Joint Research Centre (JRC)

Panayotis CHRISTIDIS, Guillaume LEDUC

IPTS - Institute for Prospective Technological Studies

Seville - Spain

http://ipts.jrc.ec.europa.eu/

http://www.jrc.ec.europa.eu/

The mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.

Our role in the process

Need to revisit Directive 96/53/EC

EC commissions study to explore potential impacts

Stakeholders present contradictory evidence

JRC asked to review studies and estimate economic impact

Stakeholders workshop 24/6/2009

EC commissions additional studies (?)

Proposal for a new Directive (?)

Additional public consultation

Impact assessment

EP, Council

JRC study approach

- Review of available studies
- Main areas of impact
- Factors affecting impacts
- Model at EU level
- Sensitivity analysis using full range of assumptions
- Analysis of economic and environmental impacts
- Boundary conditions and areas of uncertainty
- Design elements of policy measures

GLOBALLY POSITIVE POSITION

Reference	Road freight demand	Modal shift	Environment	Safety	Infrastructure	Comments
[Aurell, 2007] (SE)			Fuel consumption and air emissions reduced by at least 18%.	Modular combinations show better dynamic stability compared to standard HDVs.	Modular combinations generally cause less pavement wear than standard HDVs.	Technical analysis on the advantages of the modular concept.
[Arcadis, 2006] (NL)	6000-12000 LHVs will replace 8000-16000 regular combinations. Increase of road transport by 0.05%-0.1% and reduction of traffic volume (veh-km). Cost price per mile for LHVs increase by 6.5% but it is compensated by the reduction of the number of rides. Total cost reduction in road transport amount to 1.8-3.4%.	Decrease in rail transport by 1.4%-2.7%.	Lower fuel consumption and CO_2 emissions. Congestion reduced by 0.7-1.4%.	Traffic safety would increase (since lower veh-km). Decrease in fatal accidents by a factor 4-7 and injuries by 13-25 (no statistics-based approach was available).		Dutch pilot projects.
German Association of the Automotive Industry (VDA)[1]	If 23% of all conventional truck trips in Germany were made with EuroCombis (type of LHVs), 2.2 billion vehicle-km would be saved annually in long haul traffic. The savings would be 16% on operational costs when using EuroCombis instead of 40t trucks.		A fully loaded EuroCombi consumes 15% less fuel per ton-km compared to 40t trucks.	No safety risks from EuroCombis.	EuroCombis cause less pavement damage.	Germany-based analysis.
[VTI, 2008] (SE)	Model used for modal shift: SAMGODS (Swedish freight transport model).	Clear advantages of not going back to smaller trucks.	Model used for emissions: ARTEMIS Model used for noise: HARMONOISE Clear advantages of not going back to smaller trucks.	Clear advantages of not going back to smaller trucks.	Clear advantages of not going back to smaller trucks.	Modelling-based study: four scenarios were analysed.

NEUTRAL POSITION

Reference	Road freight demand	Modal shift	Environment	Safety	Infrastructure	Comments
T&E 2007[2]	Cost reduction by 20-25% but greater demand.	Cross-elasticity: 1.8 (rail). Rebound effects due to modal shift.	Positive impacts only if loads under 50 tons, optimising loading capacity is key issue.	Best suited to high-volume, low-weight cargoes.	Adaptation required.	

