

# EMPLOYMENT EFFECTS OF SUSTAINABLE TRANSPORT

A scenario analysis for Germany using input-output modelling

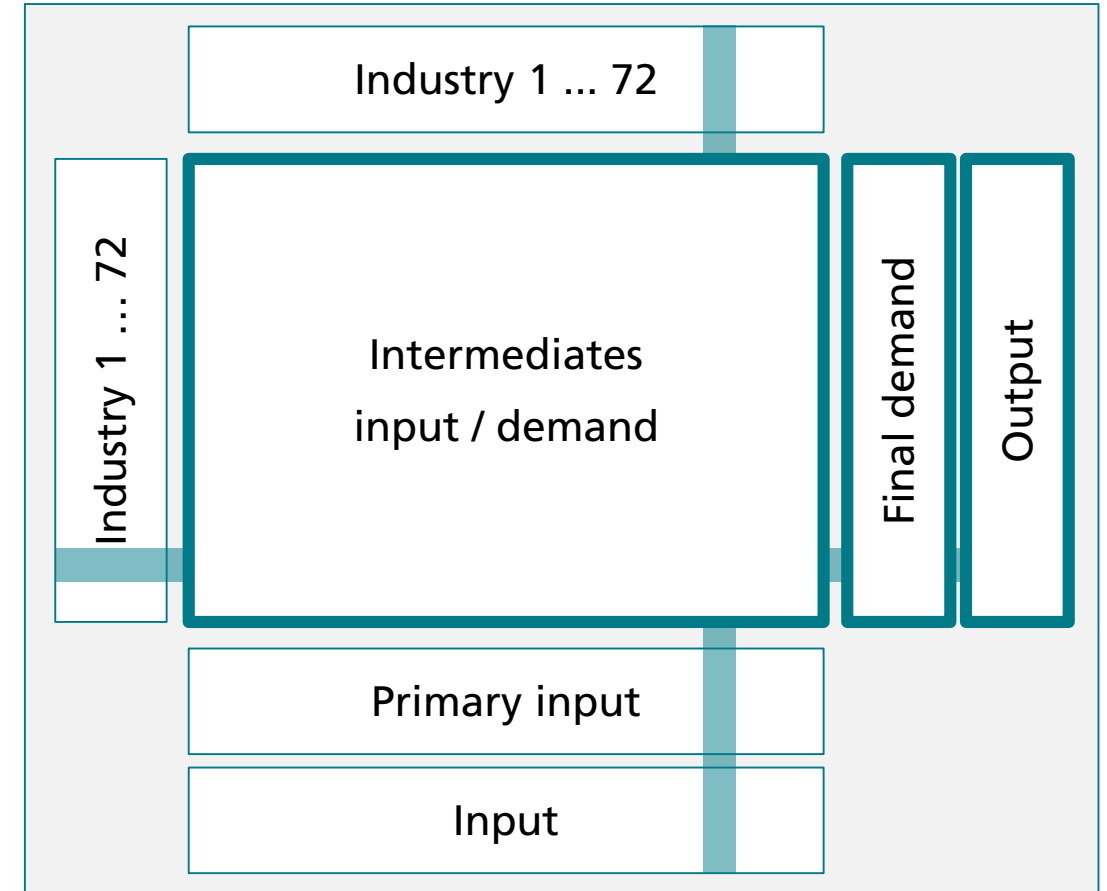
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Concordi Conference, Sevilla, 26.09.2019



