Contribution of LHV to EU environmental policy

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Outline

- Background (EU Policy, research context)
- Methodology
- Results (FC, NOx, PM)
- Completing the picture: other impacts
- Conclusions
Background: EU policy

• GHG reduction: “20-20-20”
  – CO₂ ETS for most sectors
  – Road transport is biggest emitter outside ETS
  – Separate target for road transport: 10% reduction

• Improve energy efficiency of transport
  – Optimal modal mix
  – Improve each separate mode’s efficiency

• Non-GHG: EURO standards
Background: research context

• Study commissioned by EC DG TREN (now DG MOVE) on potential effects of introducing LHV in EU
  
  – Long heavy vehicles:
    • Up to 25.25m, 60t (“Modular Concept”)
    • Up to 20.75m, 44t

  – 6 effects:
    1. Meeting demand
    2. Mode choice
    3. Road safety
    4. Infrastructure
    5. Fuel efficiency (CO₂)
    6. Noxious emissions (NOx, PM)

  – 4 scenarios
    1. S1: Business as usual
    2. S2: LHV full option
    3. S3: Corridor
    4. S4: Compromise

  – Horizon: 2020
Methodology: Introduction

• TREMOVE
  – EU model for assessment of policies on issues related to transport and environment
  – 1995-2030
  – Developed and maintained by TML
  – Modular structure: demand, vehicle stock (stock, emissions, welfare)
  – Emission module of TREMOVE based on COPERT IV software
Methodology: specific variables (1)

• Model contains information on
  – Demand (tonne.km, vehicle.km, speed)
  – Load factor
  – Region
  – Time of day
  – Truck size
  – Truck technology
**Methodology: specific variables (2)**

- **Detail of size classes**

<table>
<thead>
<tr>
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Methodology: specific variables (3)

- Truck technology: EURO classes
- Region (urban/rural/motorway)
- Time (peak/off-peak)
  → Indication for driving speed
- Load factor: tonne.km/vehicle.km (average)
Methodology: operational

• COPERT IV contains specific formulas for each pollutant, truck size class, technology and load factor, with speed the main parameter, to calculate emissions

• Relating emission-speed can take various forms; e.g., for fuel consumption:

1. \[ FC = e + a \exp(-b \cdot v) \]
2. \[ FC = \frac{e + a \exp(b \cdot v)}{a + (b \cdot v)} \]

\[ FC = a \cdot v^2 + b \cdot v + c \]
Results of calculation (1)

- Fuel consumption
  - 18.75m, 40t HDVs: 30.28l/100km
  - 25.25m, 60t LHV: 40.65l/100km

- Fuel efficiency
  - 18.75m, 40t HDVs: 25.7l/1000 tonne.km
  - 25.25m, 60t LHV: 22.62l/1000 tonne.km

→ 12.45% improvement

- Direct link between fuel consumption and CO$_2$ emission (1l diesel ~2.62 kg CO$_2$)
Results of calculation (2)

• NOx
  – Similar pattern as fuel consumption and $\text{CO}_2$
  – Slightly higher reduction due to bigger share of new EURO V/VI trucks in the LHV fleet: 13.12% per tonne.km

• PM
  – Apart from better fuel efficiency and higher share of EURO V/VI, also fewer vehicle.km: less mechanical abrasion and resuspension of road dust
  – Decrease of up to 25%

• Remark: 50t vs 60t
Completing the picture

• Autonomous demand effect
  – Lower cost (wage, fuel, material): estimated at 20% per tonne.km
  – Uptake: 30% on average in heavy transport (32t+)
  – TRANS-TOOLS calculations S2: (paper presented earlier at the conference)
    • 0.99% increase tonne.km
    • 12.9% decrease vehicle.km

• Modal shift effect
  – Generally markets show limited overlap
  – On markets with competition, rail (-3.8%) and iww (-2.9%) could lose some volume → risk for combined transport
Conclusions

• 25.25m, 60t LHV can provide gains of 10-15% in fuel efficiency and CO$_2$ emissions

• Overall:
  – 5.2 mio tonnes CO$_2$ saved p.a., of which 3.8 mio in road
  – This equals 3.6% of CO$_2$ emissions of heavy freight
  – 3.8 mio in road accounts for 0.4% of total 2005 road CO$_2$ emissions
  – Useful, yet not overwhelming contribution to 10% decrease in road CO$_2$ sought by 2020
Thank you!