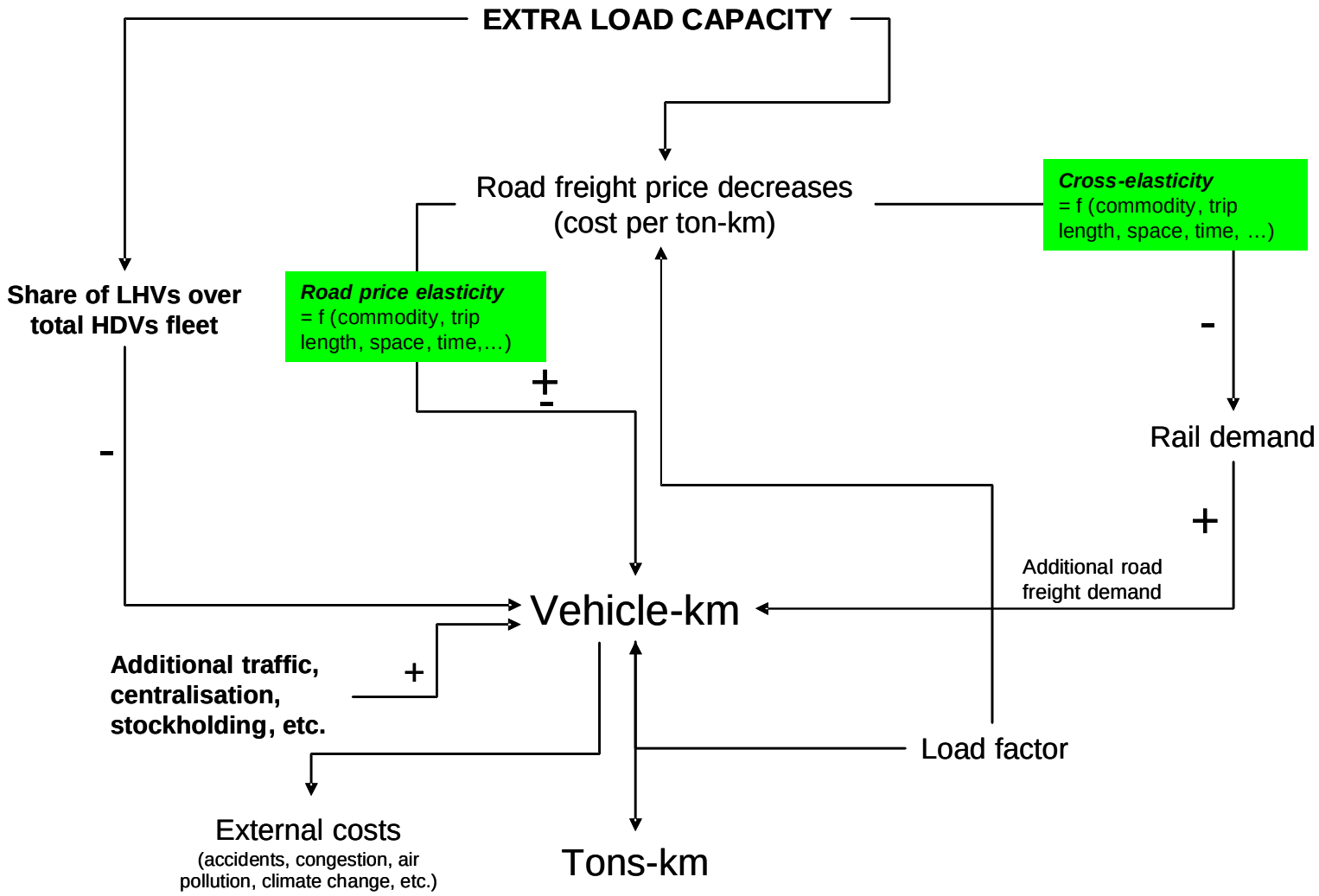
GLOBALLY NEGATIVE POSITION

Reference	Road freight demand	Modal shift	Environment	Safety	Infrastructure	Comments
[BAST, 2006] German Highway Research Institute		Important shift is expected.		Higher consequences of fires in tunnels due to larger loading volume. Increase of severity of accidents in the case of head-on collisions. This could however be overcome through the use of modern assistance systems (Lane keeping assistant, brake assistant with interval radar).	No increase in road damages expected from 8 axles (but will occur due to transport demand increase). Increase stress on bridges: it would cost €4-8 billion. Problem at roundabouts, road crossings and intersections, parking spaces due to longer vehicle lengths.	EMS in 60 tons version only. Focus on road infrastructure and safety risks.
K+P Transport Consultants[1] (DE) TIM Consult 2006[2]	Trucking costs reduced by 20-25%.	7 billion tons-km would shift from rail to road in one year. Decrease of intermodal traffic up to 55% with LHVs on the road (24% road freight increase.	CO_2 emissions reduction of 1.1% to 7.3%.			Focus on the impacts of LHVs on combined transport (in German).
[UBA, 2007] German Federal Environmental Agency	Cost per load-tonne is reduced by 20-25%.	Significant shift demand from rail to road (e.g. up to 5% decline in rail-freight transport).	Energy efficiency gain only for load rate greater than 77%. Pollutants emissions only decline when fully charged. Increase of noise emission due to heavier motorization and higher number of axles.	Higher consequences in case of accident due to heavier weight.	Parking space capacity reduced by 20% at service stations. Negative impacts on bridges.	

