

Performance measurement in freight transport: its contribution to the design of public policy

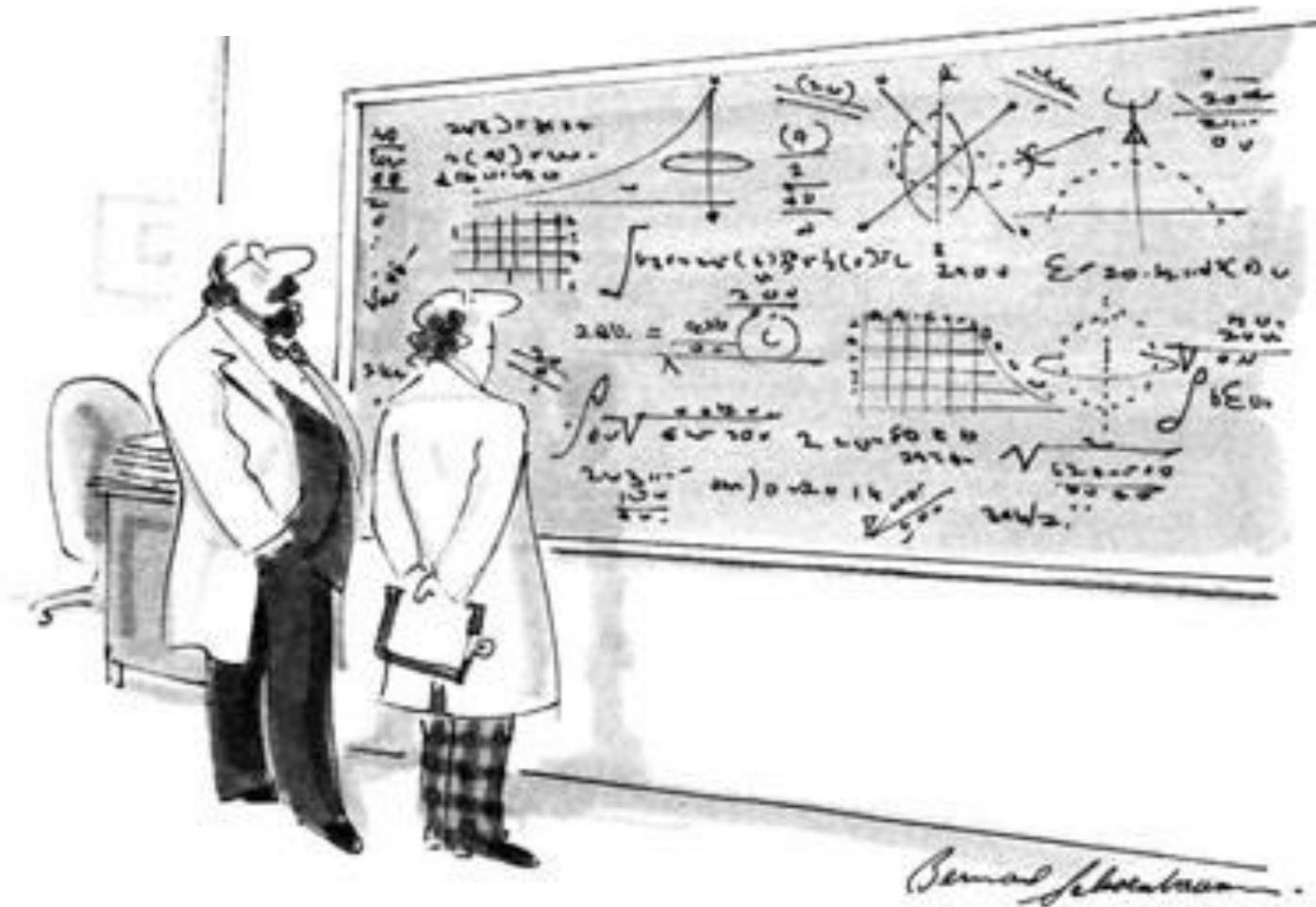
Professor Alan McKinnon

*Kühne Logistics University
Hamburg*

Roundtable
Queretaro, Mexico

9th March 2015

Freight Transport Performance Measurement



Oh, if only it were so simple

Alignment of Freight Data Collection with Policy Formulation

Need a set of basic freight statistics to get started

As freight policy evolves – statistical requirements expand

Main Forms of Public Policy Intervention in Freight Transport

Fiscal measures: taxes and charges

Financial incentives

Regulation

