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Consideration of logistics for policy analysis with freight transport models

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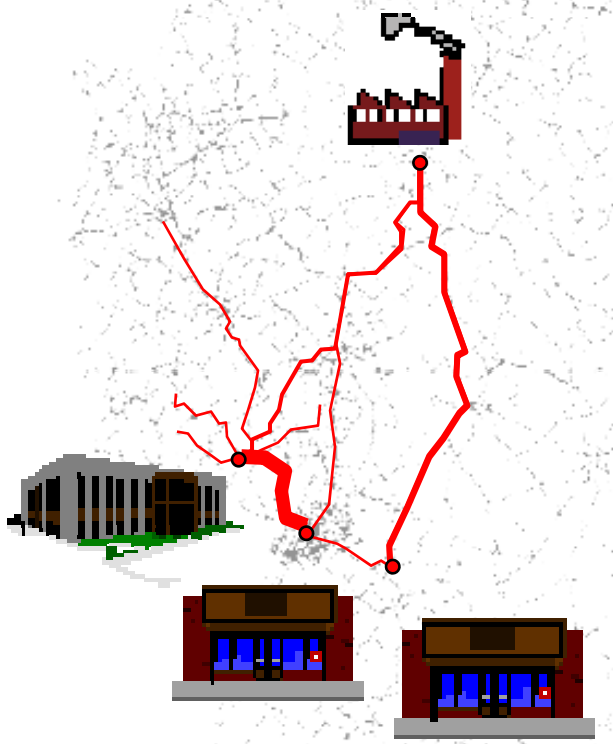
AGENDA

- **Motivation**
- Representation of logistics in freight transportation models
- Lessons learned

NEED OF LOGISTICS IN TRANSPORTATION MODELS

- Rising attention for logistics in politics
  - Masterplan Logistics EU
  - Masterplan Logistics Germany
- Higher relevance of freight transport in overall transport
- Logistics as natural interface between economic activity system and transportation system



DIFFICULTIES IN MODELING FREIGHT/LOGISTICS

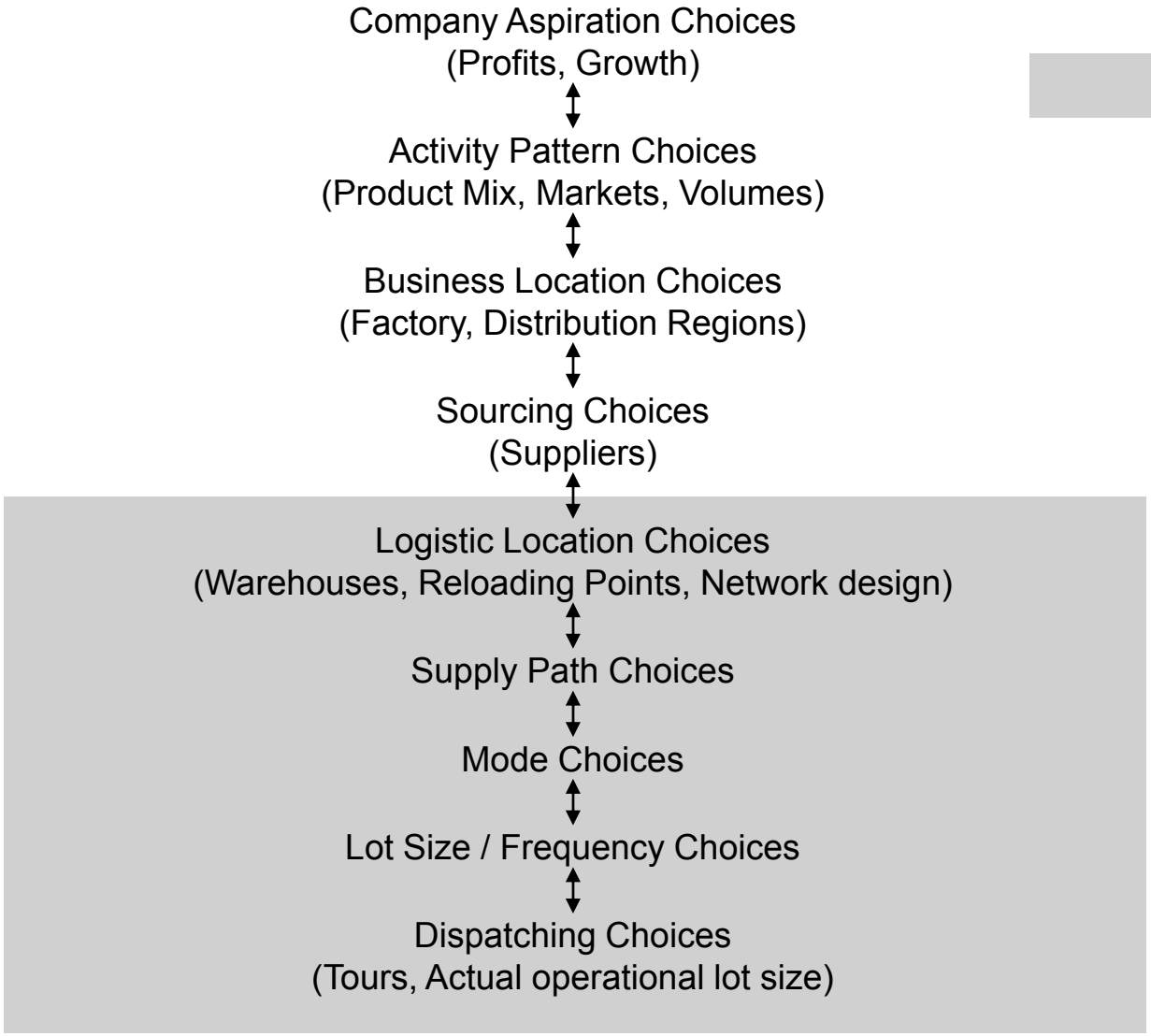
- Heterogeneity of actors and data availability
- Freight transport emerges from interaction between logistic systems using synergies (concave cost functions)
- The routing of freight flows therefore is dependent on:
  - Existence other flows
  - Networks/tour structures
  - Distribution structures
  - Locations of warehouses and warehouse structures