Focus on 3 main studies

	Share of LHVs	Cost savings	Modal shift	External impact
TML	High	High	Containers	Positive
ISI	Medium	High	Rail, long distance	Negative (CO_2)
TRL	Low	High	Rail	Unclear (infrastructure)

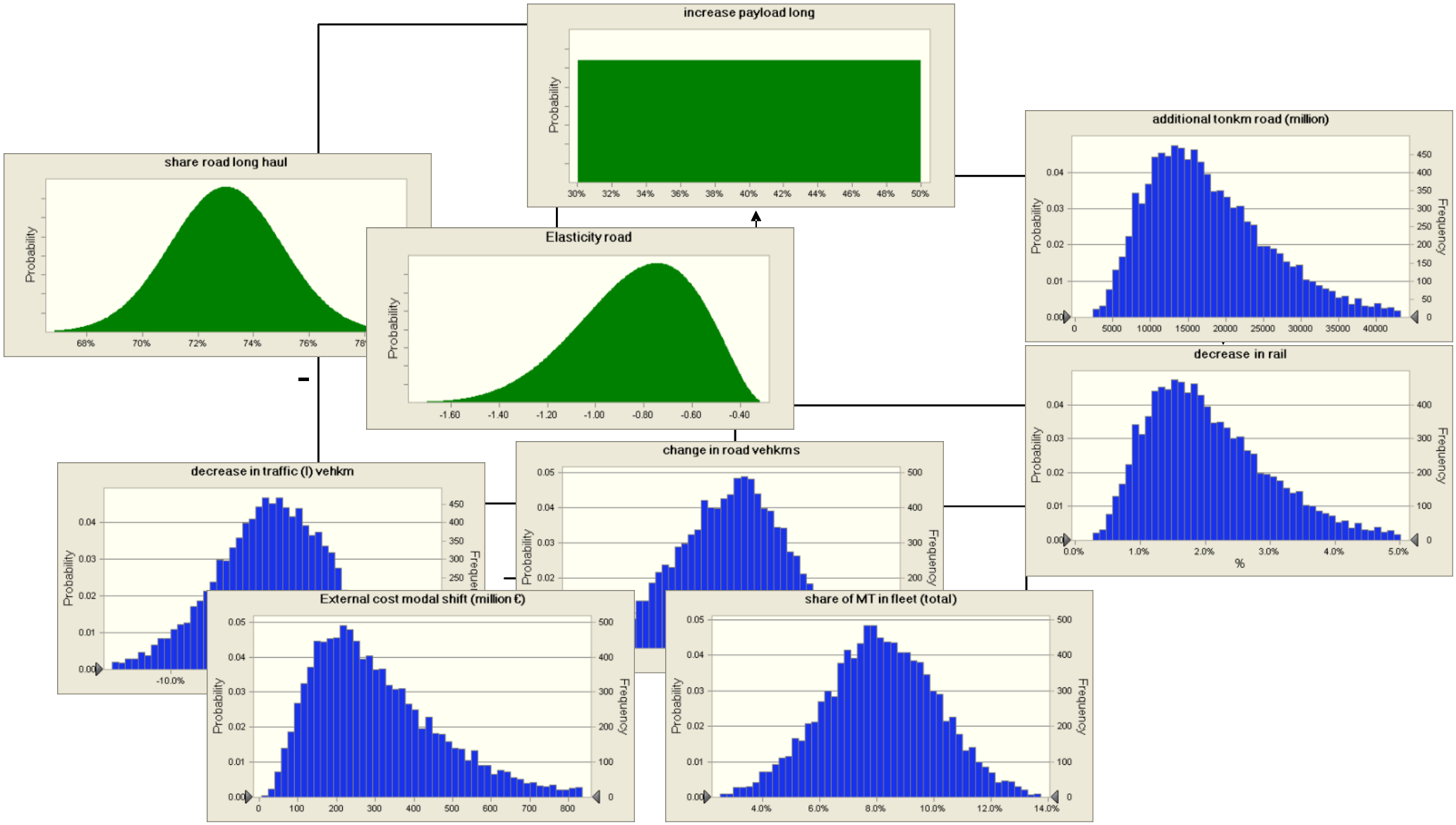
Factors determining LHV impact



Uncertainty in assumptions

- Cost savings of individual vehicle
- Payload (before and after)
- Reaction of the market (elasticity)
- Market segmentation (commodities and distances)
- External impacts of individual vehicle
- Market share of LHVs