Nationalisation / privatisation / public-private partnerships

Infrastructure investment

Land use planning

Advisory / best-practice programmes

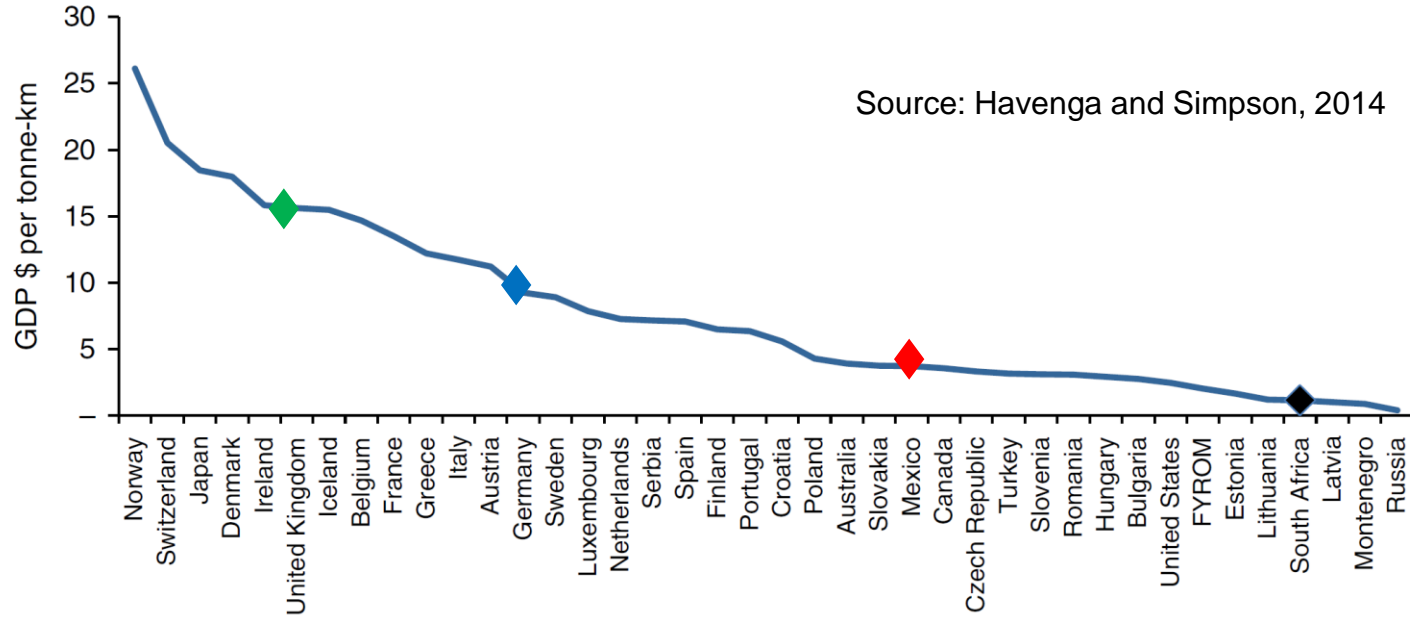
Support for research and development

Evidence-based decision-making in freight transport is very 'data hungry'

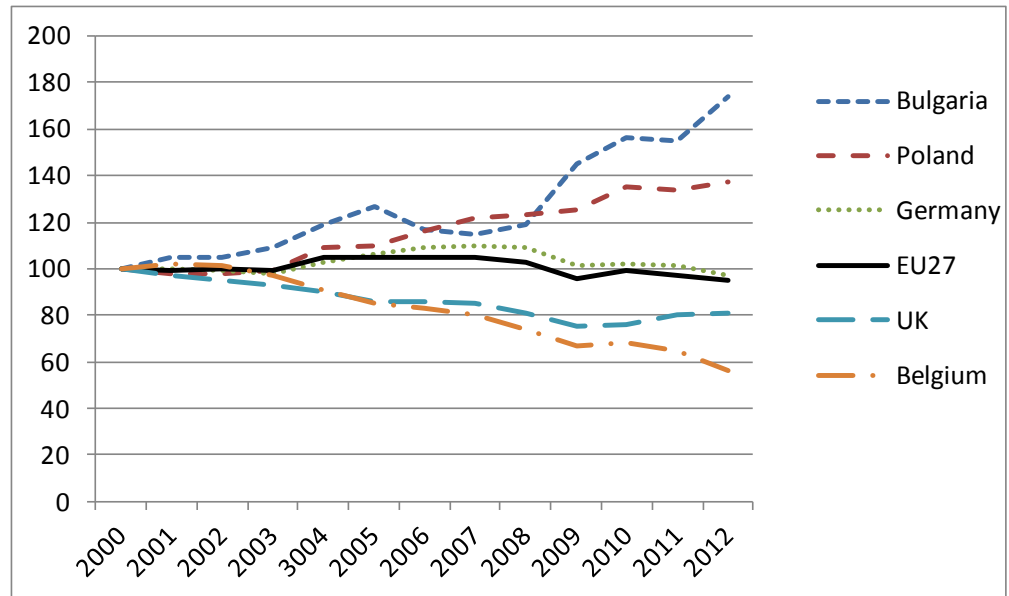
Main areas of performance measurement in freight transport

1. Transport intensity: *freight per unit of economic output*

Freight Transport Intensity



European trends in freight transport intensity



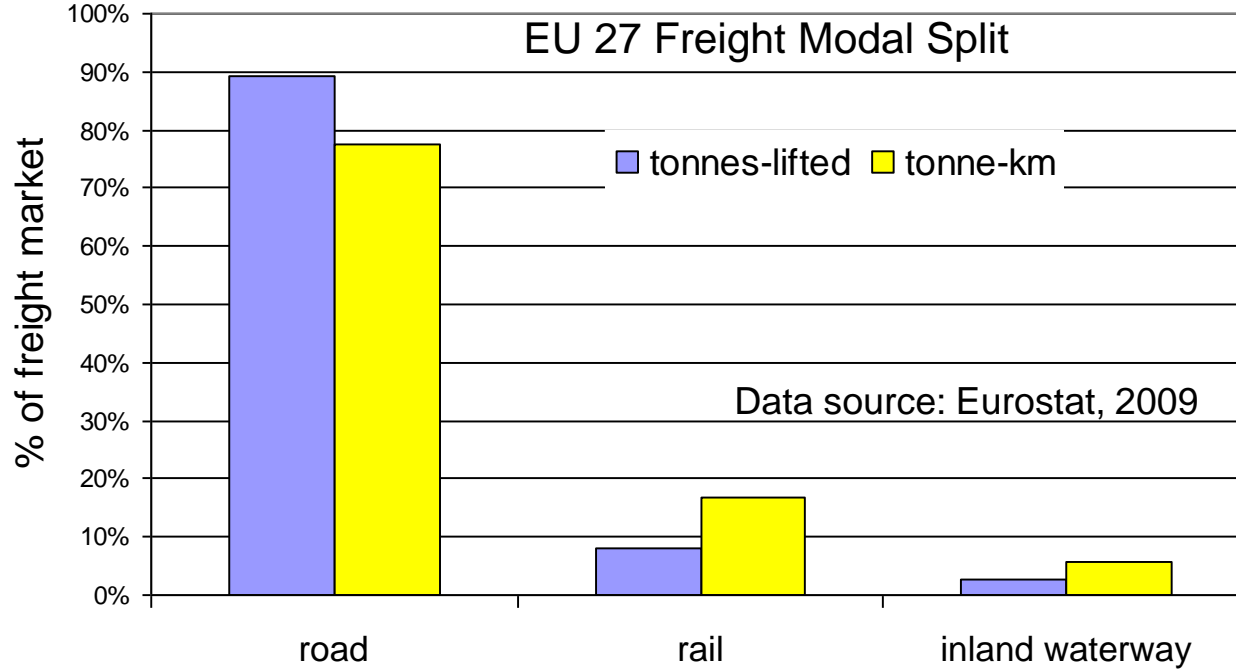
*Ratio of freight tonne-kms to GDP
(index values 2000 = 100)*

