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Understanding the effects of introducing lorry charging in Europe

July 2010

Background

From July 2010, the Belgian Presidency of the European Union is set to restart talks on a revision of the EU rules that govern national road charging schemes, the so-called Eurovignette directive.

The debate over the latest proposal to revise the law, has centred on whether member states should be allowed to include external costs, such as the costs of climate change, and congestion caused by lorries into road charges. Such a move would be in line with the polluter pays principle.[i]

The road industry has argued against this, saying the 'polluter pays (but the) problem stays', in other words, higher fees would not reduce pollution or congestion. This reflects the false assumption that road freight transport demand is relatively 'inelastic' – meaning that it does not react strongly to changes in price.

In fact there has been remarkably little research that explains how and why demand for truck transport reacts to price changes. This suggests a number of important questions on the impact of introducing kilometre charges:

- ***Will the number of trucks on the road and the distances they travel decrease? And by how much?***
- ***Will roads become less congested, safer and freight transport less polluting?***
- ***What is the effect on revenues?***

To answer these questions T&E commissioned the consultancy *Significance* to investigate to what extent hauliers and shippers respond to changes in transport costs, and what happens to overall demand for freight transport by road if prices change.[ii] The study examines all relevant scientific sources on the sensitivity of road freight demand to price changes ('price elasticity of demand' in economic parlance), and checks the results against evidence from the lorry charging schemes already in place in Germany, Austria and the Czech Republic.

The study 'Price sensitivity of European road freight transport – towards a better understanding of existing results' by Signifiance and CE Delft can be downloaded from www.transportenvironment.org/lorry-charging
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Effects and effectiveness of lorry charging

Charging lorries for each km driven, to reflect the costs they impose on infrastructure ("user charging" which is allowed under the current Eurovignette Directive 2006/38/EC) and / or to include the external costs of congestion, pollution and accidents, has a direct effect on the price per vehicle-km.

The key findings of the study are as follows:

Result 1: A €0.15/km charge will reduce vehicle kilometres by 15%

The study reports a central value for vehicle-km price elasticity of demand of **-0.9**. To take a practical example, if average EU road freight costs are around €0.88 per km and a country introduces a charge of €0.15/km this would represent a 17% price rise. The corresponding reduction of vehicle-km would be (17 x 0.9 =) 15%. As a result of the reduction of vehicle-km, there would also be a corresponding decrease in fuel consumption and greenhouse gas emissions.

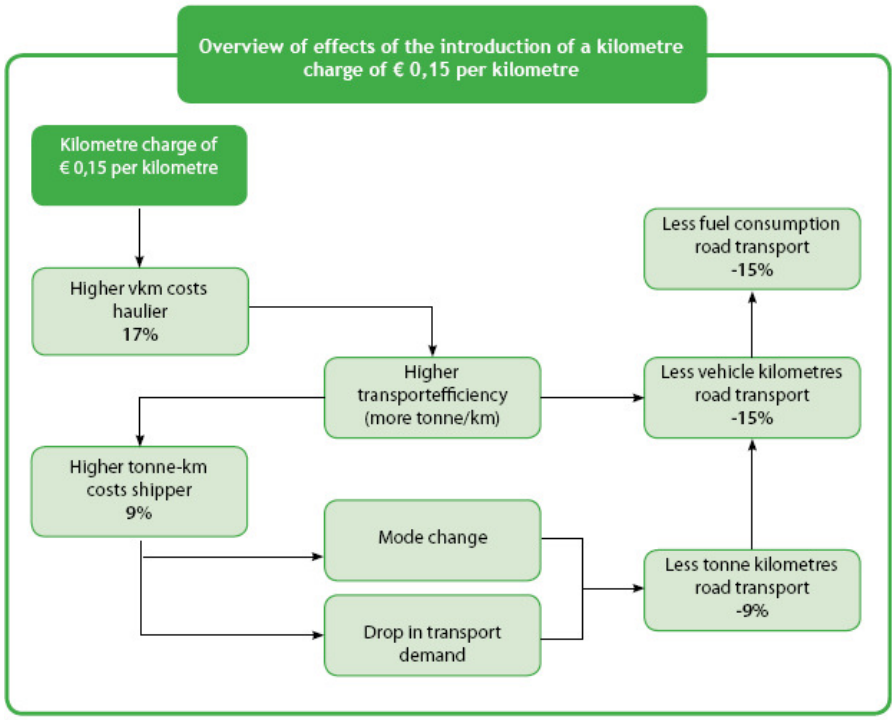
Result 2: Most of the reduction in vehicle-km results from more efficient road transport operation and optimised chains of distribution. Only one-third of the reduction can be attributed to freight moving to other modes (modal shift).

