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# Influence of truck-tolls on the modal split in cargo traffic

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# Content

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# Influence of truck tolls on the modal split in cargo traffic

## 1 Introduction

The liberalisation of the European road transport of goods was already decided in the mid eighties. By 1993 total freedom of services in EU-traffic was achieved, EU-cabotage was released in 1998. Today cabotage-restrictions only exist for the new member states within the scope of the EU eastward expansion. However today trucks from Poland are able to take up their consignment in Germany and carry it on to France. European truck fleets with different locations are able to administrate an EU-wide organisation of transportation, without having any restrictions on the national level or regulatory obstructions. Simultaneously the European Common Market generated an enormous increase in efficiency, e.g. through removal of border controls, which led to an increase in road freight transportation.

Since the rail sector did not go through the process of intra-modal competition with the corresponding increase in efficiency, which should have been an effect of the liberalisation that did not take place - the road could win clear market shares in relation to the rail freight traffic. Whereas 1970 rail and road carried a high volume of goods within the Central Europe (ca. 40% market share), today rail transport accounts for only 15 % while road transport has grown to approximately 70%.

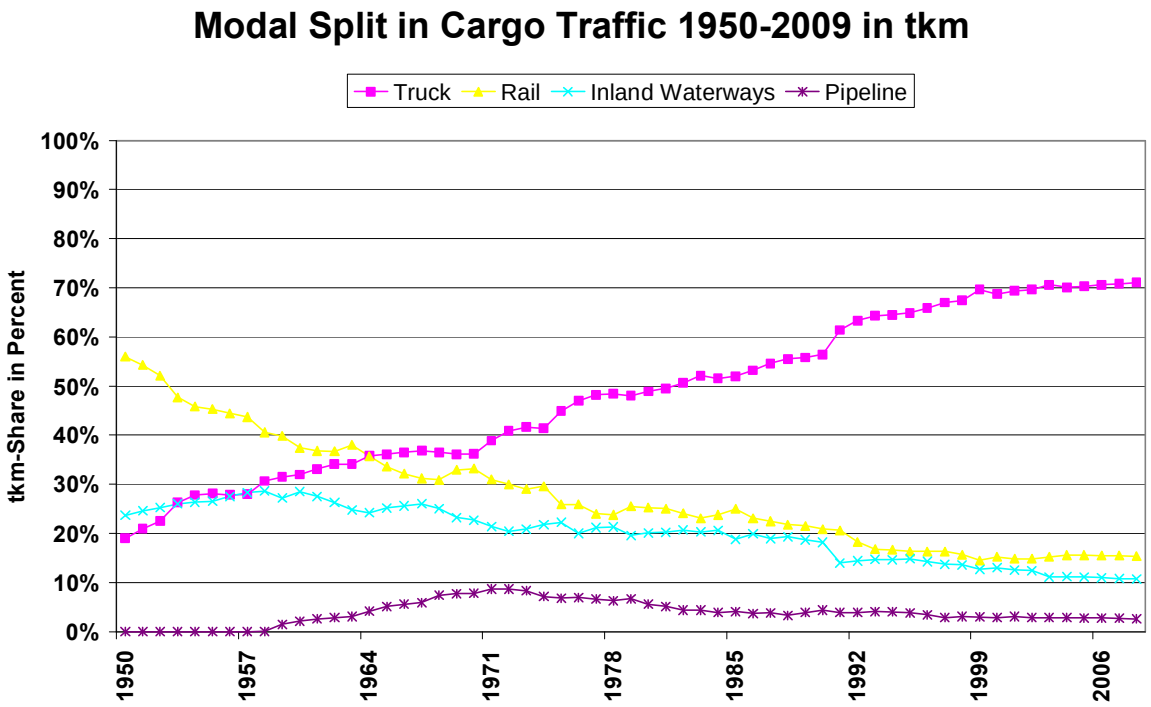


Image 1: Modal Split in Cargo Traffic 1950 – 2009 in Germany [tkm]
Source 1: DIW, ifo, Statistisches Bundesamt, Prognos/ProgTrans, BVU Illustration TransCare

In the course of liberalisation drastically falling road tolls helped prospering national economies in their development possibilities and also considerably supported the internationalisation, particularly within the consumer goods sector. Thus European goods of different origins had the same price level for the consumers.

As compared to road, rail was in fact not liberalised. Different national activities were taking place for the liberalisation of rail, which started a careful competition especially in Scandinavia, Germany, Holland, Austria and Switzerland. A liberalisation, as it is already existing on the road for more than one decade, has however not been achieved so far. This can be clearly seen on the graphic below where the fees of road transportation decreased markedly in the last 20 years, compared to rail traffic where fees slightly increased in the same period.

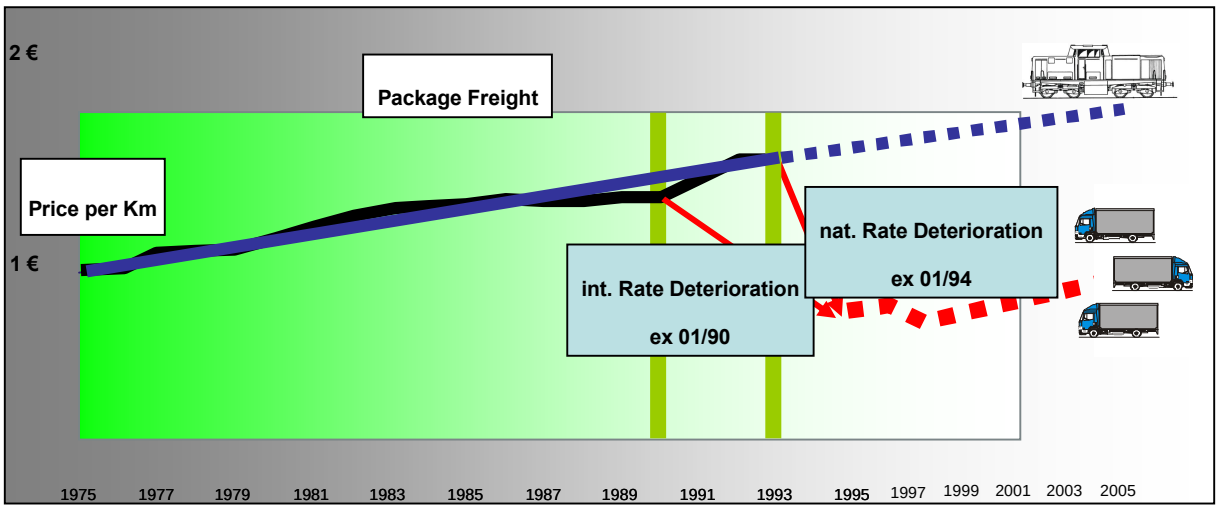


Image 2: Price Development Road-Rail 1975 -2005

Source 2: TransCare AG

Despite of positive influence of private railways, the rail transport sector is still far away from its increase of efficiency. Rail transport was affected drastically by falling market shares. It was only able to defend itself with the high volume of its traditional bulk business, especially against inland waterways. In the range of high-quality economic goods the rail could not participate in the market expansion and market shares got lost dramatically.

Only in the last couple of years the share of rail freight transport has increased a bit in the range of high valuable goods, at least in Germany, where it has been decreasing over the last 50 years (see Image 1).

Although the road transport sector reacted pro-actively to the liberalisation and increased its own process efficiency there is no sign of a corresponding pro-active competitive process in the rail sector in spite of legally initiated liberalisation. It is also the fact that the road transport market always was heavily oriented around mid-size companies. The large numbers of competitors in the market left no other possibility open other than to immediately adjust pro-actively to the changing market conditions and individual customer needs.

Opposite to this we have and always had to deal with a monopoly through state owned railways, who do not feel the intra-modal market pressure from beginning. This shows an increasing fact, that a lot of state owned railways develop monopoly strategies instead of adapting to the unavoidable competition, and look for discrimination tactics in the first place, such as:

- Admission procedures as a railway company,
- National partition of energy and communication systems,
- Engergy-charges,
- Admission rules for locomotives, especially for international use
- Renaturation of railway tracks
- etc…

Add to this, the liberalisation process in Europe is very different from each other, as shown on the graphic below.