Source: Eurostat 2014

Main areas of performance measurement in freight transport

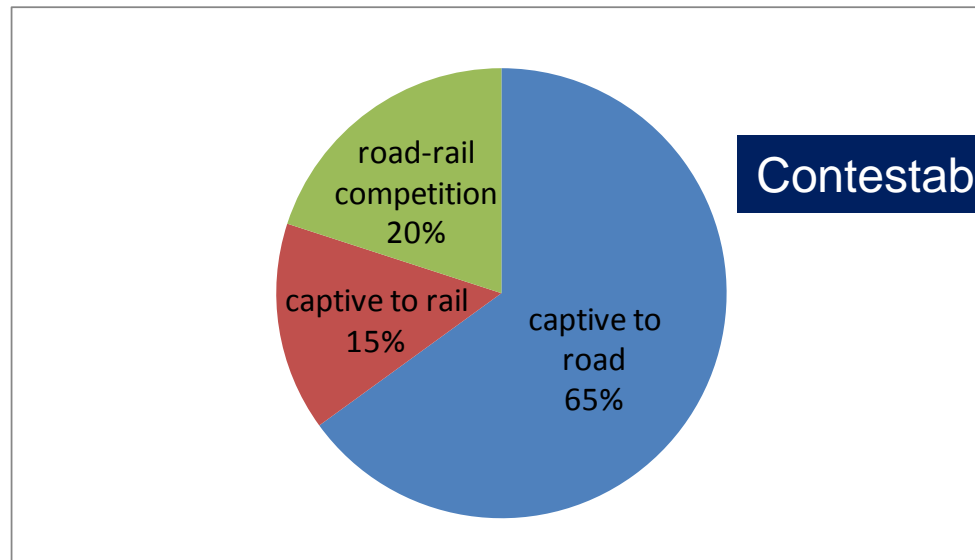
1. Transport intensity: *freight per unit of economic output*
2. Modal split: *division of freight between transport modes*