A major part of the effect is therefore *within* the road freight sector. (see Figure 2).

Result 3: although transport demand is sensitive to prices, total revenues from road charging are not severely affected.

A km-charge is intended to manage vehicle-km and the corresponding negative impacts. This study demonstrates that such charges are effective at achieving these objectives. Member States must take this into account when making revenue projections for road charging schemes. If, as in the example above, vehicle-km fall by 15% as a result of the charge, then the charge will be raised and revenue collected on 85% of the initial total vehicle-km.

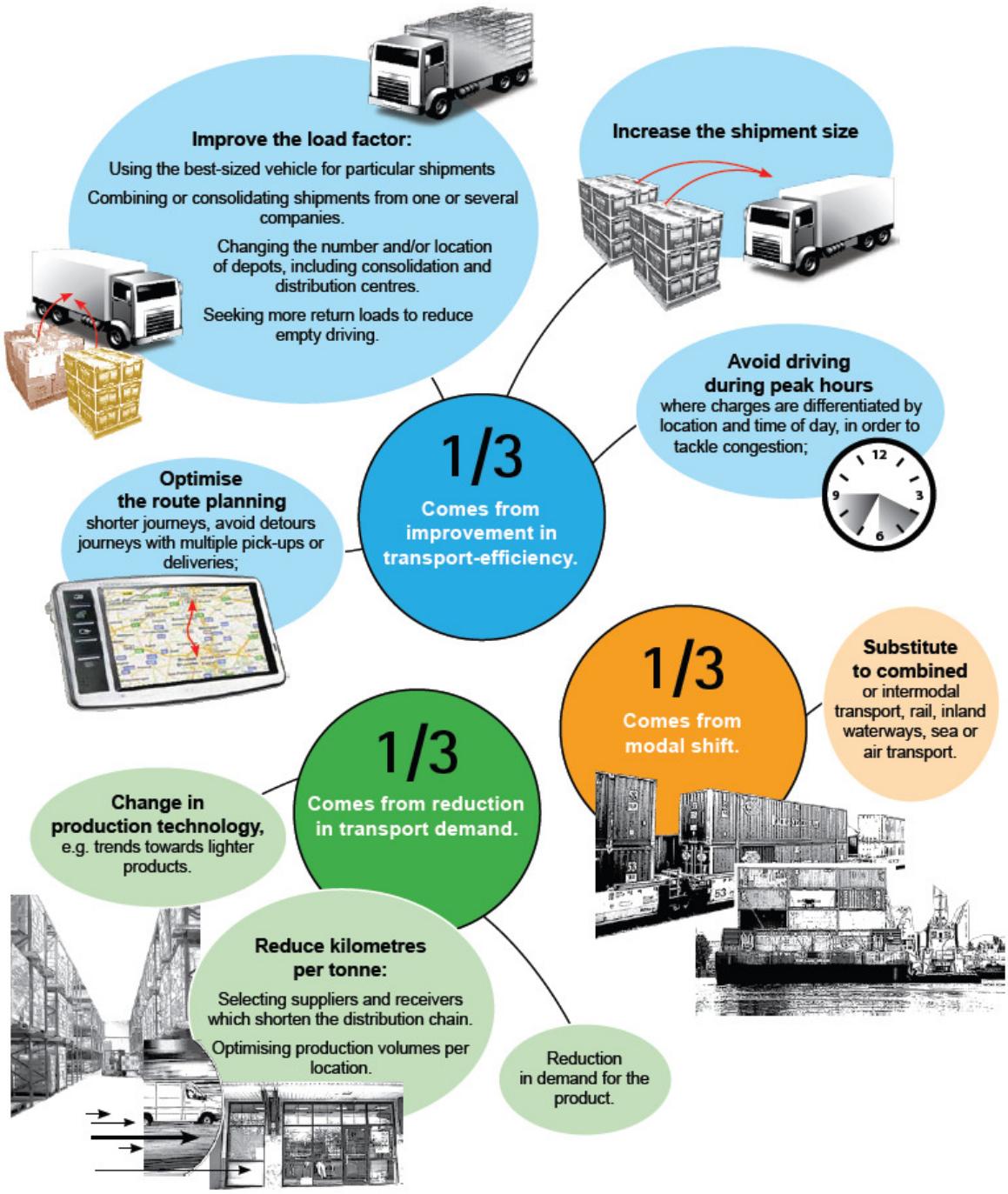
Figure 1



Why do vehicle-km go down as a result of road charges?

The road freight sector (hauliers, transporters, shippers, logistics companies) can react in a number of ways to an increase in vehicle-km prices. The study demonstrates that the reduction in demand is explained by three factors:

Figure 2



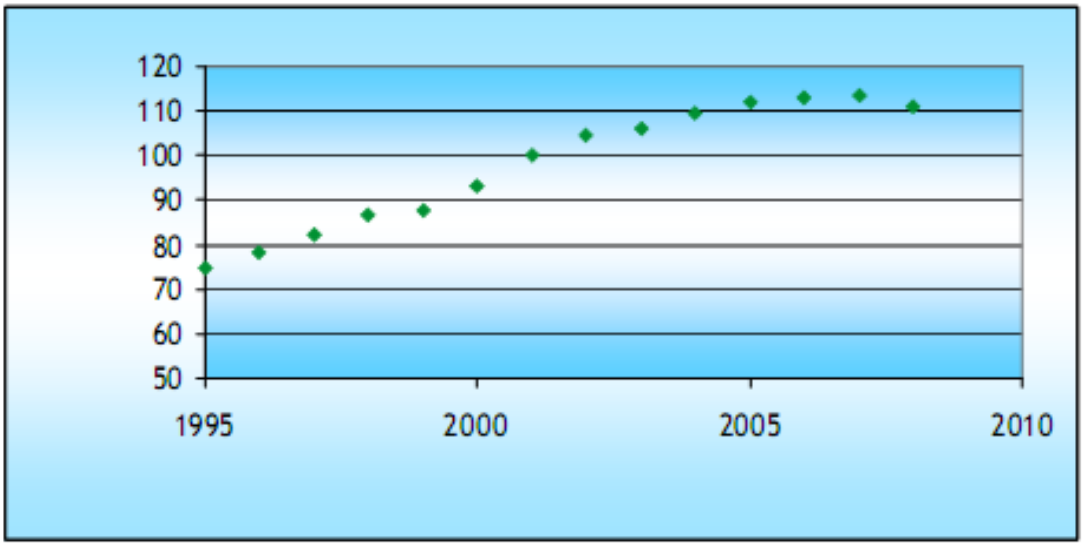
Real world evidence – Germany

The introduction of road charging in Germany led to a slowing and then a reversal of average distance travelled.

National transport statistics show that in Germany the average distance travelled per tonne of freight had been steadily increasing by around 3% per year from 1995 until introduction of the Maut in 2005. At that point, the trend towards increasing distances was slowed and the average distance even decreased slightly (0.5%) in 2008, in proportion to the overall average price increase.

Prior to the introduction of the Maut road freight price increases of around 15% were predicted, in fact transport prices increased by only 0.5% on average. Given that the Maut is based on driven kilometers, it is logical that hauliers, shippers and transporters take action to reduce distances driven, either by improving their route planning or changing trade patterns.

Figure 3 Indices of average distance travelled per tonne transported (tonne-km/tonne) of domestic road freight transport by German trucks (2005=100)