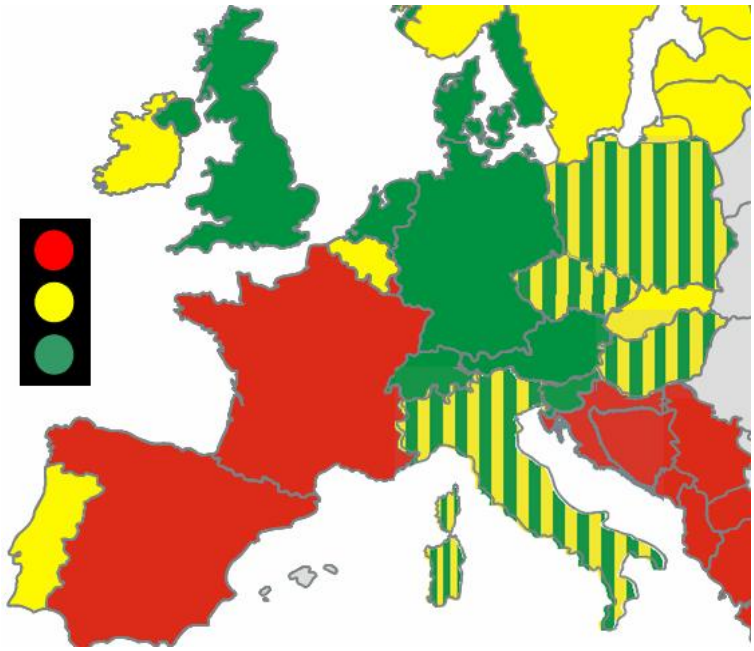

Image 3: Level of liberalisation of the rail market in Europe
Source 3: TransCare AG

While first noticeable successes are indicated in Germany, Benelux and Scandinavia, it is more difficult to initiate a generous access on the particular railway networks in the Romanic states.

Under this perspective it is very interesting to see in Germany that the growth in the railways‘ share of the modal split over the last 2 years has entirely been the result of the private players. The German State Railways has lost a further 6% of tonnage between 2000 and 2004.

This sector exclusively claimed a repeated demand to increase the road tolls for trucks to „Swiss Level“ of approximately 0,70 € per km, accentuated by a published study of McKinsey. Background of this demand is the incorrect fact that the prevailing divisions of the rail and road transports are in direct competition with each other, with exception of bulk material transport. A high utilization of the roads will lead to competition advantages for the rail and to accordingly higher market shares.
So far there was a frequent effort to gain influence in this competition by the railways, together with their trade unions and politics (usually under the seal of the envi-

ronmental policy); e.g. in the discussion of internationalisation of external costs, in order to raise the price of the entrance conditions for the road for the benefit of rail transport.

For example following measures were adopted:

- Adaption of route prices in rail transport (Bisection of route prices in Germany)
- Fees for the use of highways (Euro vignette, truck-tolls in Germany and Austria, LSVA [HVF fee for transit freight] in Switzerland)
- Increase petroleum taxes.

All these Efforts have failed their effect on the change in the modal split to railways´ benefit, because road transport was always able to increase its attractivity to the market. As a consequence the trend of modal split on the road continued, measured by total traffic.
The McKinsey study shown above enumerates now, that an increase of tolls to about 0, 70 € per km would help rail companies to increase their market share by up to 3 percentage points. This would be an increase from 14% - 15% today to 17% - 18%. According to statements of the chairmen of German and French railways Louis Gallois (SNCF) and Hartmut Mehdorn (DB) this is the only way to save single wagon traffic.

On one hand it is surprising, because in the past price increases in road transport were used to increase the prices in rail transport in parallel. On the other hand drastic toll increases, as suggested by the railway companies, signify a massive intervention into the economical development of the forwarding market on the account of the shippers.
Astonishing as well is the statement of the railway companies that the capacity of the railway system is limited at present. To this point the subsidies would have to be increased noticeably in order to extend the rail network so that a qualitatively high-value railway system would remain preserved.
The rail network would, however, clearly be able to take additional traffic. If advanced electronic technology were introduced allowing operations with electronic view, further capacities would be freed up. This type of technology is currently being successfully used in urban commuter traffic systems.
By focussing on the capacities of the road, there are clear capacity bottlenecks in congested urban areas, essentially in the rush-hours. A large part of the long distance road transport – which is exactly the traffic load that comes into question to be

shifted to rail – however takes place at night (night leap) due to the economical requirements. During this time, the long distance road network is not only overburdened, it even has extra capacity.

Ultimately a competitive price, a correspondingly required quality and a sufficient offer will decide the competition between success and failure of a forwarder within a market economy.

The reason of the current study at this point was the previous development and the fact that the railroads repeatedly try to improve their market position by increasing road tolls, instead of further development their tender structures actively.
Following questions open up to be answered:

1. Is it right to increase road tolls in order to generate more traffic for rail transport?

2. If this is right, which quantities can then be generated for the rail at what road toll price level? Or rewording the question: Which quantities react price-sensitively to a corresponding road toll increase (price elasticity of the demand)? Answering this vital question could be useful for comparison: what capacity (tonnages) can be reached then over the further development of the propositions of the rail providers (improvement of the cost effectiveness)? How high should the toll charge be at the end?

3. What effect would a toll have on the economy for this purpose?

The IRU and the BGL delegated TransCare, a competent consultancy in rail traffic, with this project. TransCare accomplished more than 300 consultation projects in the rail transport sector within the last 13 years, both for the providers´ side (state owned railways and private railways) as well as for the demand side (trade, industry and shipping), as for instance Rail4Chem for BASF AG or Seehafen-Hinterlandverkehre for HHLA AG.

That way TransCare successfully managed to shift road transport to rail in many projects. Last but not least the majority stockholder and chairman of the board of TransCare has been the managing director of the largest European intra-modal company, Kombiverkehr KG, in the past.

## 2 Analysis Status Quo „Tolls in Europe“

First of all the point is to examine how the modal split between road and rail developed in the past in those countries, were road tolls are collected. Altogether 27 European countries collect fees for the use of highways for trucks.
There are three types of tolls to set apart.

- A time dependent toll, which is paid as lump sum over a fixed period (e.g. monthly, yearly).
- A toll system dependent on travel distance.
- Geographically restricted toll systems, mostly for agglomerations.

An additional criterion for the toll calculation is the pollutant category of the truck. In many cases the toll is limited to certain roads (France, Germany) or is been charged only on special routes, e.g. the "Brenner" highway in Austria, bridges or tunnels.

The amount to be paid per kilometre in Europe differs enormously between 0.01 € in Turkey and 0.74 € in Switzerland.

The following describes different toll systems and their influence on the modal split. With Germany, France and Switzerland 3 exemplary countries were selected, that are adapted representatively for a later extrapolation on Europe (EU 25) for the following reasons:

- Tolls have been charged for differing lengths of time, allowing short, middle and long term effects to be observed.
- The average toll varies considerably from on another in the focused countries. Important conclusions can be drawn regarding the relation between the level of the charged toll and modal shift tendencies, if required.
- Another common aspect is that all 3 countries possess of an area-wide high quality rail track network.
- The analysed countries seem to be very progressive in their efforts at internationalisation and supply-oriented policy and would therefore have to be particularly successful in the required increase in road costs.
- An extrapolation of these countries on the rest of Europe (EU 25) turns out to be in favour of the rail and so far fall out optimistically.

## 2.1 Road Tolls in Germany

The road toll in Germany is a so called Free-Flow-System, where the toll is collected automatically without the necessity of a stop at a toll collect station. The amount of the toll is determined according to the cost-by-cause principle, which is simplified quite a bit and therefore charged arbitrarily. So each truck with a permitted total weight of at least 12 t pays a average rate of 12.4 cents per km (scale from 9 to 14 Cents depending on pollutant category and number of axis) while all lighter vehicles can travel free of charge.