Choice of metric for measuring modal split *tonne-kilometres or tonnes?*



No allowance for:
cubic volume
value of the freight

Mis-representation of distance
and inter-modality

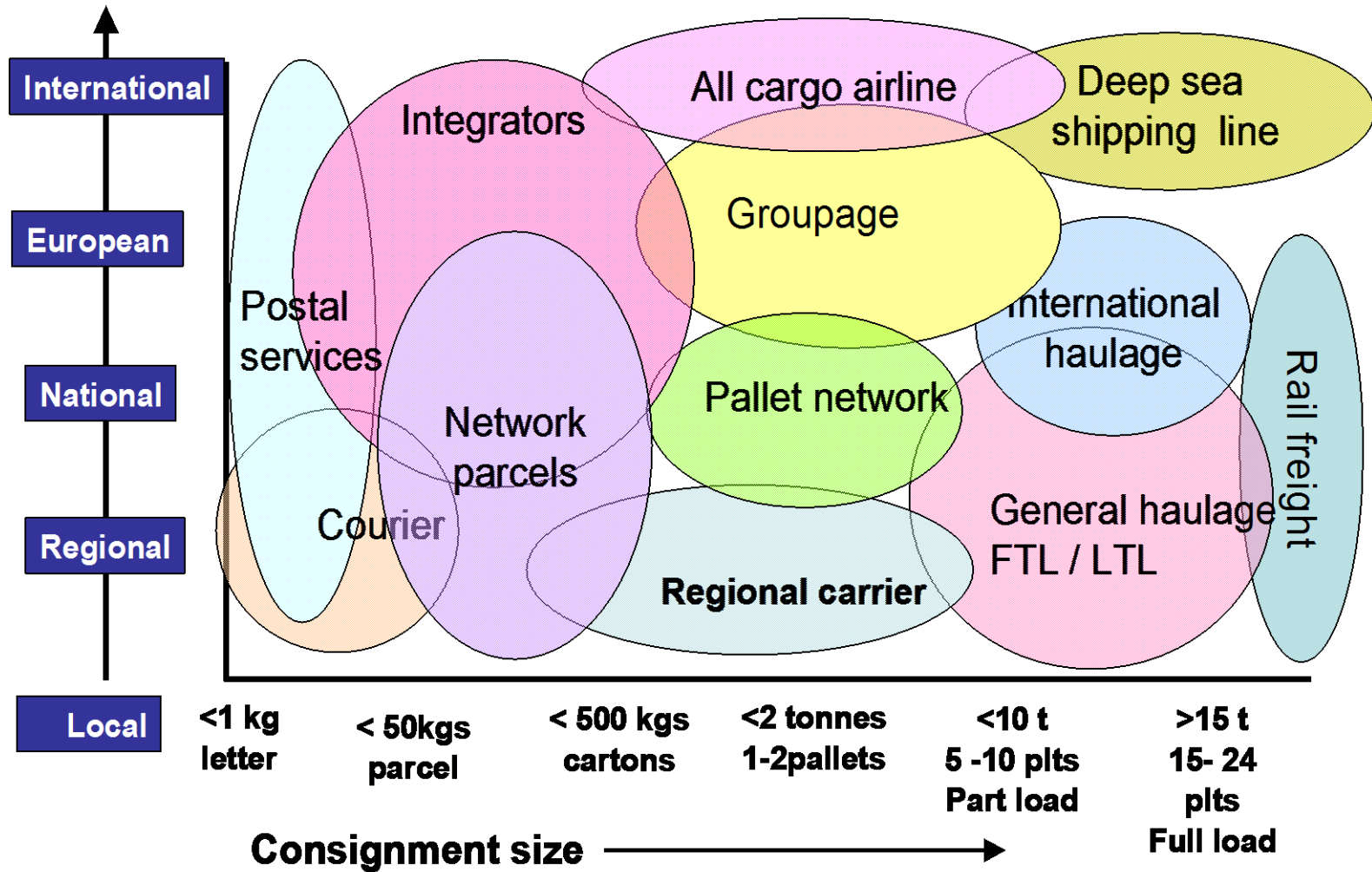


Contestability of the freight market

Main areas of performance measurement in freight transport

1. Transport intensity: *freight per unit of economic output*
2. Modal split: *division of freight between transport modes*
3. Market diversity: *range of logistics services available*

Service provision: portfolio of freight transport services



Further differentiation by speed and range of logistics services

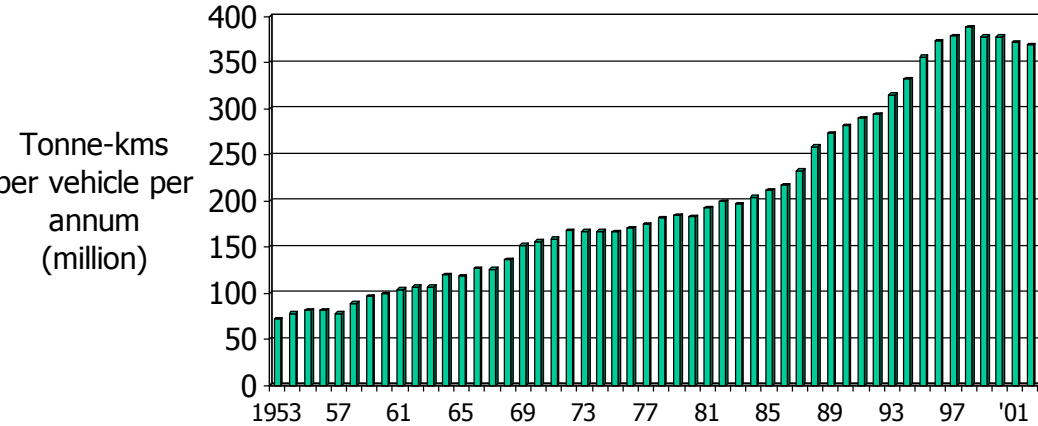
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4. Operational efficiency: *use of resources / capacity*

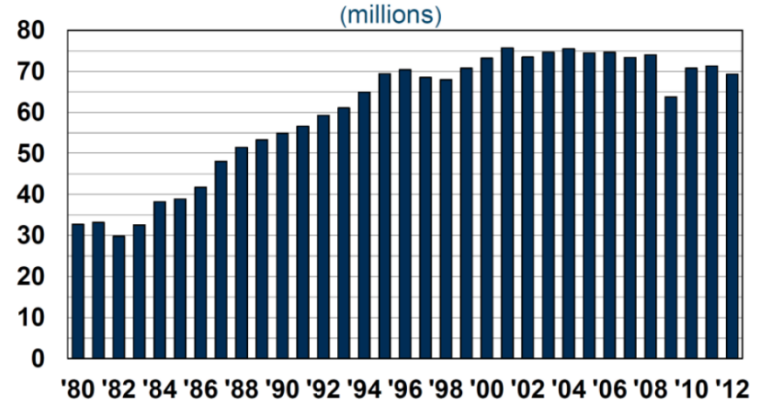
Productivity and Utilisation in the Freight Sector

productivity: *tonne-kms relative to vehicle numbers, employees, infrastructure capacity etc*