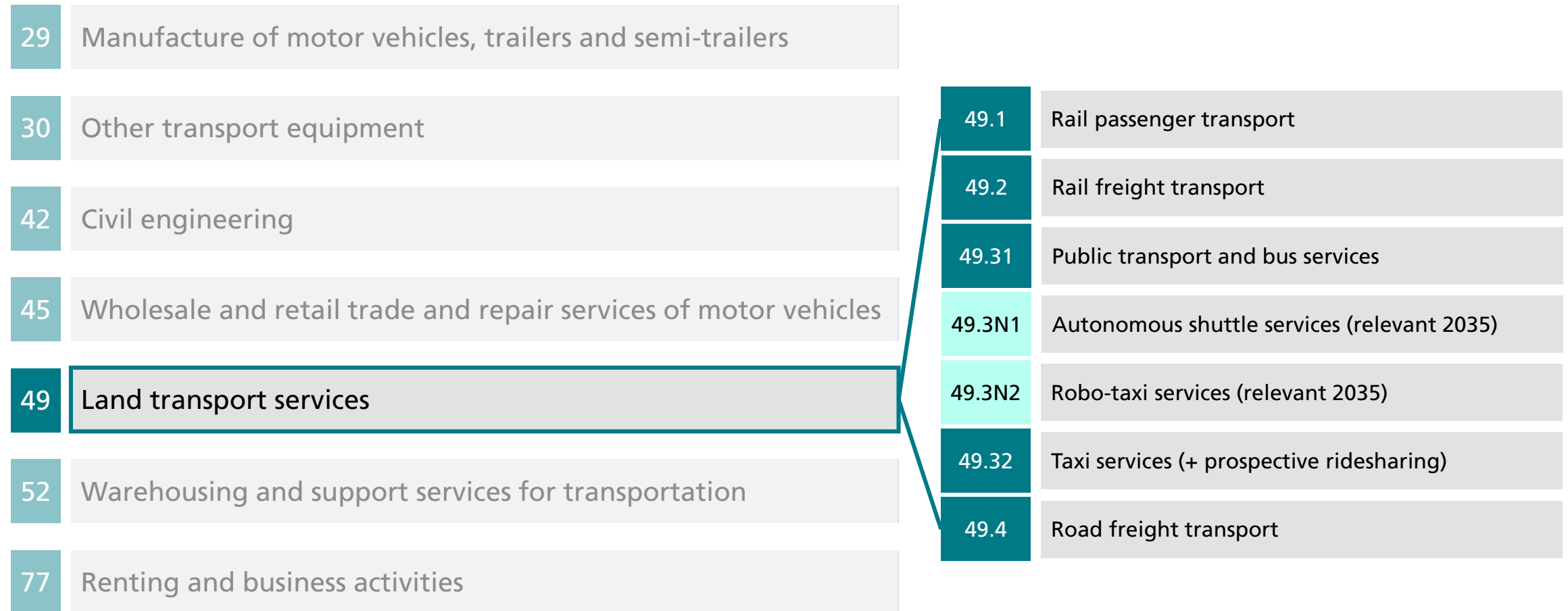
# Structure

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



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

## From 72 to 92 industries



# Scenarios 2035

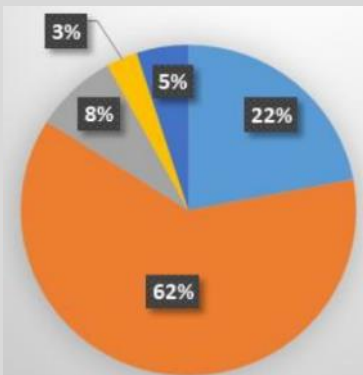
## Modal split in passenger km

### E-Street Scenario (ES35)

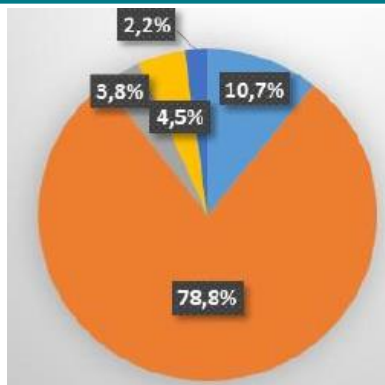
- significant strengthening of **ecomobility\***
- **road-bound traffic** retains its **dominant role** as a means of transport
- efficiency gains reached by **electrification**, highly **automated driving**, higher **occupancy rates** and a greater **diversity** of vehicles
- **rail transport** is only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

