

EMPLOYMENT EFFECTS OF SUSTAINABLE TRANSPORT

A scenario analysis for Germany using input-output modelling*

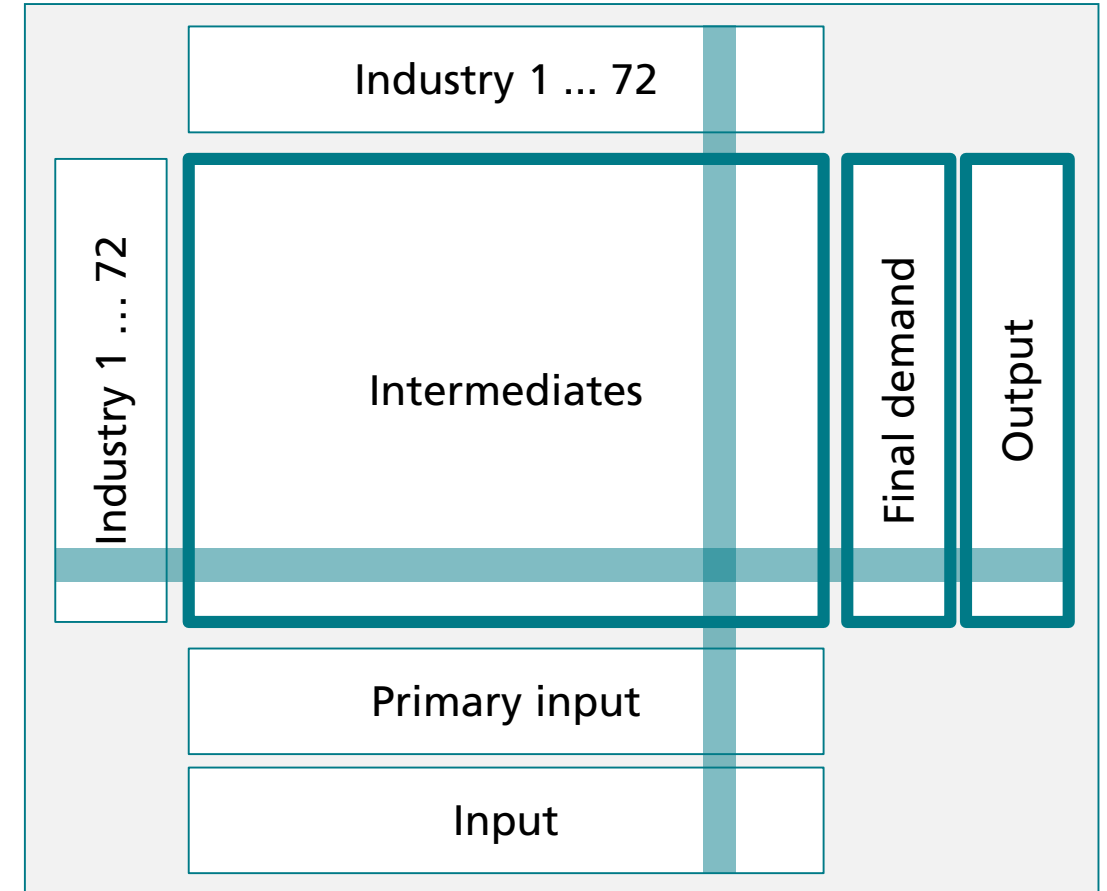
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Osnabrück, 12.03.2020