After the technical initial difficulties (incorrect billing during the test phase, faulty on board units, too few OBU and untrained workshops), now from technical point of view, the system is operating well since 1st January 2005 according to the vast majority of the forwarders, according to statements of BMVBS.

According to the final report of the federate consortium, “Modal Shift as a result of truck tolls”, a shift to the road will not lead to cost savings in 97% of the cases.

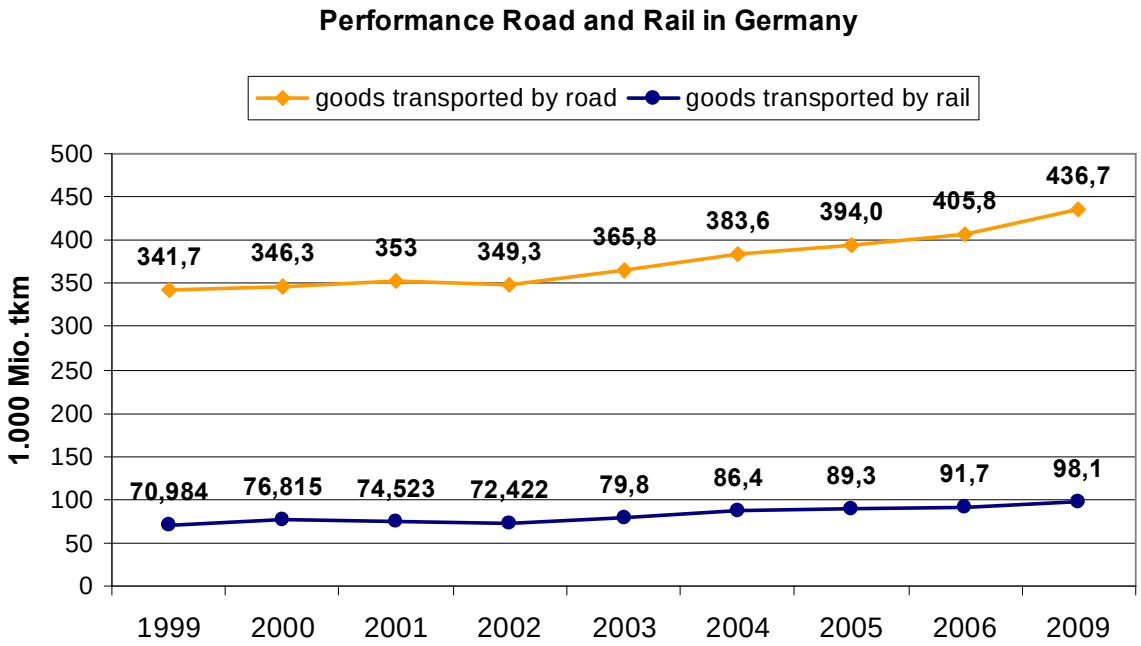


Image 4: Modal Split in Germany [Bill. tkm]

Source 4: Kraftfahrt-Bundesamt, Statistisches Bundesamt und BVU Prognose, Progtrans, Illustration TransCare

The development curve in image 4 shows very clearly that at least one of the main political intention – the transfer of freight traffic from road to rail - has not been reached, although the liberalization process is comparatively further advanced in Germany.
On the other hand Deutsche Bahn AG (DB AG) increased their fees in their core segments simultaneously when the toll system got implemented in the beginning of 2005. With this strategy DB AG was able to improve its´ margin in the combined traffic. Moreover the image also points out that even until 2009 there will be no improvement on the modal split for the benefit of the rail.

## 2.2 Road Tolls in France

In France, tolls are charged for every vehicle on all highways. The highway which leads to the Massif Central (Clermont-Ferrand - Montpellier) is toll free for the most part. Highways which pass through congested areas or stretches of highways which pass large cities are toll-free, as well. (E.g.: Paris, Bordeaux, Lyon, and Montpellier). The toll is collected at fixed toll booths by personnel or by coin machines the toll amount depends on the travel distance and type of vehicle. Moreover the amount also depends on the total costs that arose during the construction period of the road. Frequent drivers can acquire a subscription.
Today there are eleven different operators for the ca. 11,000 kilometre stretched network. Some individual roads are still government property; however they will be privatized gradually.

The trucks classified in the category III pay per kilometre travelled on the highway between 0.14 and 0.19 €. This toll system is in operation for several decades already.
Image 5 shows very clearly that a transferral effect is not to be diverted through the toll. That modal split organizes itself in France very similar like in Germany, with ca. 78% road- and 14% rail transport, related to the efficiency in ton/kilometres (t km).

In comparison with Germany, the liberalization of the rail traffic in France hardly progressed yet. In fact the state owned railway SNCF has an absolute monopoly in this sector. Merely 3 licenses are given for rail transport in France at present. Germany has more than 200 rail freight companies, of which only about 20 operators to be taken seriously.

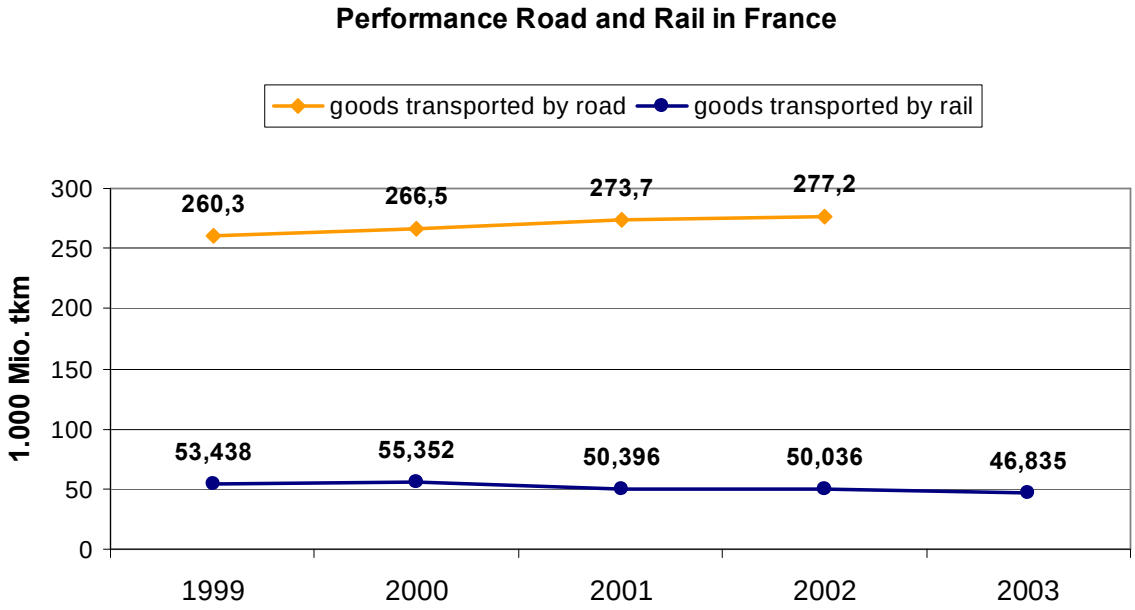


Image 5: Modal Split in France [Bill. tkm]

Source 5: EU-Commission Directorate-General for Energy and Transport, Illustration TransCare

## 2.3 Road Tolls in Switzerland

An electronic toll system for transport vehicles is in use on all roads in Switzerland and Liechtenstein. On January 1st 2001 an electronically collected, distance-based toll for trucks of over 3.5 tons went into effect, the so-called Heavy Vehicle Fee (HVF). The toll ranges from 0.05 – 0.74 € per km depending upon vehicle size and the route travelled. A typical transport truck with a gross vehicle weight of 40t pays an average of 0.70 € per km.