Simulation with full range of values



Simulation main results- road

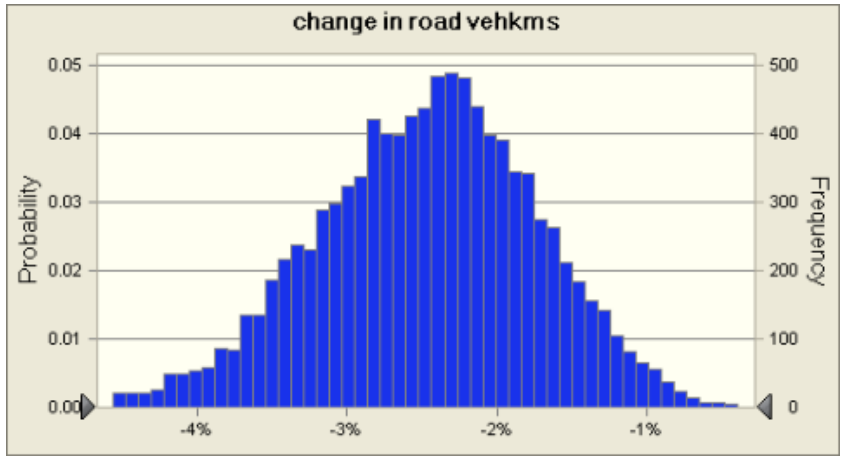
Increase in payload

↓

Fewer trucks for same tonnes

↓

Fewer veh*kms



- average decrease 2.3% (range from close to 0% to over 4+%)
- trips over 1500 km more affected (average decrease by 16.7%)
- short distance trips average decrease of 2% (but constitute largest part of demand, bring most benefits in absolute terms)