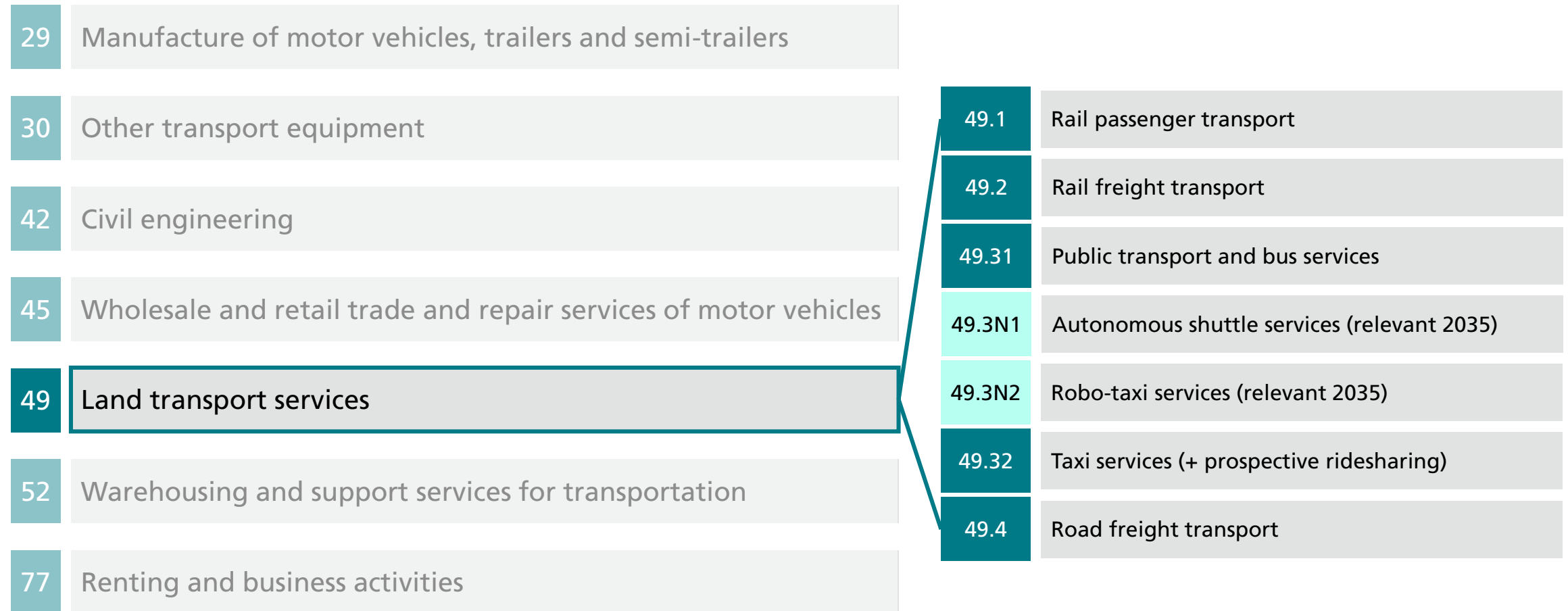
Structure

- Extension of the German input-output table
- Scenarios and implementation
- Results – Employment effects
- Critical reflection