5-fold increase in productivity of UK trucking in 50 years

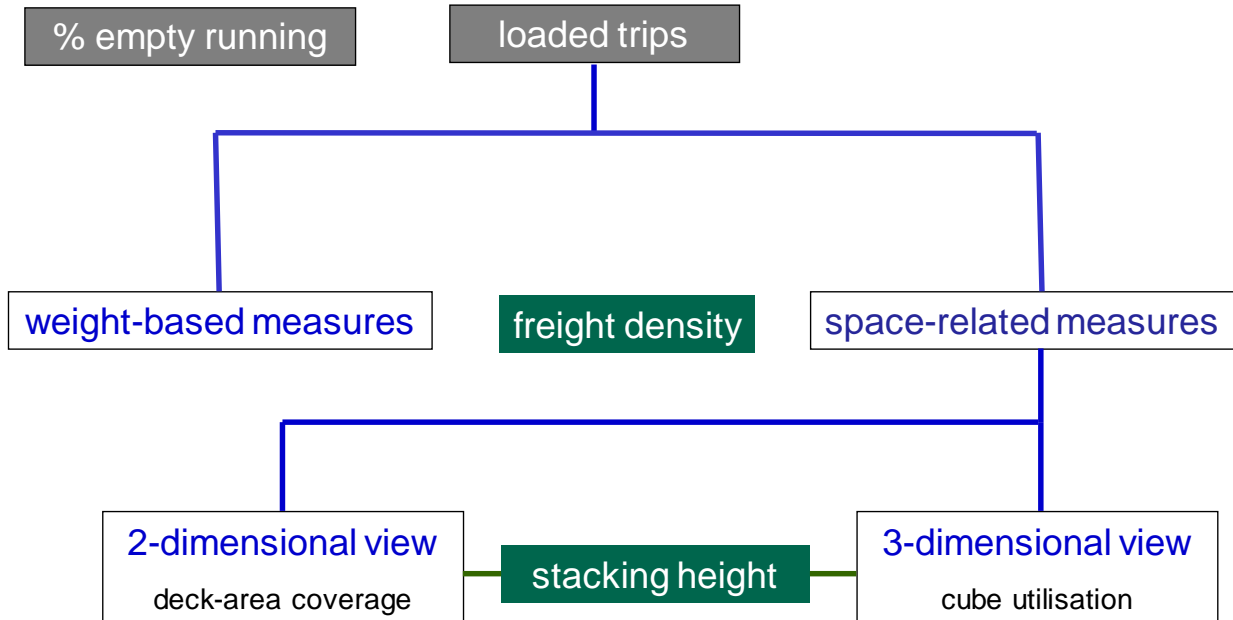


Ton-miles per locomotive (US)



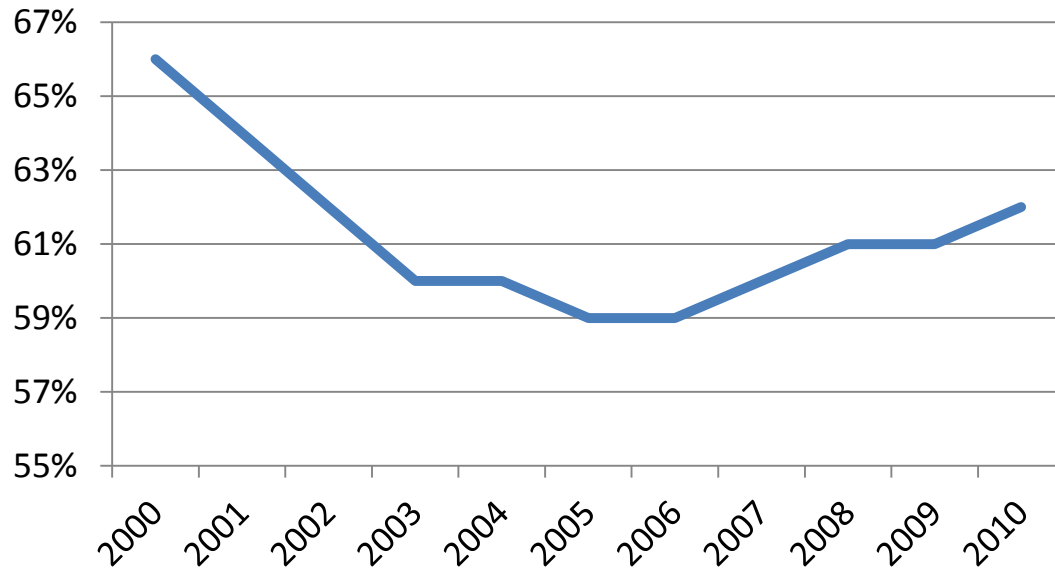
Does not indicate the proportion of vehicle carrying capacity actually used

utilisation measures



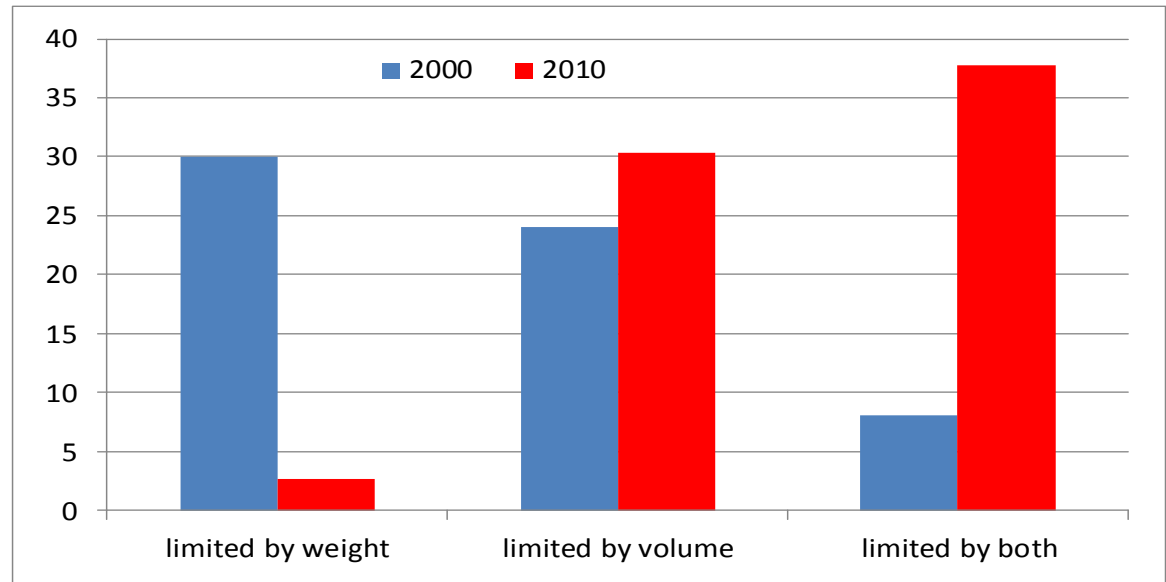
Articulated Trucks with a gross weight over 33 tonnes (UK)