Simulation main results- rail

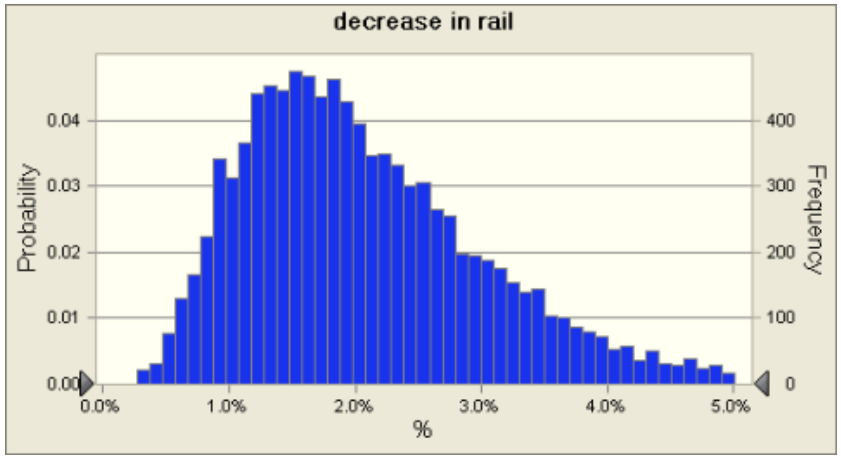
Decrease in road costs

↓

Road more competitive

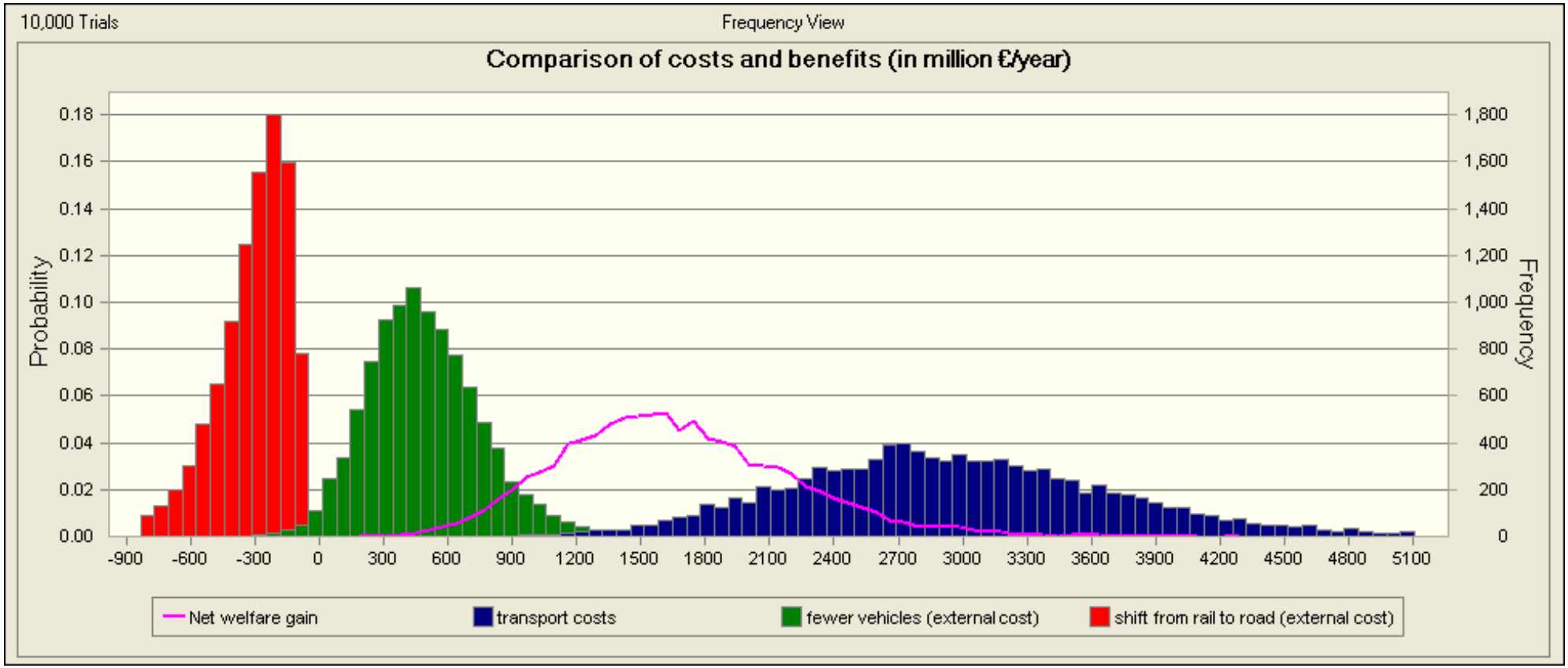