Extension of the German input-output table: Status-Quo

From 72 to 92 industries

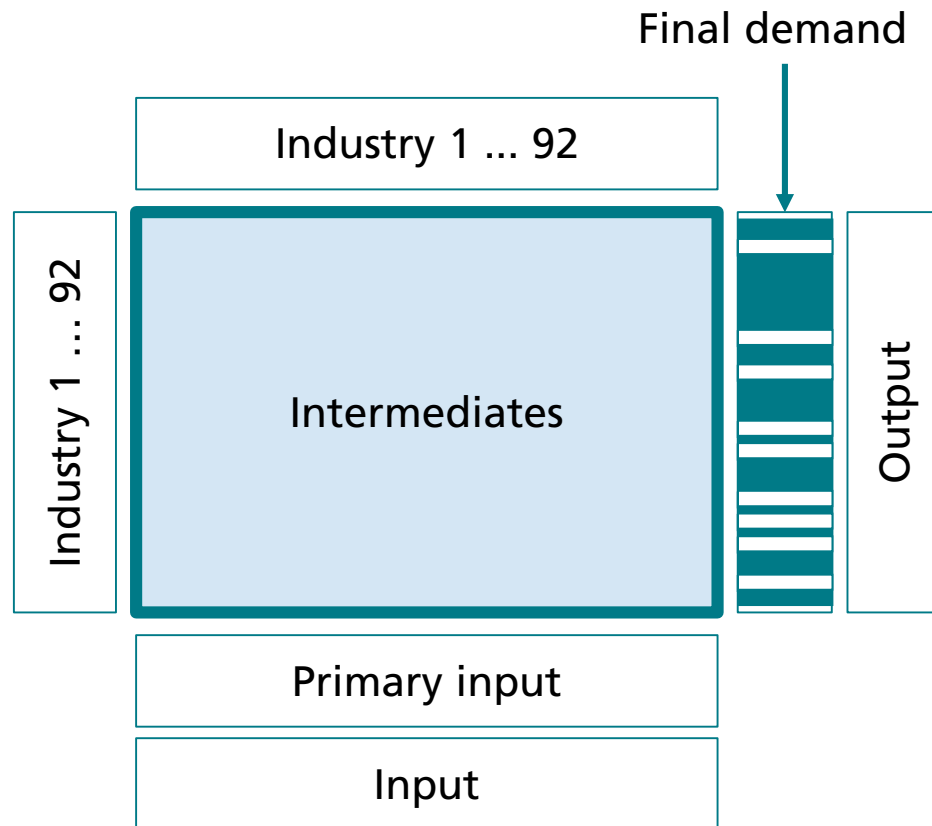


Extension of the German IOT: Methodology

- Additional lines **for established areas**: based on goods matrix 2012 (scaled for IOT 2014)
- Additional lines **for new areas** (car sharing, batteries / components for e-vehicles): total demand determined and final demand allocated

- Additional columns **of established areas**:
 - Primary inputs → Structural surveys
 - Secondary inputs → assigned to individual input coefficients, remaining input coefficients distributed analogously to higher-level ranges
 - iterative procedure until Input=Output is reached
- Additional columns **for new areas**:
 - Battery Production → Project of Fraunhofer ISI
 - Components for electric vehicles → Electrical equipment
 - Carsharing Mobility → annual report

Implementation of the scenarios



Adjustment of intermediates

- Transport services (electrification, automation)
- New technologies (production of batteries, Carsharing, autonomous driving)
- Supply of transport related industries to other industries

Impulses to transport related final demand

- Impulses in consumption, investment, export
- Bottom-up estimates (assumptions on future developments e.g. vehicle kilometers according to scenarios)
- Split into the industries of extended input-output table

Impulses to non-transport related final demand

- Transport services are demanded as intermediates from other industries
- Non-transport related industries grow by 1,17% p.a. until 2035 (OECD economic growth rate)

Scenarios 2035

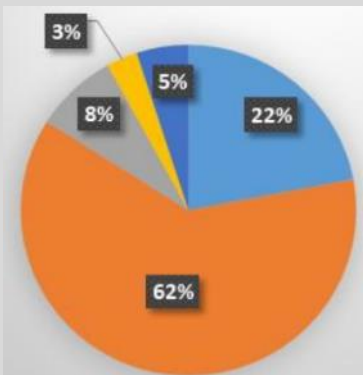
Modal split in passenger km

E-Street Scenario (ES35)

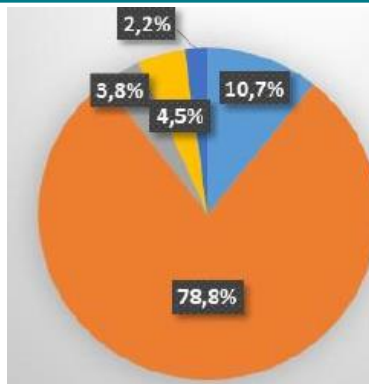
- significant strengthening of **ecomobility***
- **road-bound traffic** retains its **dominant role** as a means of transport
- efficiency gains reached by **electrification**, highly **automated driving**, higher **occupancy rates** and a greater **diversity** of vehicles
- **rail transport** is only increasing its market share moderately compared to road transport

Multi-Modality Scenario (MM35)

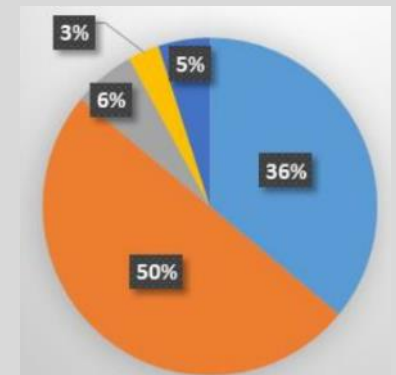
- focus on **multi-modality**
- **high share of rail transport** in long-distance and regional transport, flexibly combined with bicycle and public transport
- promotion of rail transport reached by **targeted transport planning**, a complete **internalization of external costs** of emissions and a consistent expansion of **ecomobility***