Lading factor: % of available tonne-km capacity used



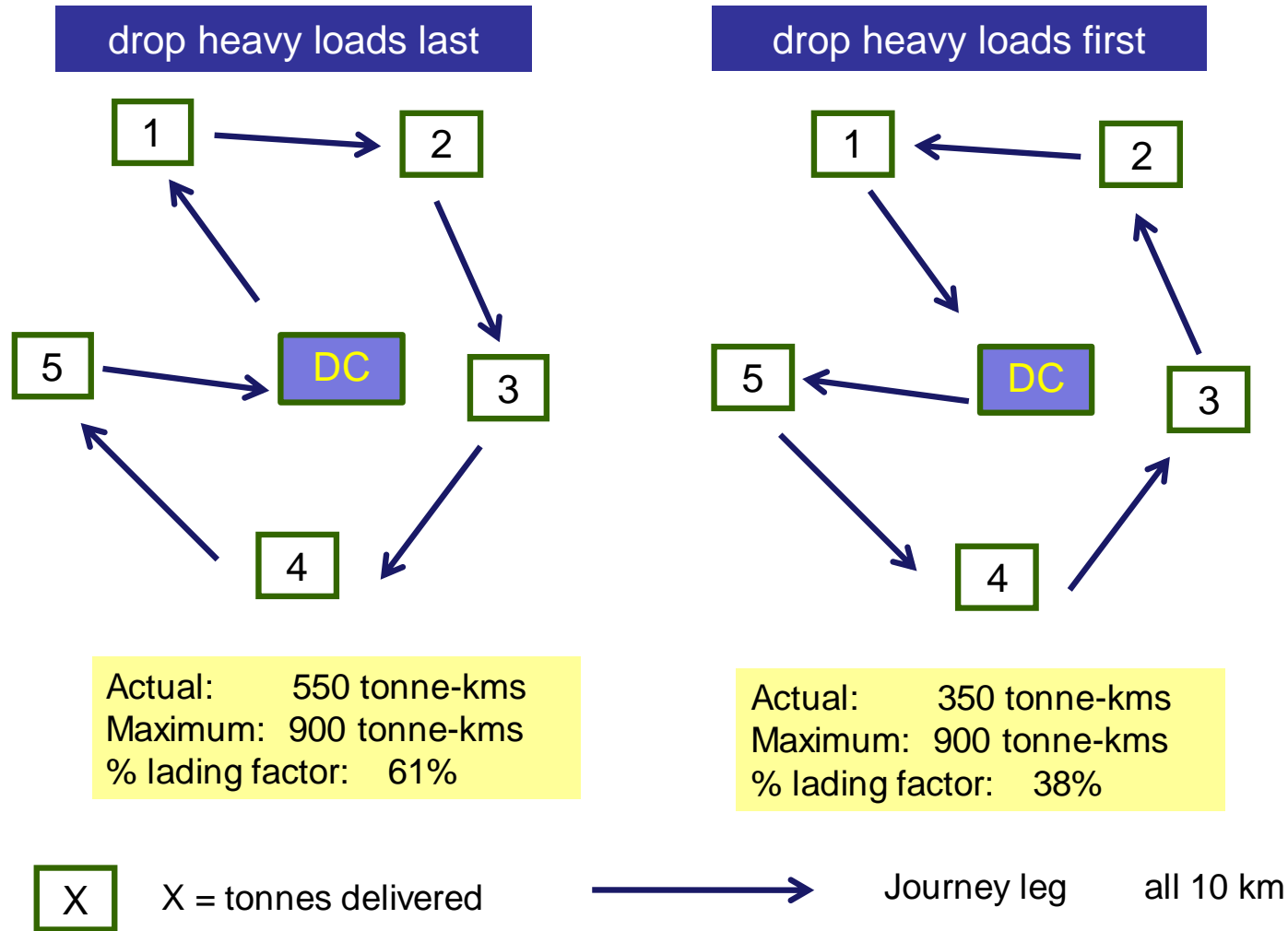
Weight-based measured
performance declined

% of Loads Constrained by Volume and Weight in the UK



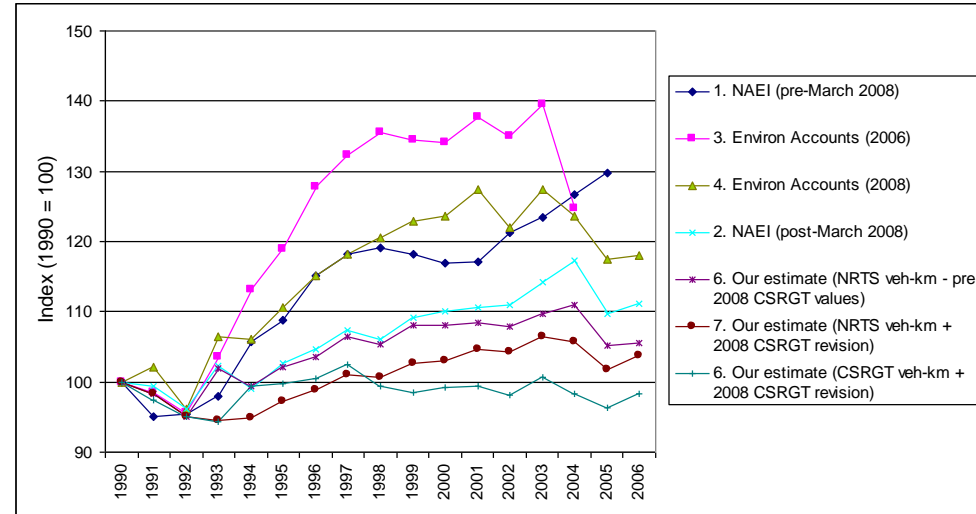
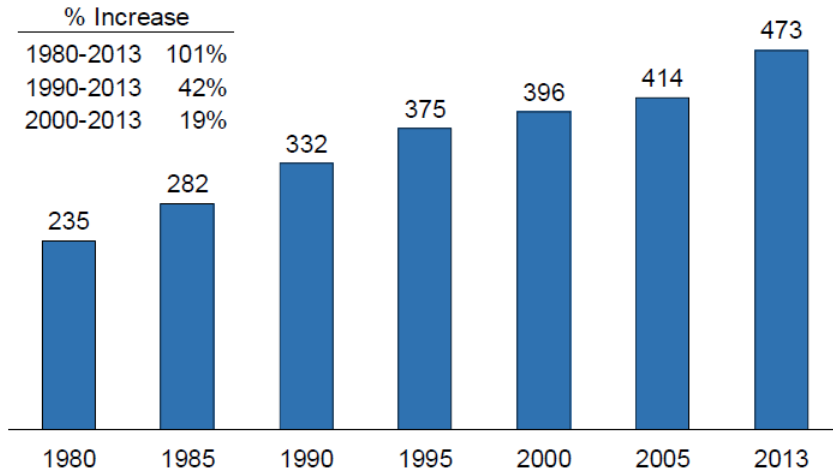
Large increase in % of
loads subject to
volumetric constraint