### Multi-Modality Scenario (MM35)

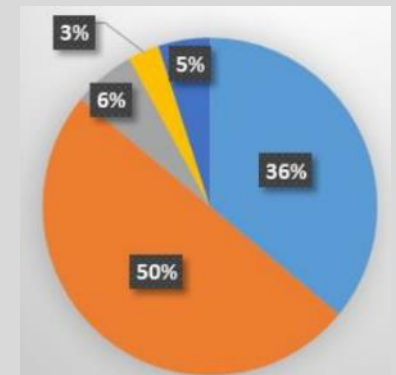
- focus on **multi-modality**
- **high share of rail transport** in long-distance and regional transport, flexibly combined with bicycle and public transport
- promotion of rail transport reached by **targeted transport planning**, a complete **internalization of external costs** of emissions and a consistent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



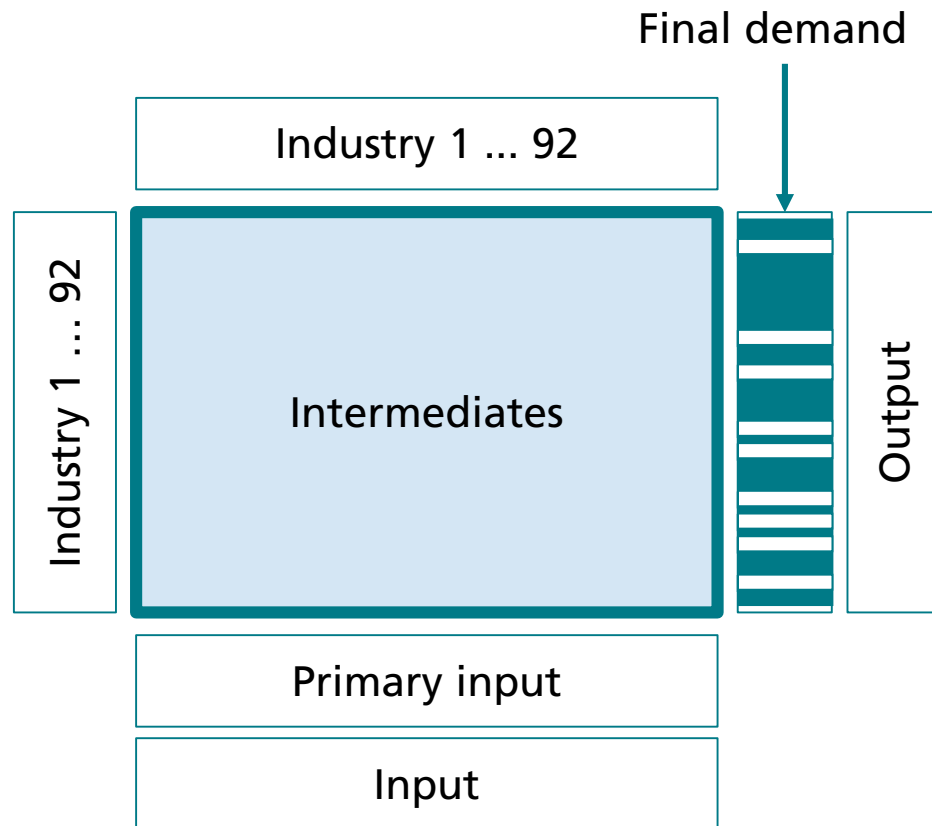
Reference 2015



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



# Implementation of the scenarios



## 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)

## Adjustment of intermediates

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

# Results: Employment effects in 2035

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Two types of employment effects:

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

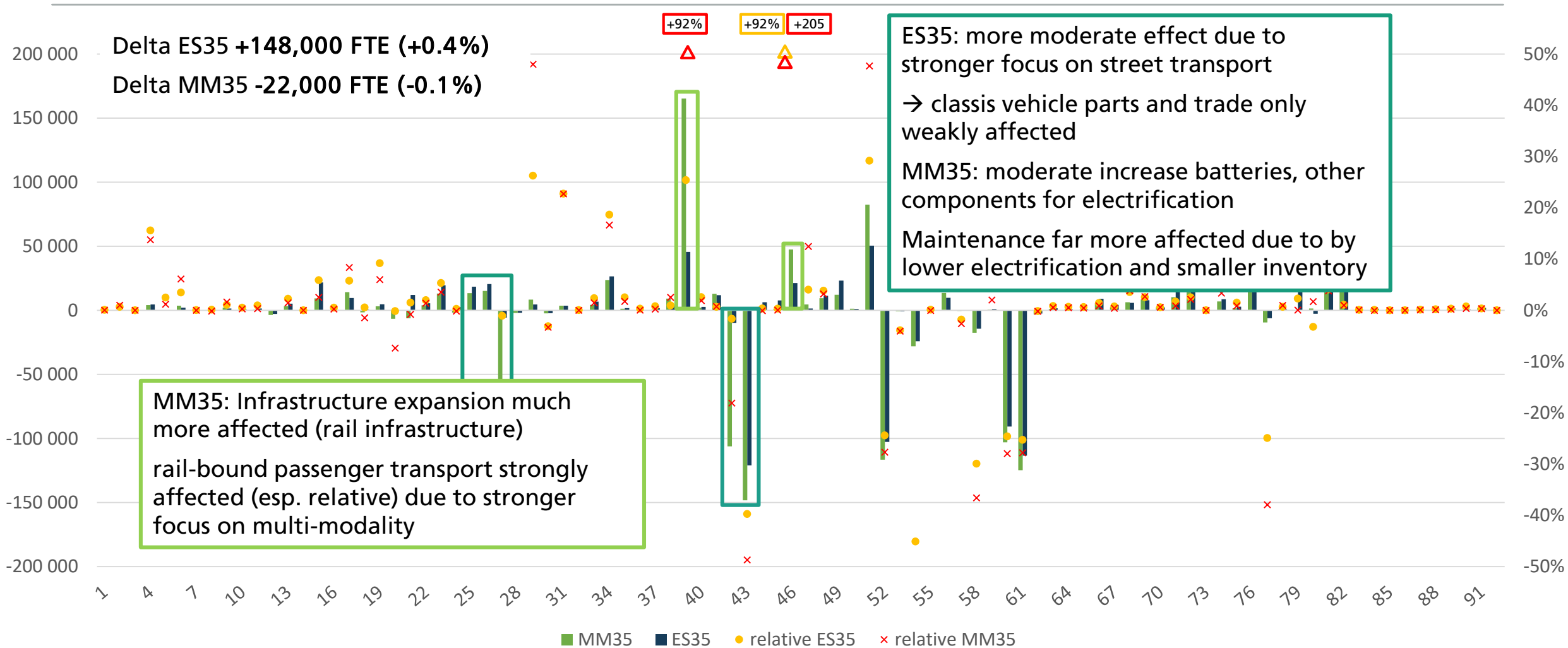
**indirect:** **Intermediates** for transport-related final demand and **intermediate demand** for transport-related goods and services as well as their intermediates

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\* Logic of chart legend (next slide)