An additional fee is collected for specific structures and some of the tunnels on the Italian border, such as the Sankt Bernhard Tunnel, for example.

Not only did Switzerland introduce the HVF, but at the same time they introduced an integrated package designed to transfer traffic from the roads to the rails. The initial target is to stabilize the number of transport vehicles on the roads and then to effect a sustainable reduction of that number over the coming years. The following measures were taken:

- Supplementary measures aimed at reducing road transport or transferring it to neighbour states
- Reimbursement of the LSVA-toll for transport to and from intermodal terminals
- Step-by-step increase of the permitted gross weight of vehicles from 28 t to 40t
- Consistent modernisation of the railway infrastructure
- Infrastructure fee reduction in rail transport

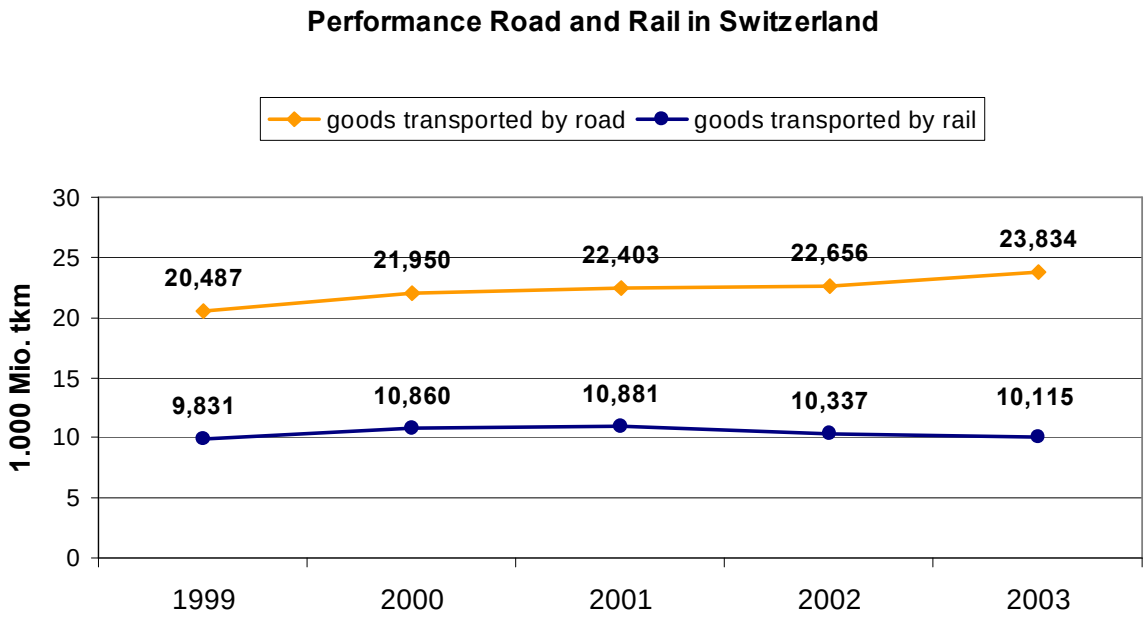


Image 6: Modal Split in Switzerland [Bill. tkm]

Source 6: LITRA, Switzerland 2005, Illustration TransCare

These measures strengthened combined transport in Switzerland while wagon-load transport continued to lose market shares. Illustration 6 clearly shows the results insofar as the sum of the wagon-load and combined transport in total rail freight services has not led to any increase in market share. Estimates of the Federal Office for Spatial Development assume that a maximum of 40% of the transferral effects in favour of combined transport arise from the Heavy Vehicle Fee. [Federal Office for Spatial Development, Bern, November 2004]. Almost the same amount has been covered by the higher truck weights. However, experts (Hupac, TransCare), quote that the changes in Hupac's purchasing policy through offers using multiple frequency locomotives - especially achieved through competition between state and private railway tenders - are responsible for most of the increase in combined transport.

Remarkably, in spite of this enormous increase in costs road freight transport has grown disproportionately to rail freight transport and has even increased its market share. This is especially true considering that the high toll costs have forced a noticeable number of trucks to use alternative routes through Austria and France.

This example demonstrates just how little influence a truck transport toll has on changes to the modal split. In spite of a toll six times higher than Germany's is today, these measures were only able to generate a marginal transfer potential for rail transport. The overall Swiss rail freight transport actually even decreased slightly from 2000 to 2003. Combined transport, where additional measures were taken, was the only sector to evince continuous growth.

Obviously rail transport profits more from a free market supply-oriented policy with an attractive cost-performance ratio than from high road toll fees.

## 2.4 EU 25

In the following text it should become – in addition to the qualitative explanations in the introduction to this chapter - quantitatively clear that a projection using France and Germany as substitutional representatives is permissible.

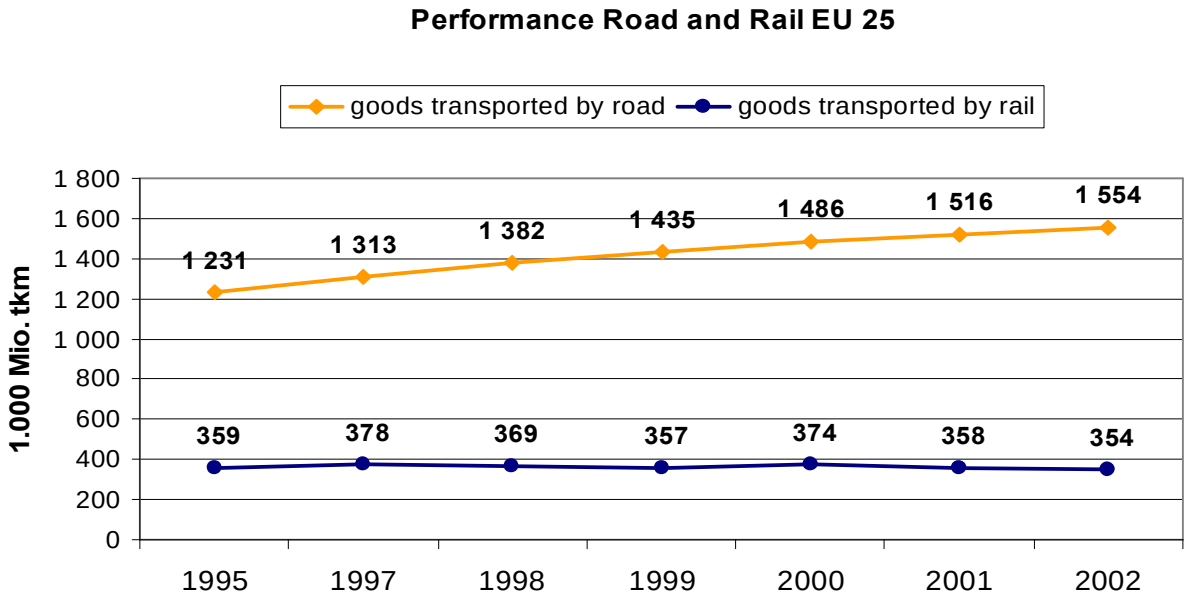


Image 7: Modal Split [t km, %], Note: Road - t km by vehicles registered in the country

Source 7: EU-Commission Directorate-General for Energy and Transport, Presentation TransCare

Image 7 shows a road freight transport volume of 1,554 billion t km in 2002. A total of 637 billion t km were transported in Germany (359.8) and France (277.2) or by vehicles registered there (see illustrations 4 and 5). This represents a 40.9% share of the total road freight transport volume within the EU member countries (EU 25).
In addition, image 8 clearly shows that the rail modal splits in Germany and France in 2002 are the same as those for EU 25:

- Rail Share Germany 14.8%
- Rail Share France 14.3%
- Rail Share EU 25 16.4%

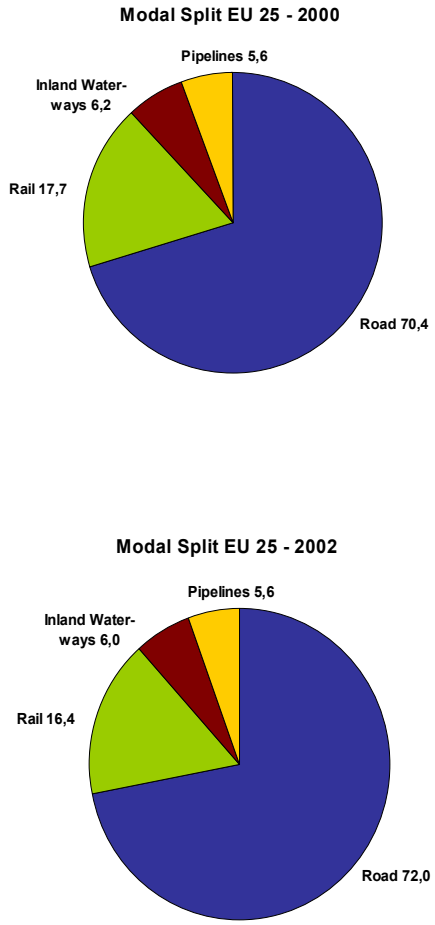


Image 8: EU 25 Modal Split [%]

Source 8: EU-Commission Directorate-General for Energy and Transport, Illustration TransCare

This will allow the volume of road freight transport available for a modal-shift to rail transport to be calculated in chapter 3 based on the detailed studies of Germany and France and then extrapolated correspondingly for the entire EU.

## 2.5 Cost Efficiency and Transport Political Conditions

In the middle of the 90ies the transportation ministries of Austria and Switzerland looked into the competitive conditions of road and rail carriers very intensively. Objective was to find out, which transport policy could actually lead rail transportation to more competitiveness with the road. In this project TransCare was assigned to review 10 transport political parameters regarding their effectiveness on the improvement of competitiveness of the rail. This was evaluated on the basis of 6 statistically

representative cases in the "Alps-Transit", where each of the political measures were valued monetarily compared with the resulting „door-to-door“ costs in road transportation and the unattended combined traffic. The costs basis regarding road and rail was updated for 2005. The advance and subsequent costs as well as the handling costs per total distance are apportioned door-to-door in the rail sector.

The traffic political measures were segmented as follows:

1) Measures that do not cost anything but generate competition
   - total liberalization
   - separation of rail network and operations
   - harmonization of the energy prices for state and private railways
   - etc.

2) Tax additives and subventions for combined traffic, e.g.
   - capital investment for terminals
   - sponsoring of equipment for combined traffic
   - etc.

3) Rise in road prices, e.g.
   - tolls and taxes
   - social policy controls,
   - Night driving bans
   - etc.

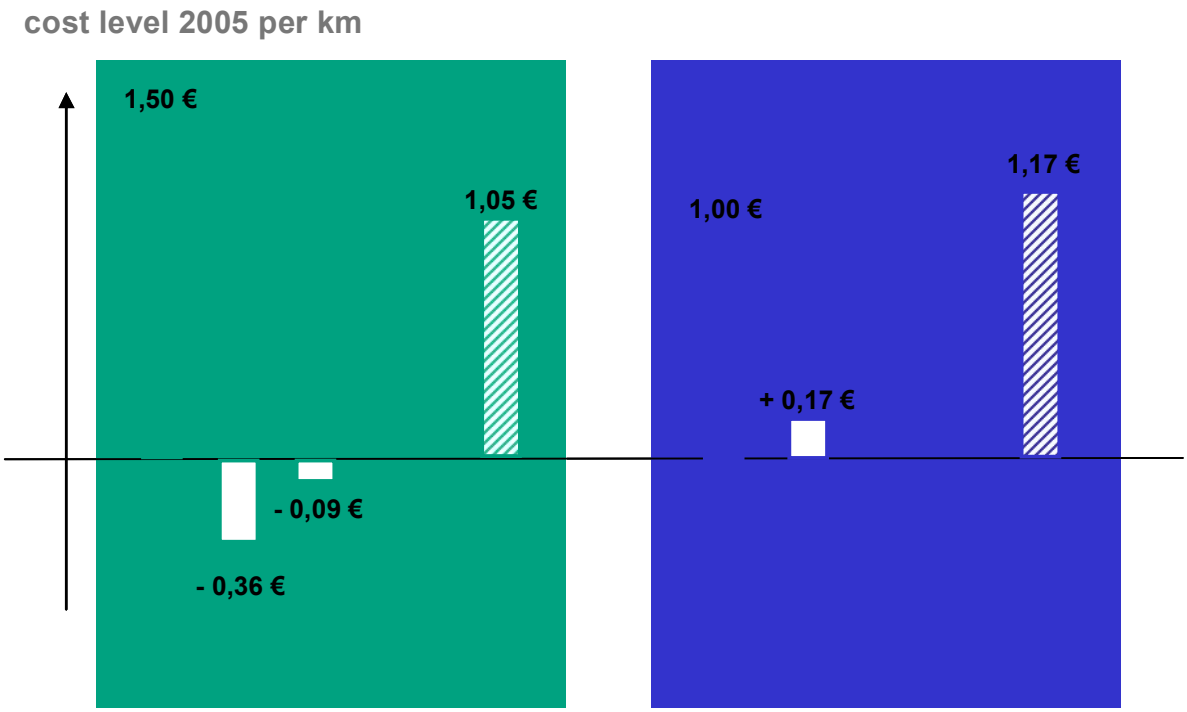


Image 9: Measures and Ranking

Source 9: TransCare (1995-97)

The result of this study which exists since 1997 validates the actual situation in Switzerland, as shown in Chapter 2.3.

With regards to the improvement of the competition position in rail and road, the generation of persistent competition in the rail sector has highest effect so far.

# 3 Modal Shift Potential Road-Rail

This chapter will determine the percentage of road freight transport volume which can potentially be won for rail transport. The initial focus is on the total carrier volume in road transport. This volume is to be reduced in logical steps on the basis of categories of goods, their average distances and specific logistical requirements with regards to modal-shift capability.

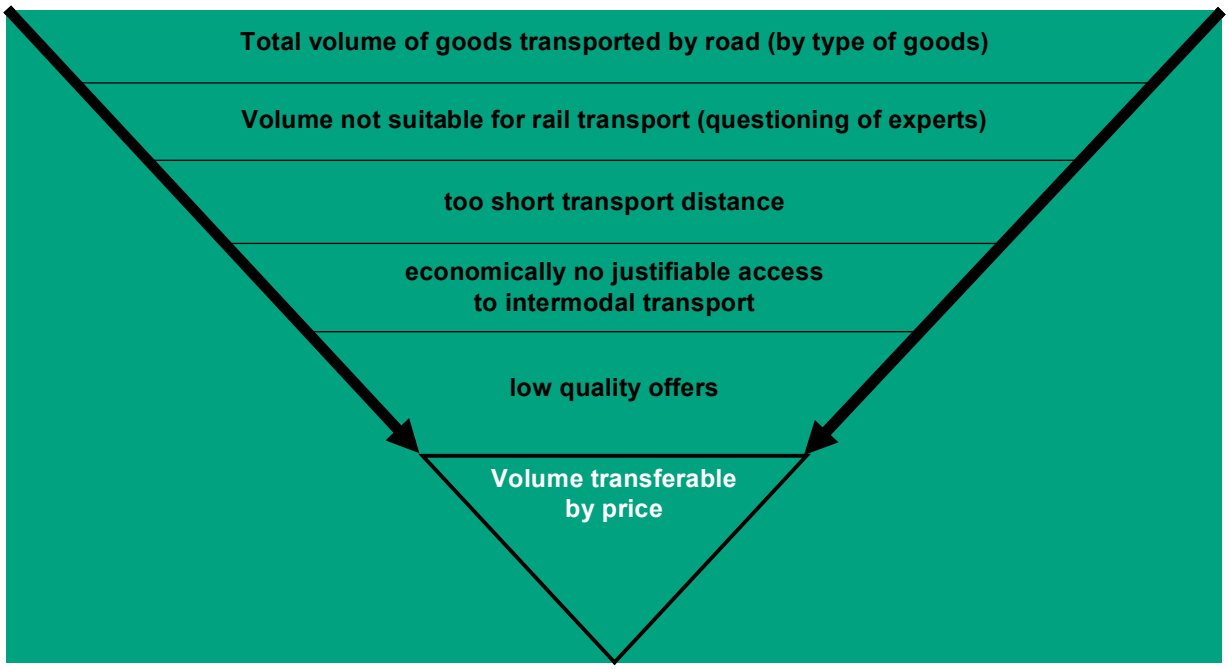


Image 10: Procedure to evaluation of relocatable potentialities of the road transport.
Source 10: TransCare AG