Need to consider combinations of flows and necessity to model logistic mesostructures

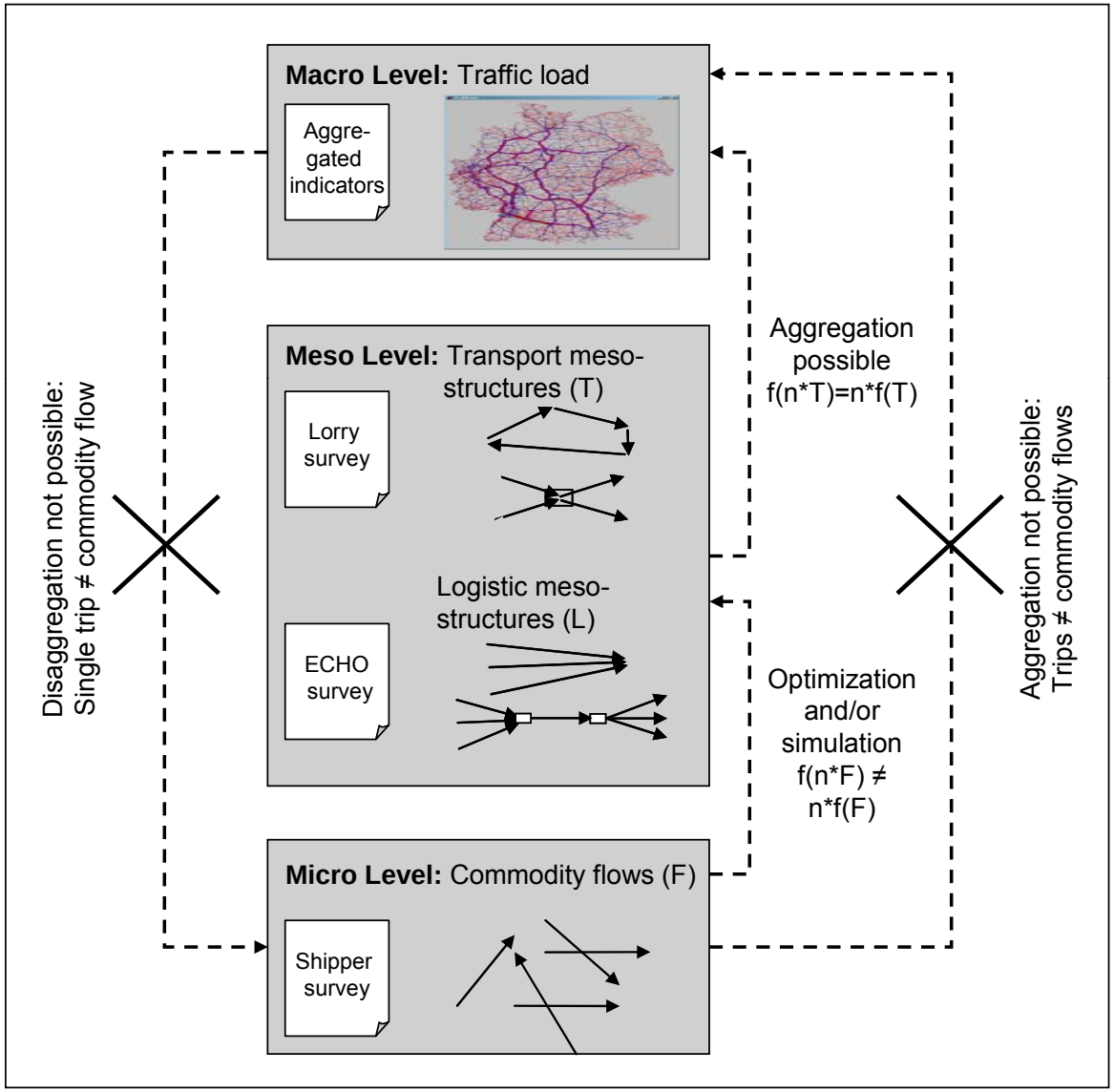
Definition Logistic Mesostructure:

A **logistic mesostructure** is an emergent operational structure, that handles several commodity flows. It can be described by **how**, **where** and **when** the goods of the commodity flows are transported, reloaded and stored. A mesostructure is the result of an **optimization** of one or several actors under
specific circumstances. These circumstances include the **state of the actors**
and the **state of their environment**.

CHOICES – FROM ECONOMIC ACTIVITY TO VEHICLE FLOWS



THE MICRO MACRO GAP



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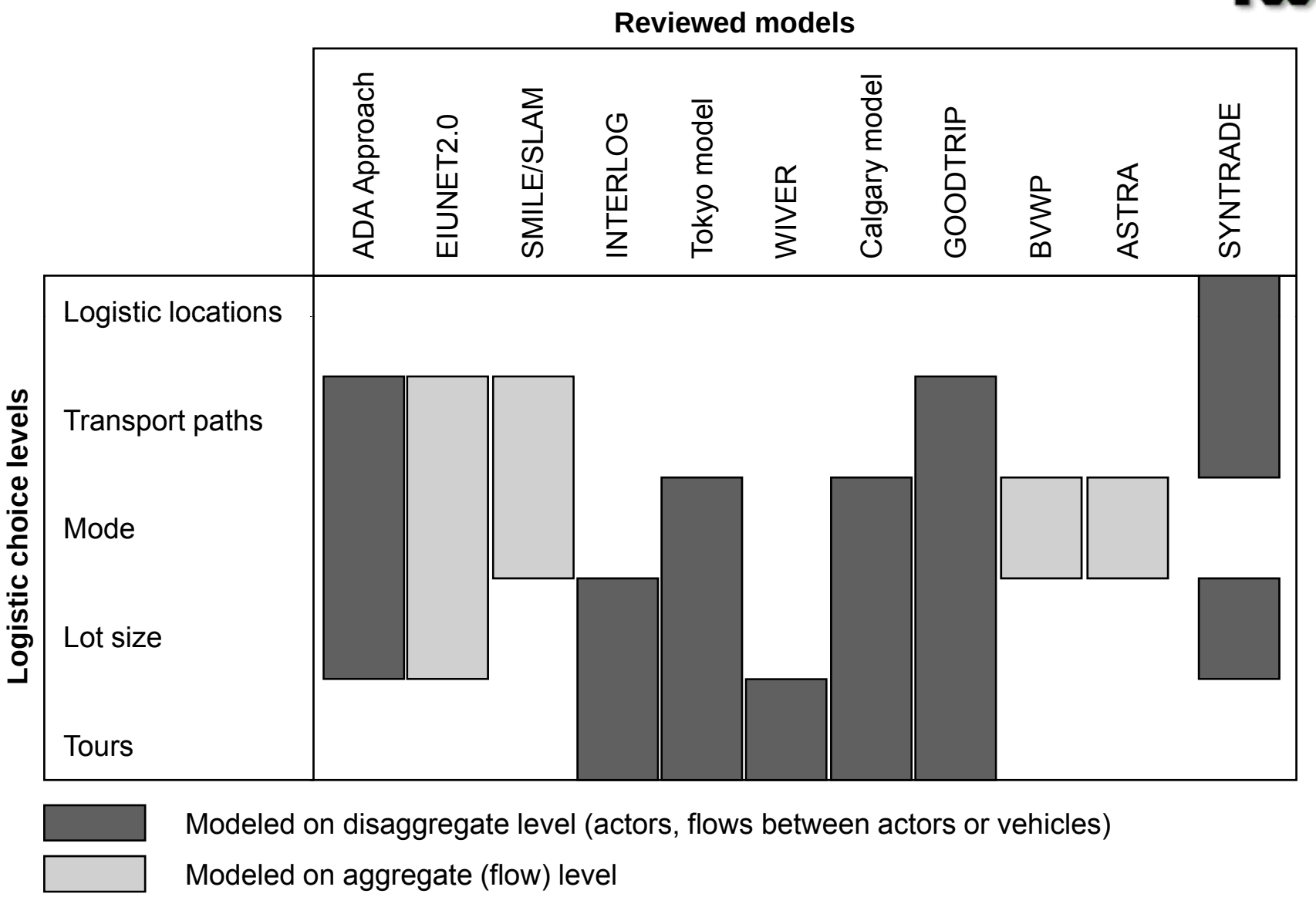
OVERVIEW SELECTED MODELS