Measuring the Efficiency of Multiple Drop Rounds: *lading factor vs fuel efficiency*



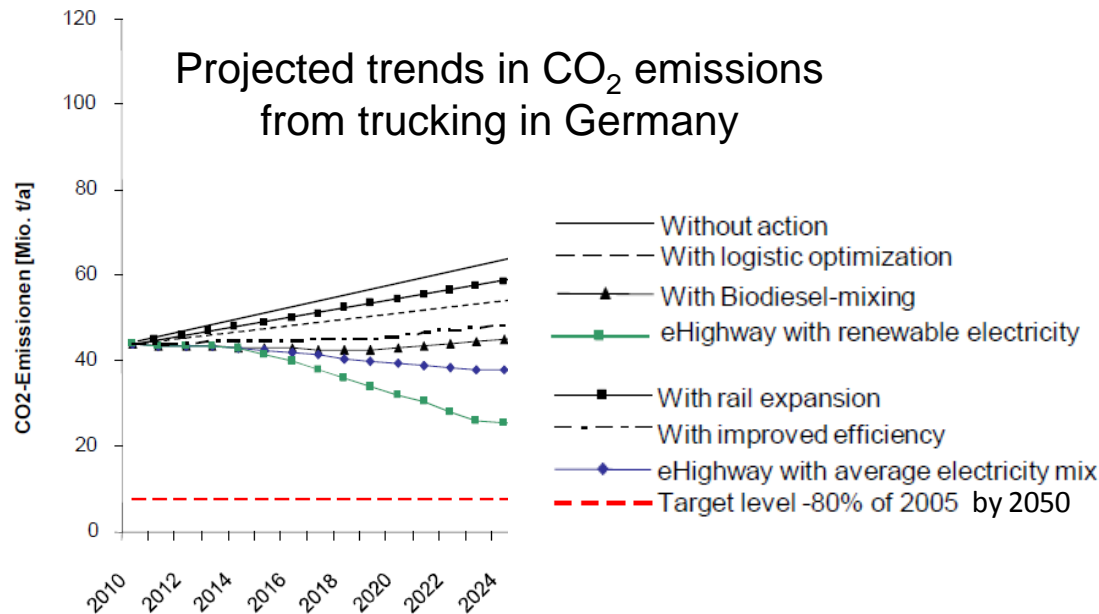
fuel use and CO₂ 57% higher

Energy efficiency and carbon intensity of freight transport



Energy efficiency of US railfreight (ton-miles per gallon)

Different methods of estimating carbon footprint of UK trucking – yield very different trends



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5. Service quality: *mainly transit time and reliability*

Service Quality Metrics

Network performance

Average speed

Average delay per vehicle-km

Terminal performance

Average throughput time

Variability in throughput time

Cross-border performance

Average border crossing time

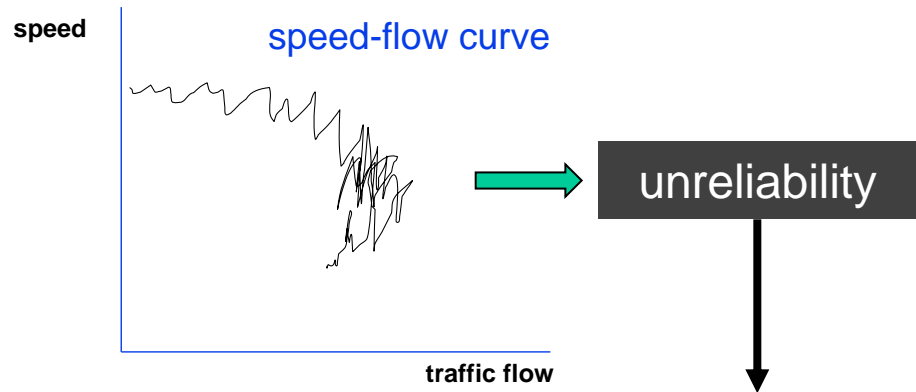
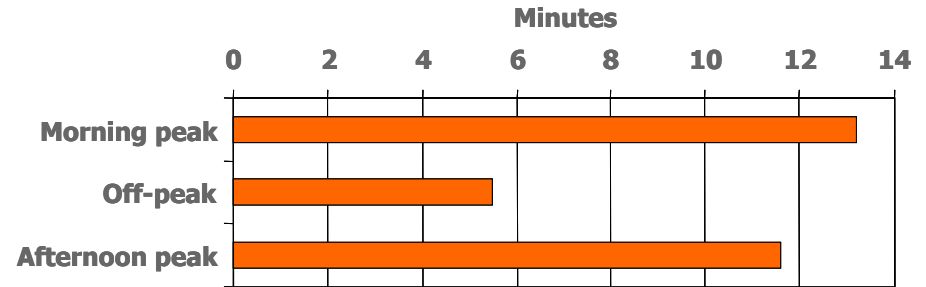
Customs-related delays