**Total Volume of Goods Transported by Road by Type of Goods (3.1)**
- Not rail feasible share of volume
**= Rail feasible volume transported by road (3.2)**
Share with too short transport distance
**= Rail affine volume transported by road (3.3)**
- Share of containerisable volumes, where use of an inter-modal transport system offers no economical justification (ratio road-based pre- and on-carriage to rail-based main carriage)
- Share with low quality offers
**= Modal shift potential for rail (3.4)**

First of all those quantities which cannot be shifted to rail are segmented and subtracted. The result of this calculation is the total quantity relocatable due to price compensations and therewith price sensitive volumes in equally remaining quality of the rail.

## 3.1 Total Volume of Goods Transported by Road (by Type of Goods)

According to the statistics the total goods transported by road consists of the following quantities:

| | | |
|---|---|---|
| » | France: | 2,076,705,000 t |
| » | Germany : | 2,727,900,000 t, |
| Total | | **4,804,605,000 t.** |

According to experiences of the past 30 years along with the current experiences in Switzerland it is obvious that the fundamental approaches to relocate the road transport to rail can only be insisted through combined traffic. As a positive fact of the combined traffic high losses in the conventional rail transport were compensated in the past 20 years. Especially in that single wagon transport losses were at least in partly compensated so that the rail could nearly keep up with the percentage increase of the road.

## 3.2 Rail Feasible Volume of Goods Transported by Road

Several projects were accomplished in Germany during the nineties already where potentials for the rail and especially for the combined traffic were analysed. Upfront container capable potentials were determined through an expert inquiry on basis of the cargo groups. Following companies/institutions were involved in this expert's survey.

- Kombiverkehr GmbH & Co. KG, Frankfurt/M.
- Association for combined traffic, Frankfurt/M.
- TransCare AG, Wiesbaden

The measurements in image 11 clearly illustrate, that high value goods (vehicles, machines, finished and semi-finished goods) show the highest affinity in combined traffic, while other goods like coal, ores, stones and soil have little or no potential.

| | Volumina D Road Transp. [t] | Containerisation Level of KeyProducts | KT-affin | Volumina F Road Transp. [t] | Containerisation Level of KeyProducts | KT-affin |
|---|---|---|---|---|---|---|
| Agriculture and Forestry | 141.000.000 | 25% | 35.250.000 | 63.223.000 | 25% | 15.805.750 |
| Food and Animal Feed | 304.000.000 | 35% | 106.400.000 | 364.892.000 | 35% | 127.712.200 |
| Coal | 12.300.000 | 0% | 0 | 6.655.000 | 0% | 0 |
| Mineral Oil and Oil Produce | 105.100.000 | 37% | 38.887.000 | 85.508.000 | 37% | 31.637.960 |
| Ores and Scrap Metal | 28.600.000 | 10% | 2.860.000 | 41.832.000 | 10% | 4.183.200 |
| Steel, Metal and Non-ferrous Metals | 72.100.000 | 35% | 25.235.000 | 39.657.000 | 35% | 13.879.950 |
| Stones and Soils | 1.361.100.000 | 15% | 204.165.000 | 941.487.000 | 15% | 141.223.050 |
| Fertilisers | 20.000.000 | 30% | 6.000.000 | 48.384.000 | 30% | 14.515.200 |
| Chemical Products | 209.600.000 | 63% | 132.048.000 | 45.891.000 | 63% | 28.911.330 |
| Vehicles, Mashines, Finished and Semi-Finished Goods | 474.100.000 | 68% | 322.388.000 | 439.176.000 | 68% | 298.639.680 |
| Total | 2.727.900.000 | | 873.233.000 | 2.076.705.000 | | 676.508.320 |

Image 11: Modal Shift Volume Road-Rail

Source 11: TransCare AG

The share of freight suitable for rail transport, depending on the classification of goods and their characteristics (size, quantity, time, etc.) was calculated in the following tonnages:

- » France: 676,508,000 t
- » Germany: 873,233,000 t,

Total **1,549,741,000 t** or **38.7%.**

After the first modal-shift review round about 40% of the total road transport is available in volume and capable for rail transport. This builds a solid basis for the next move.

## 3.3 Rail Affine Volume of Goods Transported by Road

The volume calculated by type of goods which amounts to 1.55 billion t shows a varying affinity for inter-modal transport depending on the transport distance. Short distance transports not transferable and therefore not rail affine. So far the transferable volume of goods determined here on the order of 1.55 billion t shows a difference in affinity to the combined traffic dependent upon the carrier distances. The following assumptions were made:

- » 0 – 100km 0%
- » 100 – 250km 10%
- » 250 – 500km 50%
- » > 500km 100%

Based on statistical data about the average transported distances for the different types of goods (see Annex 1), the following rail affine volume was calculated:

| | | |
|---|---|---|
| | » France: | 85,530,000 t |
| | » Germany | 110,401,000 t, |
| In total | | **195,931,000 t** or **4.1%.** |

## 3.4 Modal Shift-Potentials

A total of 196 million t in France and Germany or just up to 4% of the total road freight tonnage could be transferred to rail based on the characteristics of the goods and the transport distance. This outlines a fundamental for evaluation of the price - sensible volume.

Based on an estimated average distance of 292 km* the transferable transport performance in Germany and France amounts to 57.1 billion tkm Presently the German and French railways transport 436 million t. As a consequence of this, a complete transfer of the volumes and performance mentioned above mean an increase of:

| | |
|---|---|
| » Tonnage 436 million t: | 44.7% |
| » Transport performance 133.2 billion tkm: | 42.9% |

The 196 million t calculated can not be taken as potential that can be shifted by a simple increase in the cost of road transport. TransCare processed more than 300 projects, where it was considered to keep the volume of goods preserved for shifting to rail. It became clear that winning rail affine quantities is achievable only by definite improvements of the services offered on the rail. However the following quantities should be further subtracted:

- Quantities not economically justifiably for inter-modal transport: **35%**
- Quantities with time requirements which cannot be met by rail: **25%**
- Quantities with special requirements (temperature control, multiple delivery points, etc.) currently are not offered by rail operators **10%**

The 196 million t mentioned is therefore only roughly 30% price sensitive. This means that even reducing the rail prices to 50% of the present level, at the present quality level, 70% of this volume would not be shifted to rail.

On the other hand an increase in the cost of road freight transport would mean that in

- » France 25.659.000 t
- » Germany 33.120.300 t,

consequently max. **58.779.300 t** or **1.22%**
would react to these prices and will therefore be shifted to rail.

If the gain is calculated using the example of Germany with current 310 million t on rail (see image 12), the volume increases itself at about only 11%. The market share (not the efficiency in t km) would increase by 1.08 percent-points to 11.29% at the tonnage.

