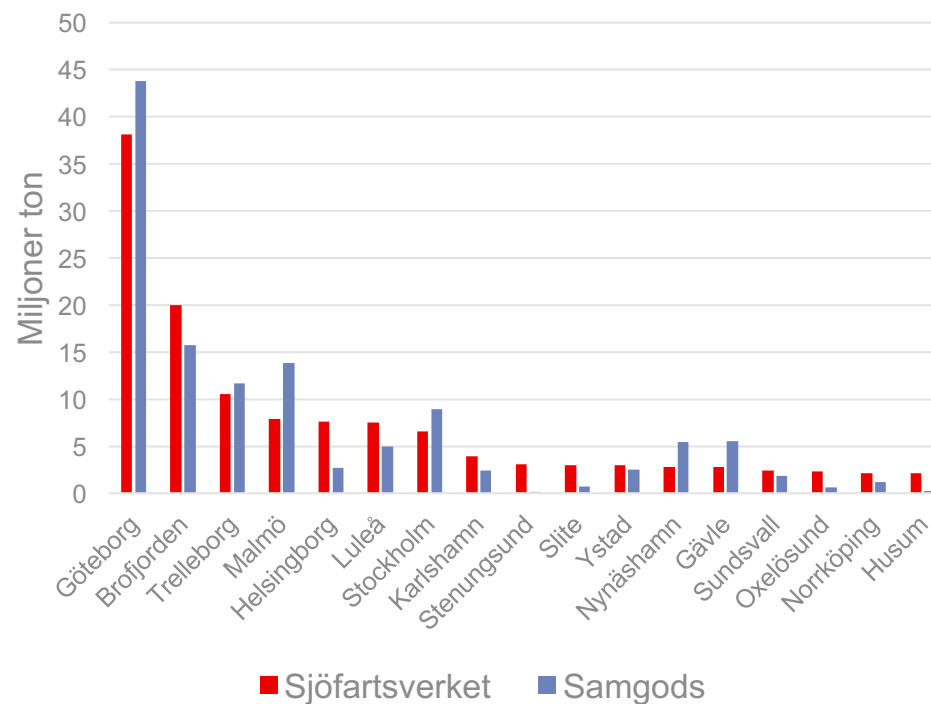
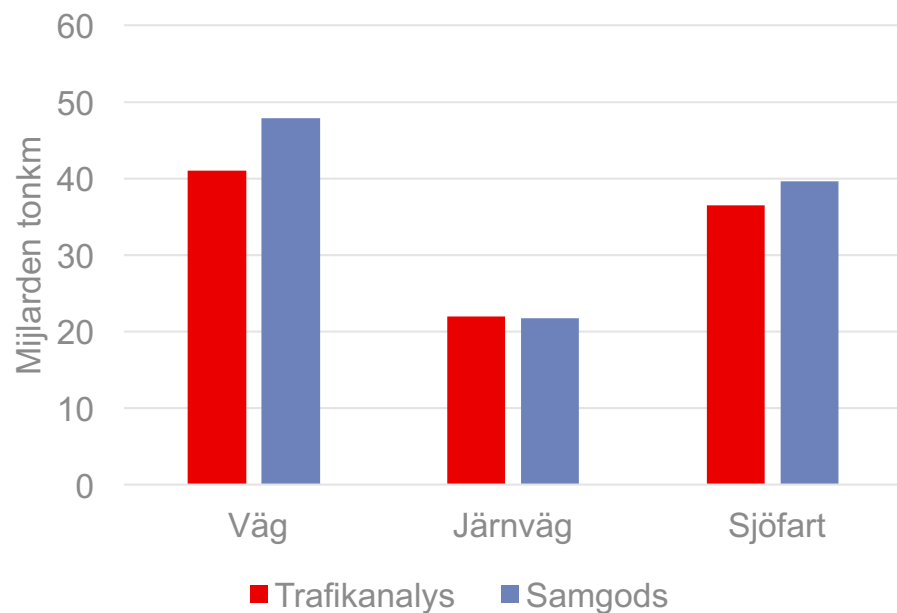
## Change in costs as function of transport volume