INTERLOG – MODEL OVERVIEW

Generation

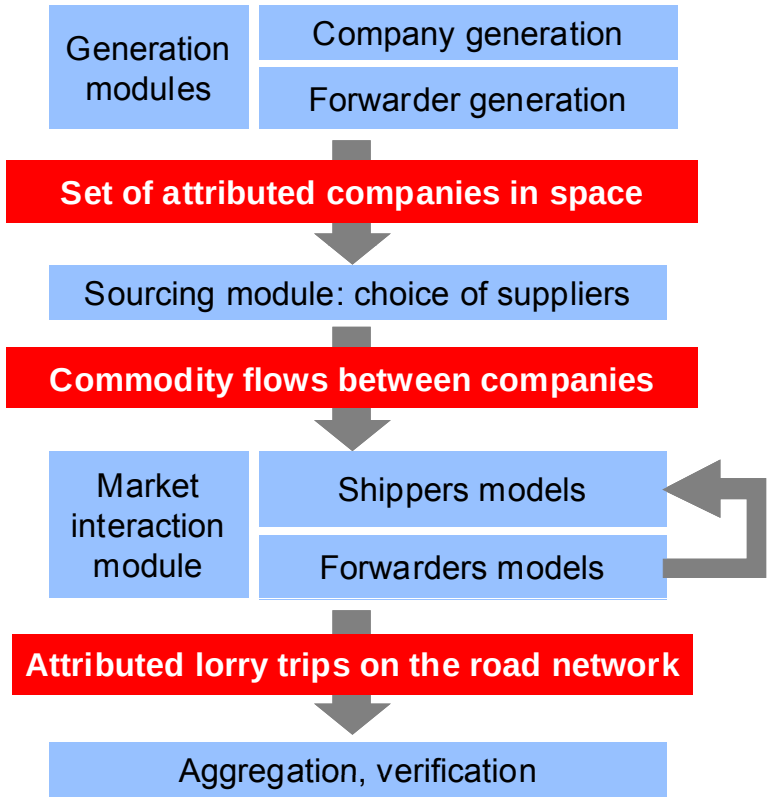
Distribution

Lot-size choice