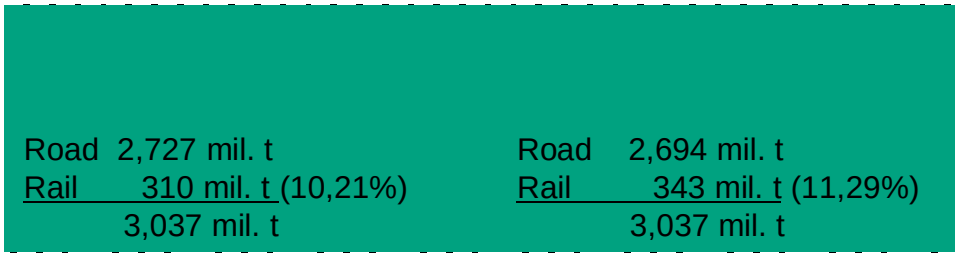


Image 12: Modal Shift-Potential for the Rail

Source 12: TransCare AG

## 3.5 Interim-Result

The total transfer potential created by political pricing (fiscal measures) amounts to a maximum of 1.22% (58.8 million t) of the goods transported by road.
However, this potential can only be achieved if

- » the cost of transport constitutes a high proportion of the total supply-chain costs
- » and the cost of freight transport by road is being increased overall.

On the other hand, the total potential for transfer of transports created by improvements in rail quality amounts to 4.1% of the road freight.
However, this potential can only be achieved if

- » the potential increase of efficiency driven by the increasing intra-modal competition is reflected in the prices
- » and the quality of the performance offered is considerably improved.

# 4 Determination of „Modal-Shift-Capable“ Toll Amount

After clarifying the fact that the potential on the order of 58.8 million t can only be achieved by increasing the price of the street, it is now essential to calculate the amount of the toll, so that the modal shift capable volume reacts to use the rail. Initially today's road and rail infrastructure fees will be examined in order to determine whether there is a comprehensible relationship between the two from a business management standpoint or whether the road use costs are too low.

## 4.1 Infrastructure fees

The following Image 13 illustrates the determined infrastructure fees per truck for the road and combined traffic with the example of Germany . As a comparison rail transport with diesel locomotives was underlied, in order to be able to charge both transits with the adequate mineral oil tax. The costs for using the rail would have been a bit lower by using electrical locomotives, which are generally used in combined traffic.
The route prices for rail transport are collected per covered kilometre in Germany and the rest of Europe and can therefore be carried over on a per-truck basis. The usual break-even calculation model based on a train length of 600 m running at 66% of capacity was used. Based on this a train would transport approximately 20 truck-suited transport units.

| **Infrastructure Fees - Road** (per km/truck) | | | **Infrastructure Fees - Combined Traffic per Truck** (1 Locomotive, 2/3 utilization rate = 20 trucks) | | |
|---|---|---|---|---|---|
| Toll | 0.12 | € | Standard Track Price | 0.15 | € |
| Vehicle Tax | 0.02 | € | Fuel Tax Equivalent | 0.06 | € |
| Fuel Tax | 0.18 | € | % Fuel Tax to and from Terminal | 0.03 | € |
| Cost per truck unit | 0.32 | € | Cost per truck unit | 0.24 | € |

Image 13: Infrastructure Fees Road vs. Combined Traffic

Source 13: TransCare AG

The result in Image 13 illustrates that the use of the road is even more expensive by 25% than the costs using the infrastructure of the combined traffic.

## 4.2 Price Sensitivity

The previously determined modal shift potential of road freight transport of 58.8 million t consists mainly of high priced and at the same time small sized goods over longer distances. The potential in the other sectors, here shown grey, should be disregarded.

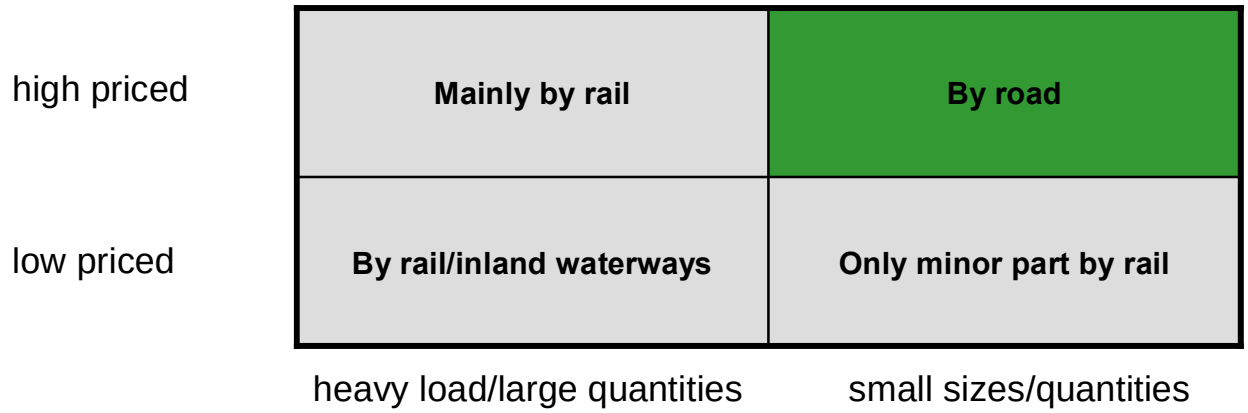


Image 14: Price-Sensitivity of goods
Source 14: TransCare AG

In the following the transport costs are shown as a proportion of the total logistics costs. From this it can finally be concluded how far an increase of transportation costs would effect the total costs of the supply chain. Furthermore it can clearly be seen how high the toll increase would have to be in order to cause a modal shift.

The modal shift potentials were classified into following logistical segments.

- Parcel
  - » Parcel solution: collection – reloading – transport – reloading – delivery
  - » Parcel price in Europe ca. 6 €, of which freight **10%**
- Shared pallet
  - » Pallet solution: collection – reloading – transport – reloading – delivery
  - » Pallet price in Europe ca. 60 €, of which freight: **20%**
- Full pallet
  - » Pallet solution: collection – reloading – transport – reloading – delivery
  - » Pallet price in Europe ca. 40 €, of which freight: **30%**
- Part load
  - » LTL*-solution: collection - load additional cargo – transport - part off-load - delivery
  - » Pallet price in Europe ca. 30 €, of which freight: **50%**
- Full load
  - » FTL*-solution: collection by road - transport by rail - delivery by road
  - » Proportion of transport cost in the turnaround costs incl. loading time **75%**

It becomes clear that cost increases in the pure road transport have very different effects on the affected supply chain. The sensitivity of the single logistics structures will be very different in this respect. It is thereby supposed that with a cost increase by 10% on the complete supply chain, alternative means of transport will be taken into consideration.

Image 15 recapitulates by showing that the higher the quality of the market segment the lower the affinity to change over to rail with simultaneously increased costs on the road. Especially high quality segments like piece goods, package freight and pallets appear as high prised segments as well along with the corresponding marginal capacity for the forwarder. Exactly one of these segments (packages) reacts however to a cost increase of the road only if an additional toll of 1 € per km is charged on all roads and for all types of trucks. Piece goods react on an increase by 0.50 € at the earliest. Therewith the determined price sensitive modal shift-potential of 58.8 million t can only be reached entirely, if the prices on the road are increased by around 1 € per km.



* FTL = full truck load

LTL = less than truck load

| Cost Increase Road / Cost Influence Supply Chain | Share of transport costs | 0.25 € = 25% | 0.50 € = 50% | 0.75 € = 75,0% | 1.0 € = 100% |
|---|---|---|---|---|---|
| Package | 10% | 2,5% | 5,0% | 7,5% | 10% |
| Shared pallet | 20% | 5,0% | 10,0% | 15,0% | 20% |
| Full pallet | 30% | 7,5% | 15,0% | 22,5% | 30% |
| Part load | 50% | 12,5% | 25,0% | 37,5% | 50% |
| Full load | 75% | 18,8% | 37,5% | 56,3% | 75% |

Effective cost increase of process > 10% of volumes will be shifted

Image 15: Effective raise of processing costs

Source 15: TransCare AG

Such an amount will have a massive effect on the marked as well as on the affected economies.