Reference 2015



- rail + public transport
- motorized individual transport
- bus
- airplane
- foot + bike



Results: Employment effects in 2035

Two types of employment effects:

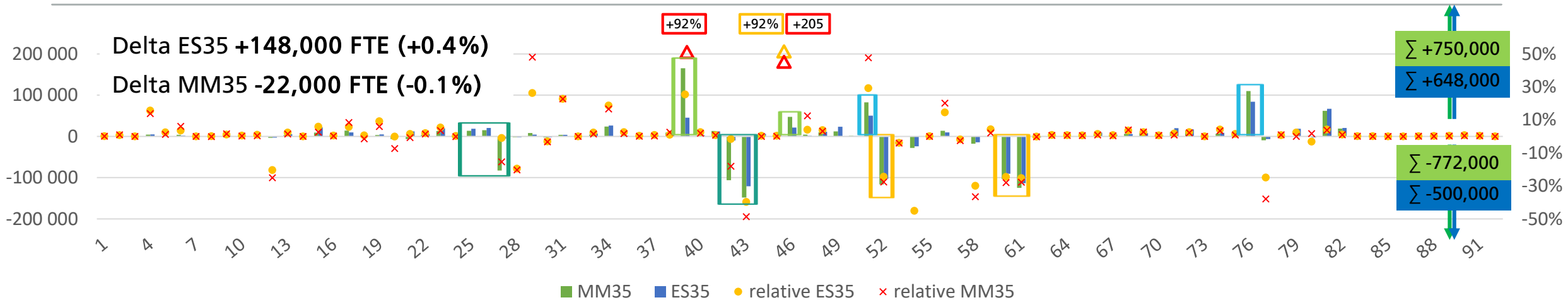
direct: result from transport related **final demand** (consumption, investments, exports)

indirect: Intermediates for transport-related final demand and **intermediate demand** for transport-related goods and services as well as their intermediates

* Logic of chart legend (next slide)

Results (direct + indirect effects)

Absolute deviation ES35 and MM35 to Status Quo



ES35: more moderate effect due to stronger focus on street transport

→ classic vehicle parts and trade only weakly affected

MM35: moderate increase batteries, other components for electrification

Maintenance far more affected due to lower electrification and smaller inventory

25 vehicle batteries 42 vehicle maintenance

26 other equip. electrification 43 vehicle trade

27 classic motor vehicle parts

MM35: Infrastructure expansion much more affected (rail infrastructure)

Rail-bound passenger transport strongly affected (esp. relative) due to stronger focus on multi-modality

39 construction rail and road

46 passenger transport rail

MM35: carsharing and taxi larger effects (multi-modality)

Taxi services with high labor-intensity

76 Taxi services

51 Carsharing

MM35: Road-related services in freight transport decline more strongly

52 road-freight transport

60 other services (mainly haulage)

61 courier, express and parcel service

Σ +750,000

Σ +648,000

Σ -772,000

Σ -500,000

Critical reflection

- Input-output analysis well suited but with **limitations**:
 - Linear-limitational production function
 - Homogeneity of groups of goods
 - Proportionality of physical and monetary variables
 - Static and open model

- Adaptation of the model to the problem through higher level of detail, but:
 - **Limited data availability** for extension of the IOT in the status quo
 - Uncertainty about the impact of **new technologies** on cost structures
 - **Simplifying assumptions** for the determination of final demand impulses
 - No limitation of macroeconomic activity
 - **Domestic shares** such as status quo

Conclusion

- Structure and extent of effects depend on the **design of mobility** (higher demand in ES)
- **Clear differences** in individual areas → Expanded IOT makes sense
- Results show **demand, supply side** was not displayed, weighing not meaningful
- **Negatively affected:** road freight transport, haulage, CEP services
 - Reason: high automation, BUT also solution for shortage of skilled workers in this area
- **Negatively affected:** Motor vehicle maintenance, motor vehicle trade, motor vehicle production (classic areas)
 - Reason: electrification and decline in domestic demand;
 - Export increase and domestic production of E-components assumed
 - Retraining / adaptation of training necessary
- **Positively affected:**
 - Public transport: services and infrastructure, strong automation mitigates effect
 - Individual transport: Car sharing and taxis, sustainability questionable
- Consider employment effects in conjunction with **other sustainability aspects**