# Results (direct + indirect effects)

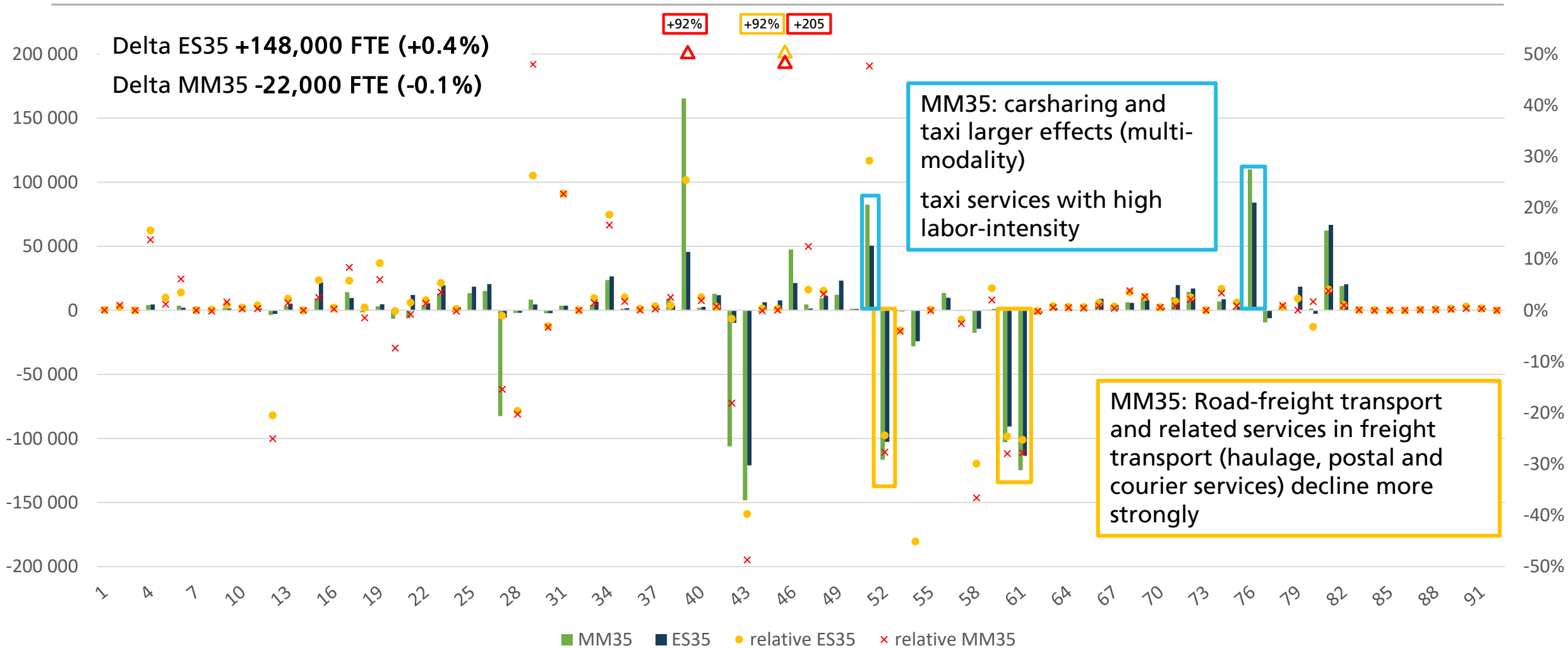
## Absolute deviation ES35 and MM35 to Status Quo





# Results (direct + indirect effects)

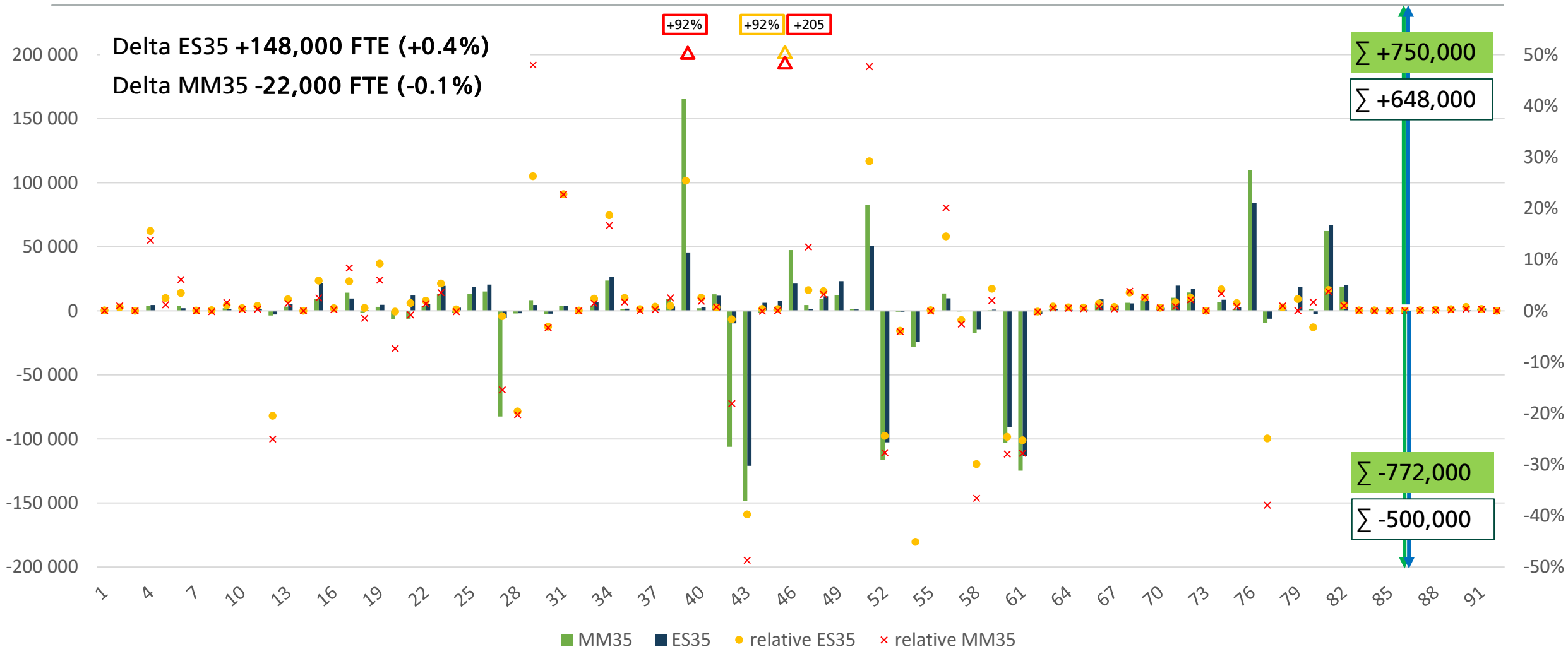
Absolute deviation ES35 and MM35 to Status Quo