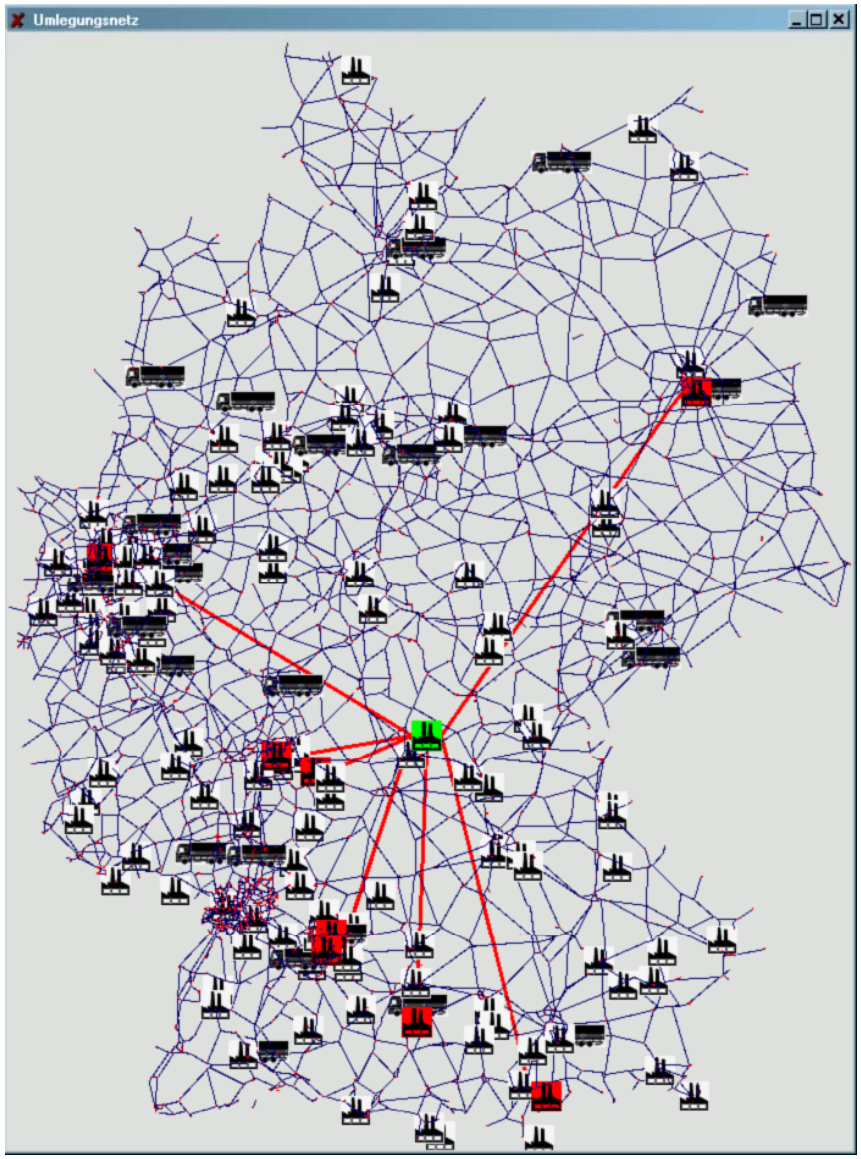
Market choice

Lorry model

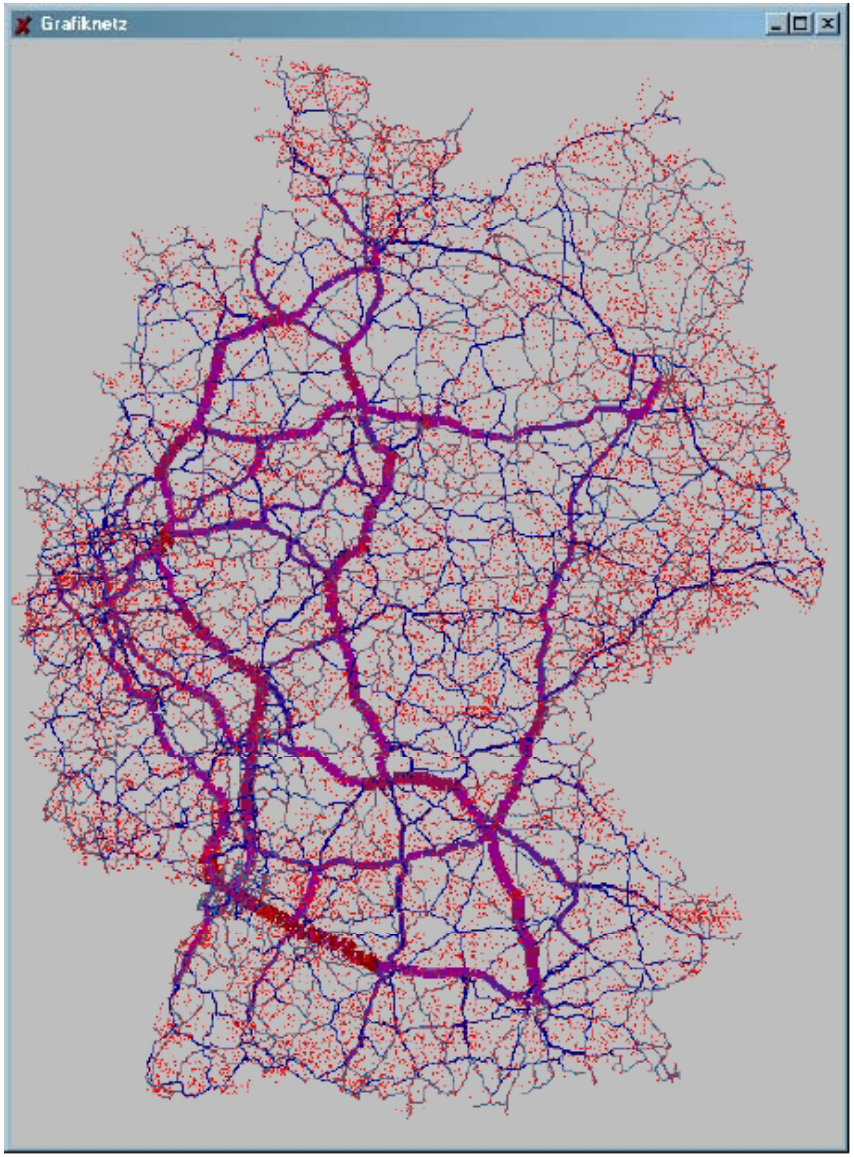