↓

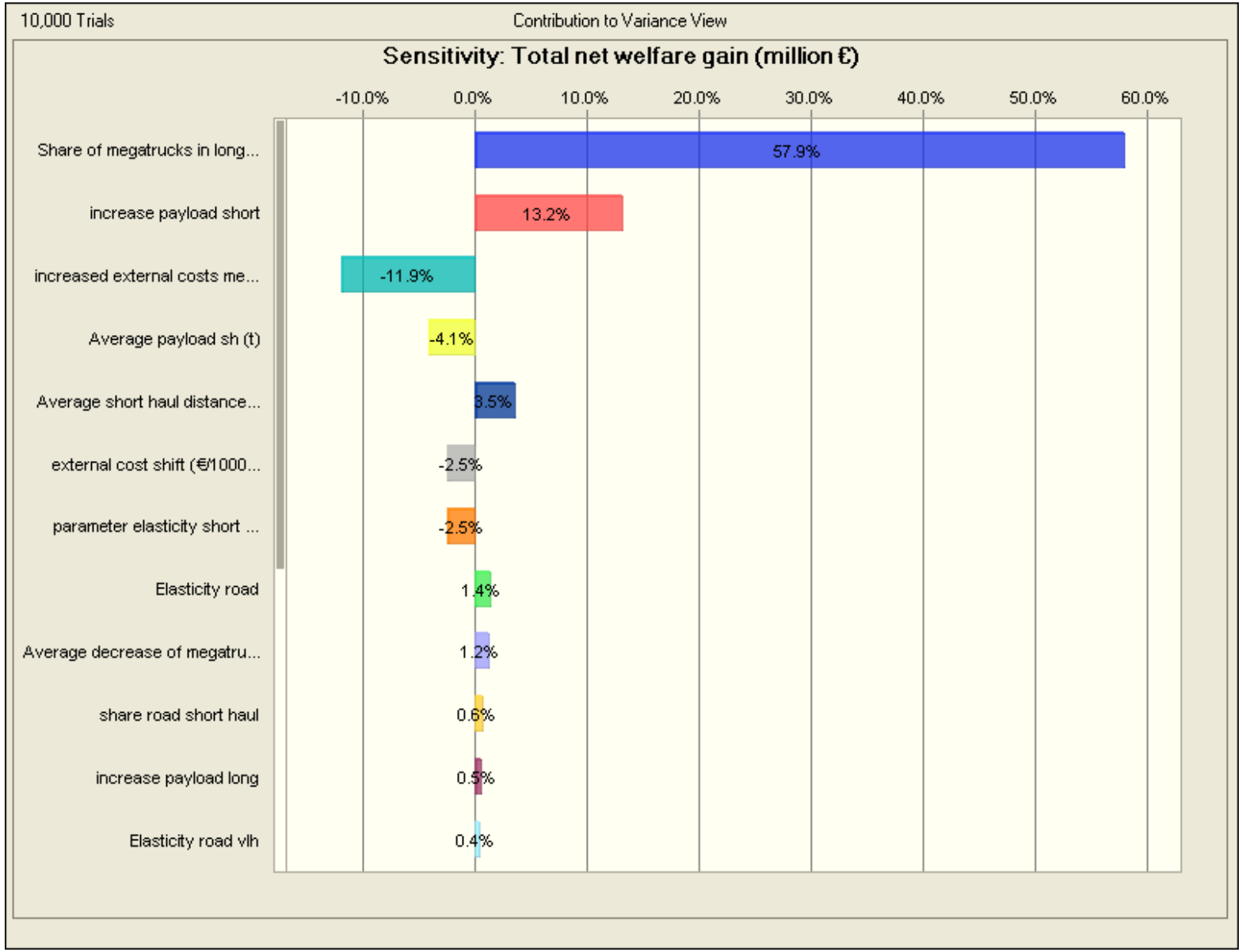
Decrease in rail market share



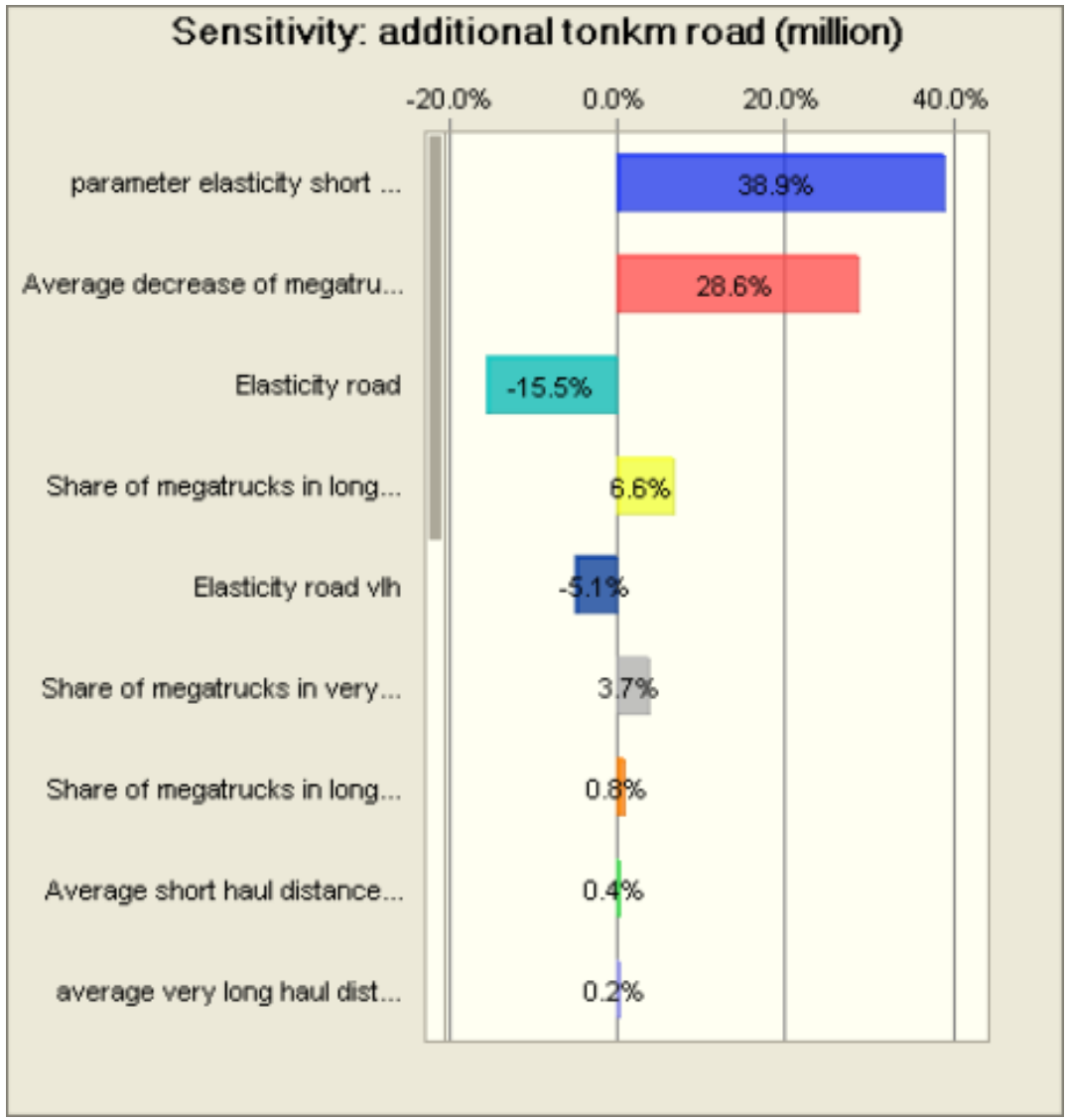
- Modal shift, long distance bands, non-bulk products
- 73.3 million tons lifted/year, 18.1 billion ton-km
- Railways: 2.1% decrease Road: 0.6% increase
- Long trip distances: 56% to (extreme cases) 100%