# Results (direct + indirect effects)

## Absolute deviation ES35 and MM35 to Status Quo



# Critical reflection

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- 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 address limitations 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** equivalent to the status quo

# Conclusion

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- 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, postal and courier 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**

# Backup

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# Overview on extended industries

| WZ-2008  | Industry description                                      | Cons. No. | WZ-2008   | Industry description   | Cons. No. |
|--|---|-----------|---|--|-----------|
| The industry <b>Manufacture of motor vehicles, trailers and semi-trailers (29)</b> is split into:        |   |           | The industry <b>Warehousing and support services for transportation (52)</b> is split into: |  |           |
| 29.N1  | Manufacture of vehicle batteries                          | 25        | 49.3N2  | Robo-taxi services (only relevant in 2035)                           | 50        |
| 29.N2  | Manufacture of other equipment for electrification        | 26        | 49.32   | Taxi services (prospective ridesharing included)                     | 51        |
| 29   | Manufacture of motor vehicles, trailers and semi-trailers | 27        | 49.4  | Road freight transport   | 52        |
| The industry <b>Other transport equipment (30)</b> is split into:  |   |           | The industry <b>Renting and business activities (77)</b> is split into:                     |  |           |
| 30.1   | Building of ships and boats                               | 28        | 52.1  | Warehousing and storage  | 55        |
| 30.2   | Rail vehicle construction                                 | 29        | 52.21   | Land transport services  | 56        |
| 30.3   | Aerospace manufacture                                     | 30        | 52.22   | Water transport services   | 57        |
| 30.9   | Other transport equipment                                 | 31        | 52.23   | Air transport services   | 58        |
| The industry <b>Civil engineering (42)</b> is split into:  |   |           | 52.24   | Cargo services   | 59        |
| 42.1   | Construction of roads and rail routes                     | 39        | 52.29   | Warehousing and support services for transportation (mainly haulage) | 60        |
| 42.2, 42.9   | Other civil engineering works                             | 40        | The industry <b>Renting and business activities (77)</b> is split into:                     |  |           |
| The industry <b>Wholesale and retail trade and repair services of motor vehicles (45)</b> is split into: |   |           | 77.1N1  | Carsharing   | 76        |
| 45.1, 45.3, 45.4   | Trade with motor vehicles                                 | 42        | 77.1  | Renting and leasing of motor vehicles                                | 77        |
| 45.2   | Maintenance and repair of motor vehicles                  | 43        | 77.2-77.4   | Renting and leasing of other machinery and tangible goods            | 78        |
| The industry <b>Land transport services (49)</b> is split into:  |   |           |   |  |           |
| 49.1   | Rail passenger transport                                  | 46        |   |  |           |
| 49.2   | Rail freight transport                                    | 47        |   |  |           |
| 49.31  | Public transport and bus services                         | 48        |   |  |           |
| 49.3N1   | Autonomous shuttle services (only relevant in 2035)       | 49        |   |  |           |