Network model



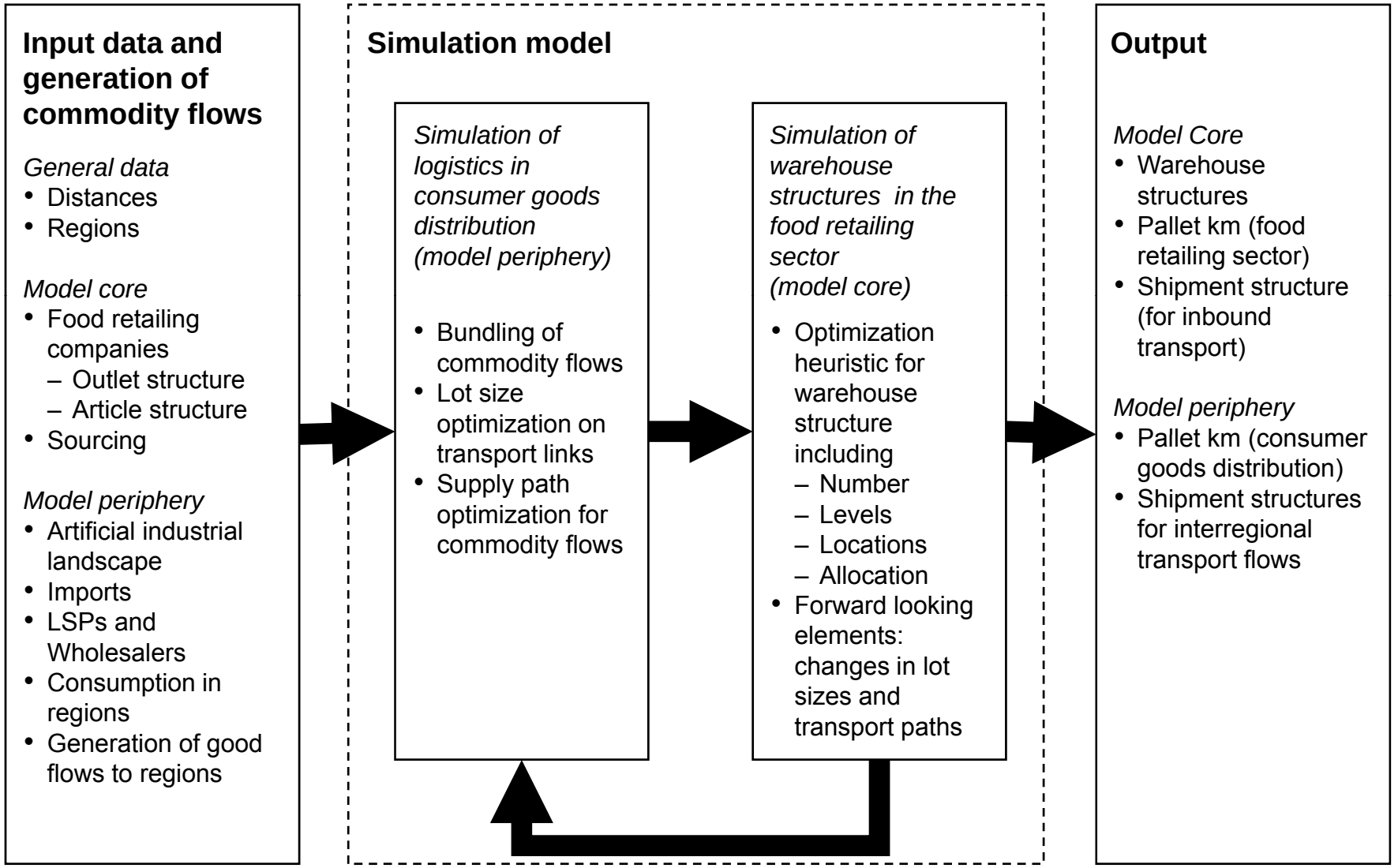
INTERLOG – ARTIFICIAL INDUSTRY LANDSCAPE