Logistics system performance

% of on-time deliveries

% of on-shelf availability

Average Weekday Delay to Trucks on UK Trunk Roads



interaction with other causes
of logistical unreliability

indirect effect of delays on
other economic activities

monetary valuation of direct
and indirect costs of delay

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6. Environmental impact: *atmospheric emissions, noise and accidents*

Environmental Variables

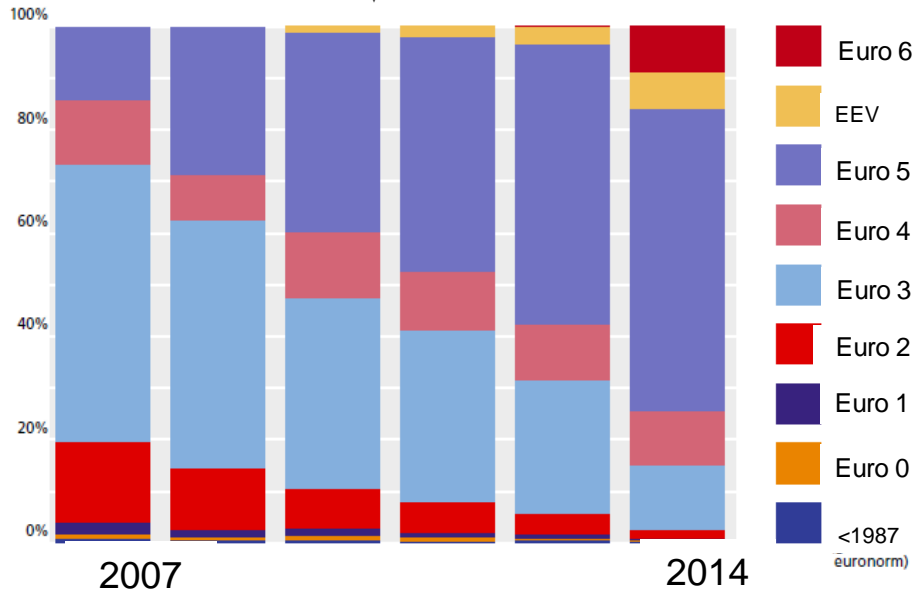
CO₂ emissions = f (fuel use)

Noxious gases:

fuel use

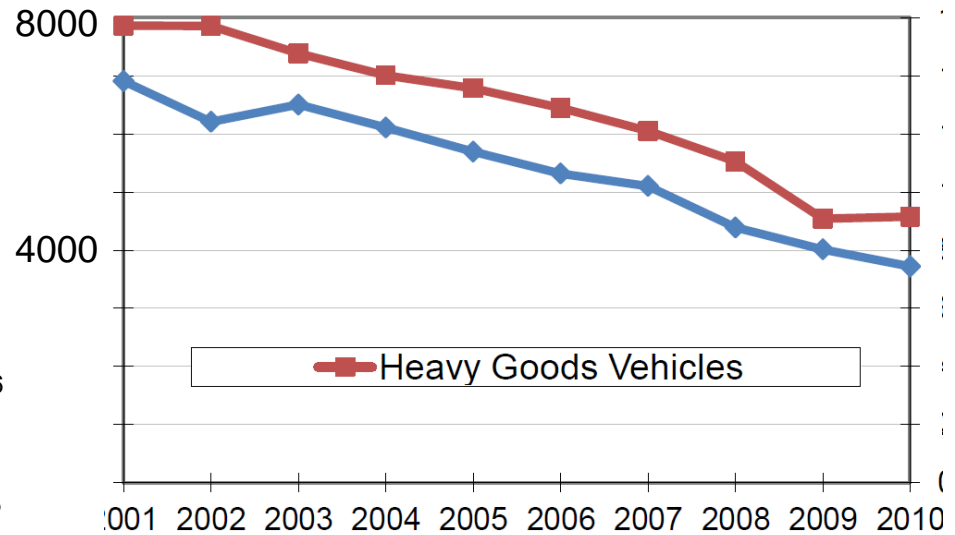
fuel quality

vehicle emission standards



emission standards of Dutch truck fleet

Traffic accidents involving freight vehicles



Fatalities in accidents involving trucks in EU 19

Internalisation of the environmental costs of freight transport

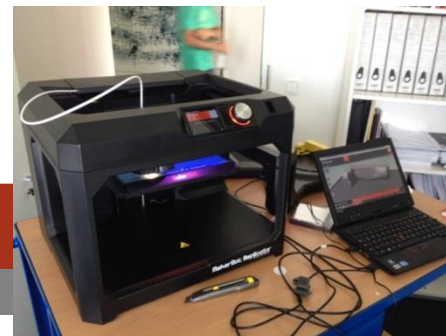
Monetary valuation of externalities

Compiling Freight Performance Statistics

Problems and Constraints

- Insufficient attention given to performance measurement in the freight policy-making process.
- Isolating and evaluating the effects of individual freight policy initiatives is difficult
- Different metrics give differing impressions of performance
- Ensure that metrics induce the desired behavioural response
- Major differences in the nature and amount of performance data available for different modes
- Chronic lack of volumetric data: *over-reliance on weight-based statistics*
- Data relate to individual freight journeys: *lack a supply chain perspective*

- of less relevance in a 3D printed world



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