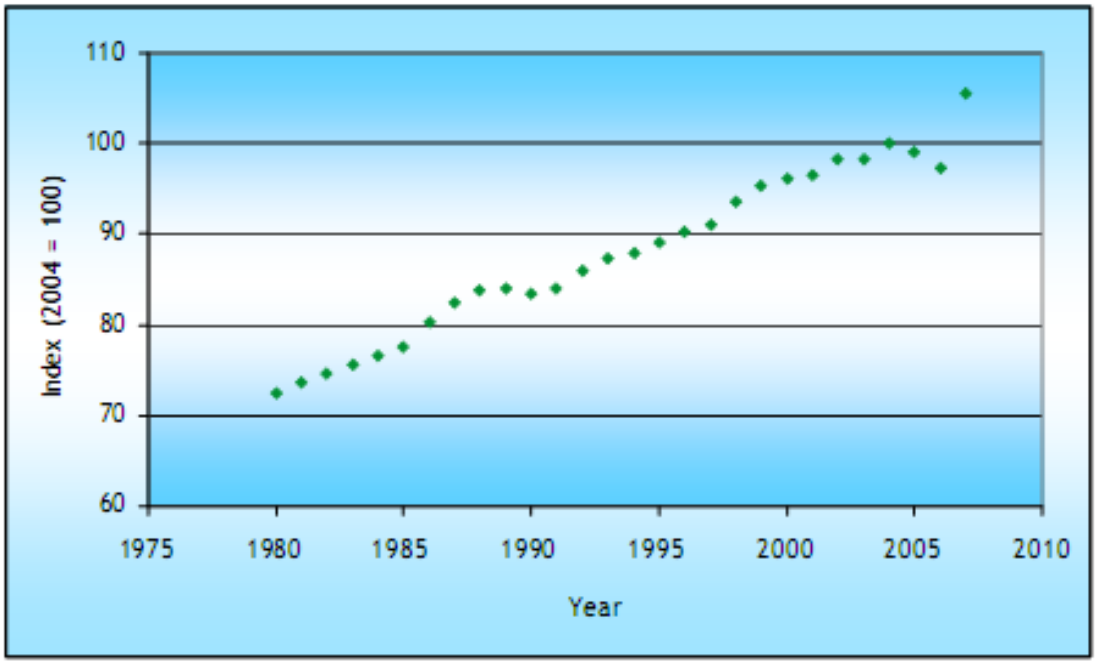


Source data: Tonne-km/ tonne: Statistisches Bundesamt Deutschland (2009)

Real world evidence – Austria

The Austrian 'Lkw-Maut' has been in place on highways since 2004, and applies to all vehicles over 3.5t. The figure below illustrates the change in distances driven, and an abrupt break in 2004 to the previous trend towards increasing distances.

Figure 4 Indices of average distance travelled per tonne transported (tonne-km/ton) of freight transport by road in Austria (2004=100)

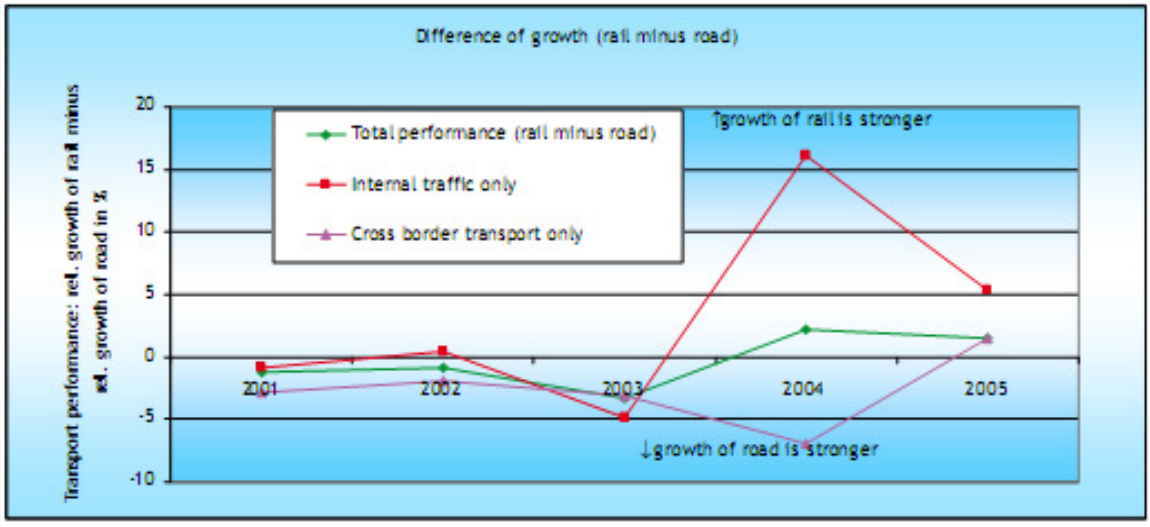


Source data: Austrian federal ministry of transport, innovation and technology (2009) (see Appendix C)

During the period 2004-2006, a decrease in average distance travelled per tonne is seen, of about 3% per year. As in Germany, tonnes transported remained roughly constant, but the distances decreased. However, in Austria the previous trend appears to have resumed in 2007, when a km-charge for lorries was introduced on Czech motorways. Some of the distance effect on Austrian highways could be attributable to traffic diversion to the Czech Republic, which returned once a km-charge was also introduced there.