INTERLOG – RESULT: VEHICLE FLOWS

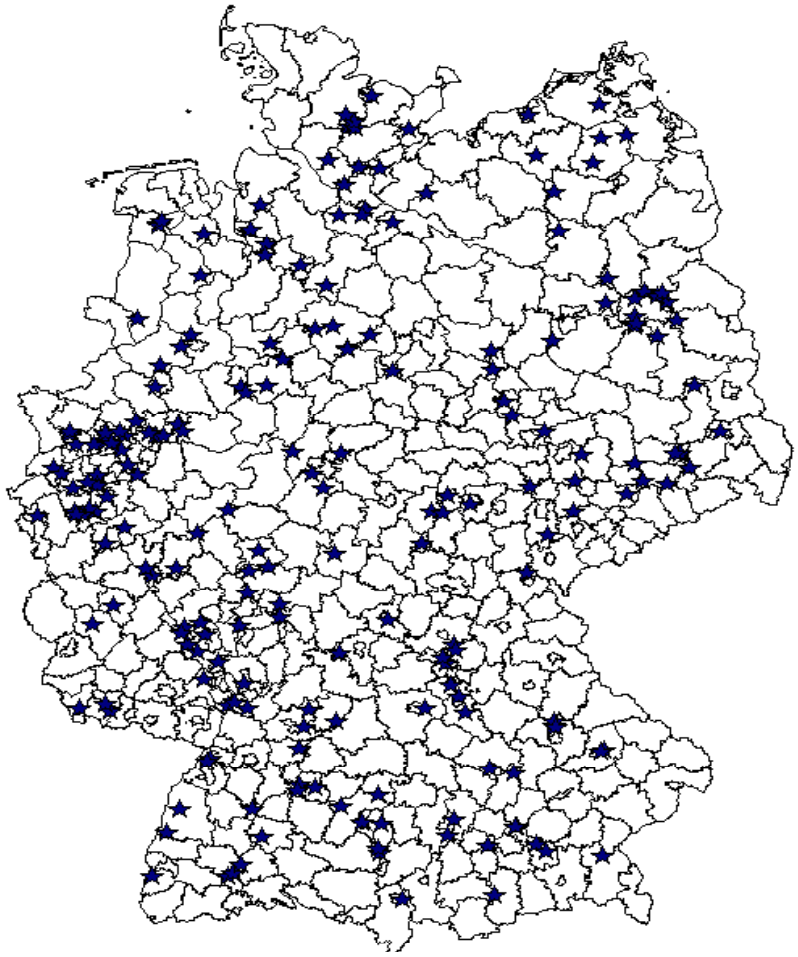


SYNTRADE – MODEL OVERVIEW

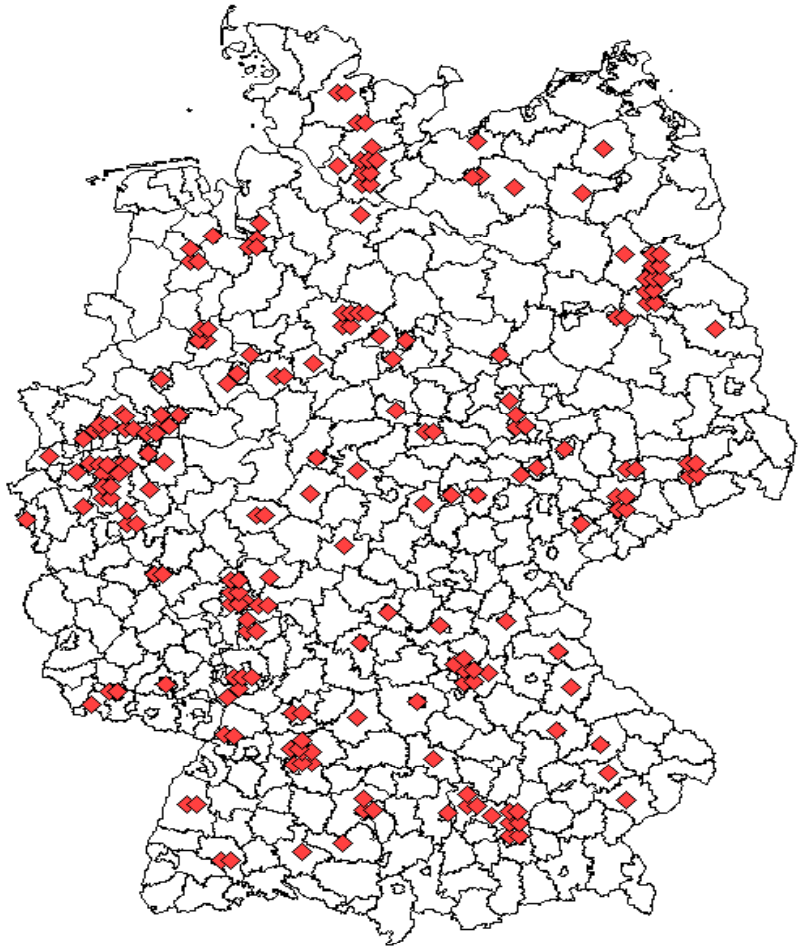


SYNTRADE – RESULTS: WAREHOUSE LOCATIONS

Existing warehouse locations of food retailing companies in Germany



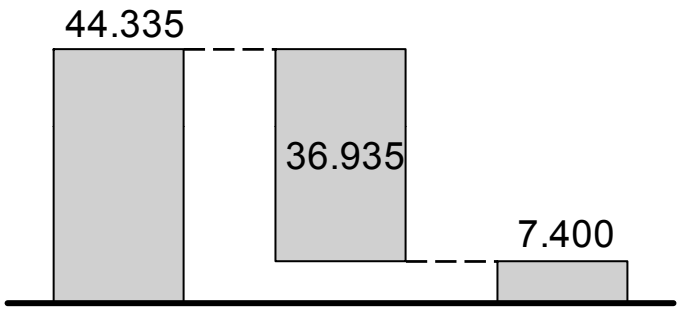
Simulated warehouse locations of food retailing companies in Germany



SYNTRADE – RESULTS: FUEL PRICE SCENARIO

Change in pallet km
(Mio. pallet km)

Base scenario



Fuel price scenario
(Assumed change of +25% in transport costs)

Change in warehouse structures

Companies	Number of regional warehouses (and central level (c))	
	Base scenario	Fuel price scenario
Discounter 1	33(c)	+5
Discounter 2	31(c)	+4
Discounter 3	33(c)	+7
Discounter 4	10	+2
Discounter 5	5	+1
Discounter 7	11	+1
Discounter 8	3	+1
Full Assortment Retailer 1	7(c)	+1
Full Assortment Retailer 3	7(c)	+2
Full Assortment Retailer 4	6(c)	+3
Full Assortment Retailer 5	2	+1
Full Assortment Retailer 6	3	(+c)
Full Assortment Retailer 7	4(c)	+2
Full Assortment Retailer 8	5(c)	+1
Full Assortment Retailer 11	3	+1(+c)
Full Assortment Retailer 12	3	+1(+c)
Full Assortment Retailer 14	3	+1(+c)
Full Assortment Retailer 15	1	+1

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LESSONS LEARNED FOR FREIGHT TRANSPORT MODELING

Challenges	Solution approaches
• Data availability (modeling heterogeneity)	• Artificial generation of disaggregated data • New data sources through more detailed modeling of sectors
• Complexity – Combinatorial problems – Involvement of many actors in decisions	• Simplified but realistic heuristics • Modeling markets and market interaction • Possible simplifications through market modeling: simplified representation of supply or demand or the overall market outcome
• Reaching “realistic” overall system states through simulation	• Choosing realistic decision scopes and heuristics • Forward looking elements in simulation

CONCLUSIONS FOR POLICY ANALYSIS

- State of the art freight transport models only include basic logistic aspects
- Recent developments try to include more complex logistic structures, but are still limited in scope
- Policy analysis on effects of logistics on transportation by freight transportation models is therefore limited