	Total cost	Transport cost	Order cost	Holding cost
Economy of scale parameter M	-0.47	-0.46	-0.79	-0.34

## Summary part 1 (Effects of changes in transport demand)

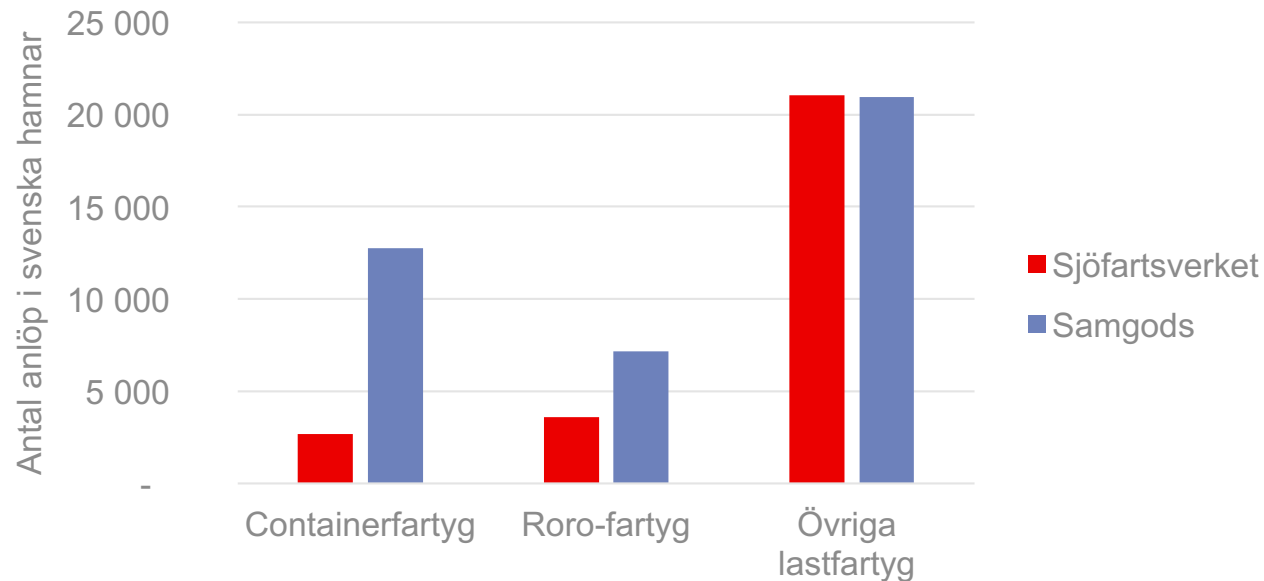
- Larger transport volumes lead to modal shifts and shifts to larger vehicle and vessel sizes within the modes
- Average level of consolidation increases with increased transport demand
- Without further empirical data, it difficult to assess whether the strength of this effect also corresponds to reality
- Part 2: Focus on modelling of economies of scale for sea transports **in logistics model**

# Existing model version: Calibration of modal split and throughput in ports





## ... but not calibration of number of calls in ports



- Economies of scale (and frequencies) are not modelled in proper way for container- and roro-vessels - the smallest of 3 ship size classes is chosen to 100% (98%)
- Better fit for other vessels (where positioning costs are modelled)

## Further steps needed

- In-depth analysis of reasons for differences between statistics and Samgods results (i.e. distribution over container vessel sizes)
- Which simplifications (i.e. number of commodities) are possible without affecting relevant results?
- Which focus, level of detail and method should be used in calibration?
- Question is related to use of model

Thank you for your attention!

J Westin, I Vierth, G de Jong, R Karlsson, N A Krüger, M Johansson,  
*Analyzing model uncertainty and economies of scale of the Swedish national  
freight model to changes in transport demand*  
European Journal of Transport and Infrastructure Research (EJTIR) 16(4), 2016

I Vierth, R Karlsson, J Westin  
*Validering av sjötransporter i Samgodsmodellen Version 1.1*  
(forthcoming VTI-rapport)