Overall costs and benefits




10,000 Trials
Contribution to Variance View
Sensitivity: Total net welfare gain (million €)
-10.0%
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
Share of megatrucks in long...
57.9%
increase payload short
13.2%
increased external costs me...
-11.9%
Average payload sh (t)
-4.1%
Average short haul distance...
3.5%
external cost shift (€/1000...
-2.5%
parameter elasticity short ...
-2.5%
Elasticity road
1.4%
Average decrease of megatru...
1.2%
share road short haul
0.6%
increase payload long
0.5%
Elasticity road vlh
0.4%

Sensitivity analysis – road demand



Considerations (1)

- Net welfare gain has a high correlation with the level of uptake of LHVs. Since higher numbers of LHVs would imply higher savings in transport costs, maximizing the share of LHVs would be positive for the economy as a whole.
- The maximum level however can not be set by policy makers, since it is up to the market itself to find the optimum level.
- Most studies analysing the issue doubt the possibility of LHVs reaching high shares of the market since a small part only of shipments are of sufficient size to exploit the advantages of LHVs.

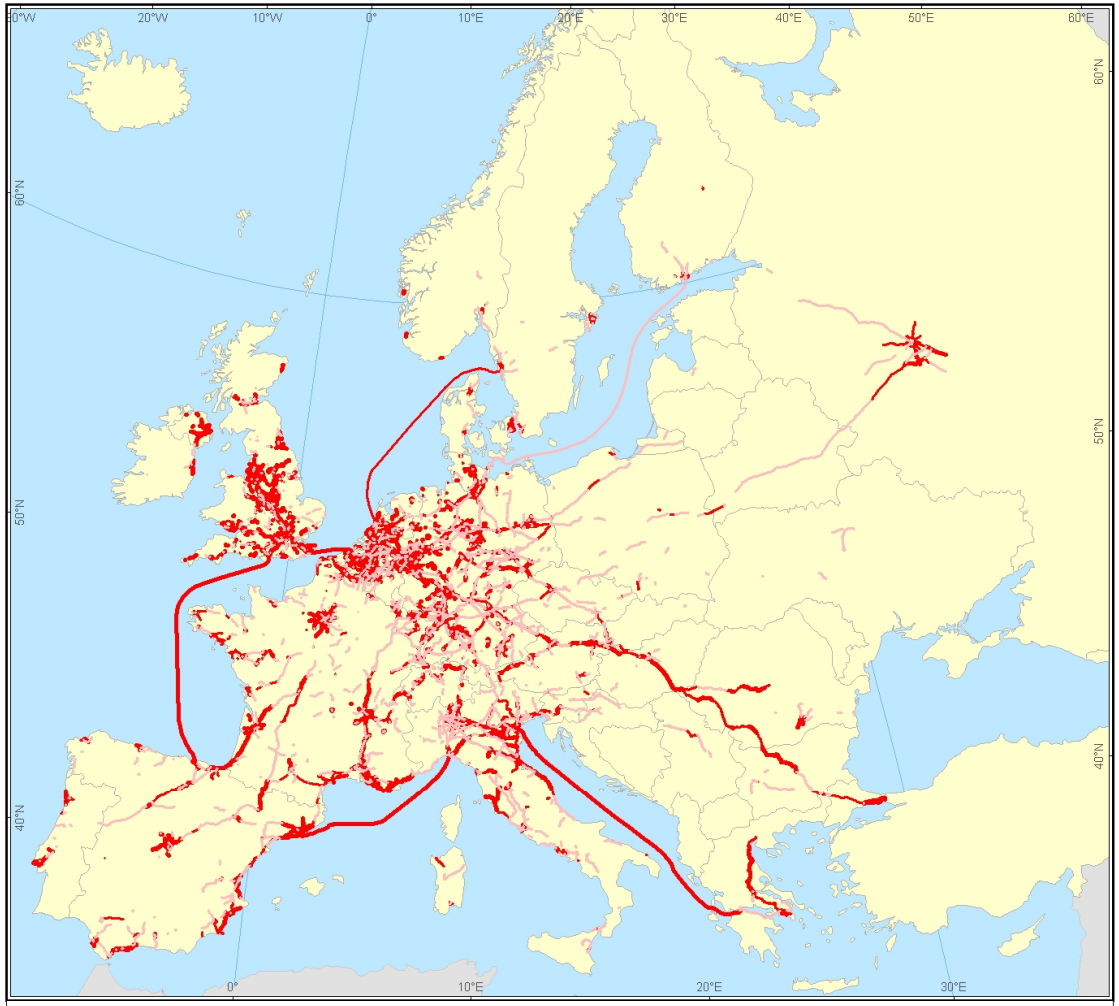
Considerations (2)

- Average increase in payload (in absolute terms, i.e. tonnes) important factor (especially for shorter trips)
- Current average payload for short trips is very low, increasing it would lead to important transport cost savings
- But: shippers and operators will not have the incentive to use LHVs.
- Assume that the share of LHVs for shorter trips is minimal.

Probable range of impacts

Variable	Unit	Mean value	Min	Max
Share of LHVs in road freight		3.2%	0.5%	5%
Decrease in road transport activity	veh*kms	2.3 billion 1.1%	0.4%	3.2 billion 1.6%
Increase in road transport volume	Tonnes lifted	33 million 0.15%	10 million 0.05%	50 million 0.30%
Decrease in rail transport activity	Ton*kms	13 billion 1.5%	10 billion 1.2%	15 billion 1.8%
Decrease in external costs from more efficient shipments	€	230 million	180 million	260 million
Increase in external costs from modal split	€	230 million	130 million	300 million
Decrease of transport costs	€	1.4 billion	500 million	2 billion
Net welfare gain	€	700 million	200 million	1 billion

Impact on road network



Main benefits of LHV: substitution of trucks with trucks

…as long as…

- **LHVs are used efficiently**
- **Infrastructure requirements are minimized**

Designing specific policy measures

- Geographical coverage
- LHV typology
- Efficiency/utilization standards
- Internalisation measures
- Infrastructure requirements
- Efficiency in logistics and distribution
- Detailed market analysis

Conclusions (1)

- analysis of uncertainty in the technical and economic aspects of LHVs
- identification of the main factors that influence the potential impacts

Main conclusion:

- LHVs would be beneficial for the EU economy and - under certain conditions- environment and society as a whole

Improve impacts of LHVs:

- Improvements in vehicle design to reduce fuel consumption, environmental damage and accident risks.
- Enforcement of minimum load limits and/or maximum percentage of empty trips.
- Standardisation of vehicle sizes and loading units.
- Suitable charging systems to internalise external costs and minimize the impact on other modes.
- Common infrastructure design specifications for Trans-European Transport Networks.

Thank you for your attention!

Contact:
Panayotis CHRISTIDIS (Panayotis.Christidis@ec.europa.eu)
European Commission, Joint Research Centre
Institute for Prospective Technological Studies

Edificio Expo, C/ Inca Garcilaso 3
E-41092 SEVILLA, Spain
Phone number: +34 954 48 8493
Fax number: +34 95 448 8279

http://ipts.jrc.ec.europa.eu