Importantly, the Austrian figures also indicate some modal shift from 2004, when rail transport grew 2% faster than road transport. The effect on modal share is particularly evident and relevant for national transport. This could be explained by the fact that the Austrian Maut has a more limited effect on the overall vehicle km costs of international transport companies, so it is economically more interesting for companies engaged in national transport to look into shifting volumes to rail. However, with the introduction of the German Maut in 2005, this also became more relevant for longer distance, cross-border transport decisions.

Figure 5 Difference in growth (as % of previous year) between rail an road transport (Rail-Road).



Source: Deußner (2005), adapted by Wolfgang Rauh. ÖBB-Holding AG and CE Delft

Real world evidence – Czech Republic

A km-charge was introduced for vehicles over 12 tonnes on motorways and expressways in the Czech Republic from 1 January 2007. The volume of heavy goods traffic on these roads is seen to have decreased by 10% following the introduction, even with impressive economic growth rates during that period.

However, it is assumed that this includes some diversion of heavy goods traffic from the tolled roads to minor roads (and into neighbouring countries, particularly Slovakia which then introduced its own km-charges in January 2010). Since the magnitude of this diversion effect is not yet clear, it is not possible to draw conclusions on the overall impact of the km-charge on transport volume in the Czech Republic.

Conclusions

The study shows clearly that road freight transport demand is relatively 'elastic', meaning that demand does react directly to changes in price. Road charging is therefore an effective measure to reduce congestion, pollution and accidents from lorries.

The study shows that road freight transport demand is sensitive to price changes, and explains the ways in which hauliers, shippers and transporters are likely to react:

- For the most part price rises will be absorbed by efficiency gains within the road sector, for example by improved route planning, increased load factors or reorganisation of locations in the production and distribution chain over the longer term.
- The remaining part (one-third) of the reaction to price changes is likely to be a shift towards competing modes (modal shift).
- As demand drops in relation to the price rise, this effect needs to be accounted for in revenue expectations of road charging schemes.

The conclusions of academic (theoretical) studies are broadly confirmed by the experiences of road pricing schemes for lorries in Germany, Austria and the Czech Republic. This leads to important conclusions about the likely effectiveness of road pricing scheme for lorries in EU Member States:

- The 'price signal' sent by road charging is effective at reducing demand for road freight transport: demand for vehicle-km drops in relation to the price change.
- The major effect is the reduction in distances travelled by lorries, and not a reduction of tonnage, meaning that road charging does not hamper trade.
- Efficiency within the road freight sector will increase; the current wasteful planning – manifested especially in poor load factors and empty driving – will be tackled as a priority.
- Since the negative impacts of road freight transport, congestion, accident risk, air and noise pollution, are directly proportionate to total distances driven (vehicle-km), these will also be reduced.

Policy recommendations

The flexibility of Member States to allow road charging schemes for lorries to tackle congestion, safety and pollution problems by reducing distances driven should be maximized.

With regard to the ongoing revision of the Eurovignette directive, allowing Member States to internalise the external costs of congestion and pollution (and accidents and climate change), will enable their schemes to be even more effective at tackling these problems, in proportion to the level of the charge.

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[i] 'Polluter pays' means making the party responsible for pollution responsible for paying for the damage done to the natural environment, and to society at large. In the case of charging for the use of road infrastructure, the theory is that by making users pay for the external costs of their action, the negative impacts will be reduced as users seek to avoid paying the charges to the maximum extent possible.

[ii] Note on methodology: The study investigated long-term effects in European (long distance) road freight transport, as this is most relevant for EU decision-making. Looking at the longer term means that the full effects in terms of transport and logistics optimization can be identified.