## 5 Effect on national economies

A drastic increase of road transportation will bring two potential effects. On hand the cost increase on the road would be passed on to the shippers and consequently apportioned to the goods to be transported. This will inevitably lead to price increases without added value and to inflation. On the other hand the economy could compensate the additional costs which would lead to minor margins and a decrease of competition lately. Both effects are illustrated in the following.

### 5.1 Increase of Operational Incosts through Truck Tolls

Overall 4.8 billion tonnes are transported on the road in Germany and France. A total of 50 billion km are travelled by Trucks. An increase of the toll by 1 € per km would cause a surplus load of additional expenses on the order of 50 billion € per year. 2004 the GDP in Germany was at 2.21 billion € and 1.65 billion € in France, 3.86 billion € in total. A cost increase on road freight transport will cause a increasing of operational costs. As shown in illustration 16, this calculation has been performed for all important European countries, whereby the operational incosts arising from a toll charge of that magnitude could run as high as 8.5% (Slovakia).

| Land | GDP 2004 [mio. €] | Traffic Operation Truck [mio. km] | Toll-increase [€] | Increasing Costs [mio. €] | Cost increase in X % of GDP |
|---|---|---|---|---|---|
| *be* Belgium | 288089 | 3755 | 1 | 3755 | 1,3 |
| *cz* Czech Republic | 86787 | 5495 | 1 | 5495 | 6,3 |
| *dk* Denmark | 196300 | 2316 | 1 | 2316 | 1,2 |
| *de* Germany | 2215650 | 28792 | 1 | 28792 | 1,3 |
| *ee* Estonia | 9043 | 595 | 1 | 595 | 6,6 |
| *es* Spain | 837316 | 19090 | 1 | 19090 | 2,3 |
| *fr* France | 1648369 | 21709 | 1 | 21709 | 1,3 |
| *ie* Irland | 148557 | 2314 | 1 | 2314 | 1,6 |
| *it* Italy | 1351328 | 13422 | 1 | 13422 | 1,0 |
| *cy* Cyprus | 12533 | 143 | 1 | 143 | 1,1 |
| *lv* Latvia | 11167 | 741 | 1 | 741 | 6,6 |
| *lt* Lithuania | 18083 | 1183 | 1 | 1183 | 6,5 |
| *lu* Luxembourg | 25664 | 726 | 1 | 726 | 2,8 |
| *hu* Hungary | 81115 | 2201 | 1 | 2201 | 2,7 |
| *nl* Netherlands | 488642 | 6836 | 1 | 6836 | 1,4 |
| *at* Austria | 237039 | 3268 | 1 | 3268 | 1,4 |
| *pl* Poland | 203711 | 12872 | 1 | 12872 | 6,3 |
| *pt* Portugal | 142434 | 3833 | 1 | 3833 | 2,7 |
| *si* Slovenia | 26146 | 955 | 1 | 955 | 3,7 |
| *sk* Slovakia | 33119 | 2822 | 1 | 2822 | 8,5 |
| *fi* Finland | 149725 | 2620 | 1 | 2620 | 1,7 |
| *se* Sweden | 282014 | 2531 | 1 | 2531 | 0,9 |
| *uk* United Kingdom | 1715059 | 23944 | 1 | 23944 | 1,4 |
| *no* Norway | 204358 | 1776 | 1 | 1776 | 0,9 |
| *ch* Swiss | 288853 | 6966 | 1 | 6966 | 2,4 |
| **Average** | **428044** | **6836** | **1** | **6836** | **1,6** |

Image 16: Increase of operational incosts

Source 16: TransCare AG

An increase of the toll on the value of 1 € will cause economical total cost increasing in the magnitude of 1.6% - an enormous economic burden.

## 5.2 Economical Effects

Apart from the increasing of the economical total cost, further negative effects are to be expected, if the toll will be increased:

- » Decline in Europe's attractiveness as a logistics centre in the global network
- » Increase of production costs
- » On the one hand, a price increase:
  - population will carry a big part of the additional costs caused by the increased toll fees
  - weakening of the domestic economic situation and the resulting dampening of the growth rates
  - weak economic growth means an increase in unemployment

» On the other hand, a proportion of the increased costs would be compensated inside the economic cycle, as they can not be projected onto the global market. This would, in turn, lower the already low profitability in the European commercial economy. The result would be
  - A reduction of over 50% in the return on turnover in I, GB, F, DK, A and D
  - Bankruptcies
  - Loss of employment

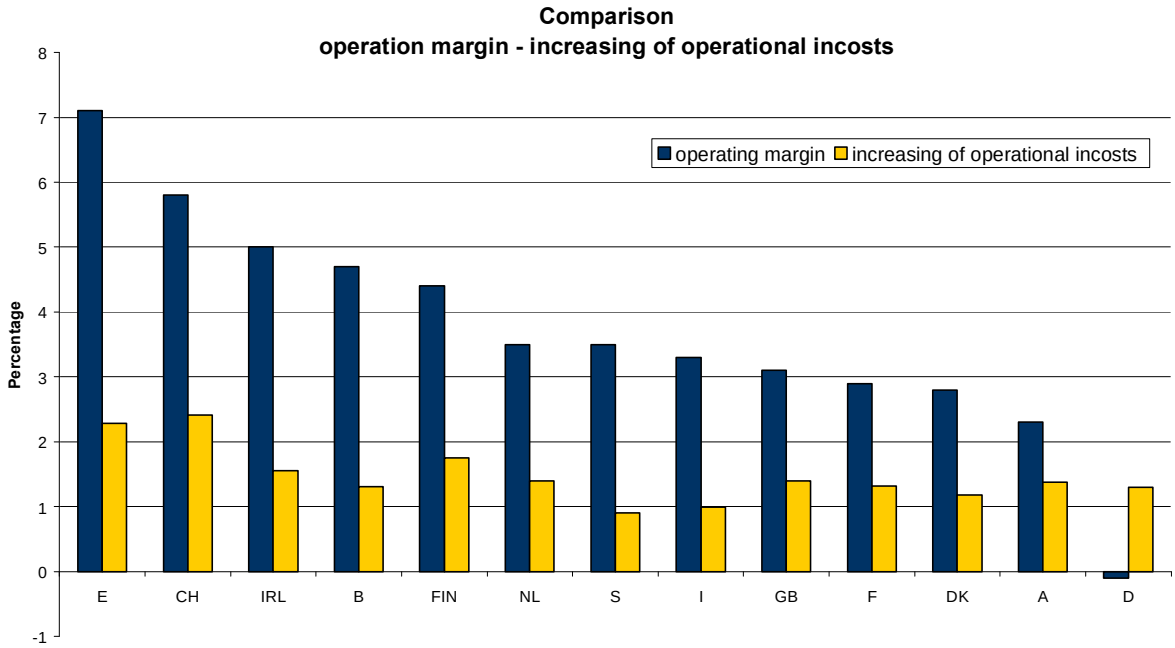


Image 17: Operating Margin vs. Increase of Operational Incosts

Source 17: Institut der Deutschen Wirtschaft (IW), Köln, Darstellung TransCare

A decline of the operating margin in such a way will cause an additional enormous shift of production and jobs to non-European countries.

## 6 Result and Summary

The existing survey pays very close attention to appeal of the state railways to increase the costs of the road by increasing tolls. According to the railways´ opinion the modal split could be improved in favour for the rail. The increase of the toll in Europe demanded by the European railway companies comes to 0.60 €.
This unique study shows, pragmatically as well as statistically documented, that a toll increase as demanded will have no measurable transfer effects!

1. The modal shift potential created by pricing and without increasing quality of rail transport is limited to 1.22% of the current volume transported by truck.

2. This modal shift potential (1.22% or 58.8 million t) could only be achieved through an increase of the toll to a value of 1 € per truck-km on all roads.

3. It is still uncertain, if the improvement of the competitive environment has been used by the railways. However price increases in road transport were used to increase the prices in rail transport in parallel in the past, without using the possible competitive advantage to the generation of more traffic.

4. The effects of a toll increase of this magnitude on the national and business economies are severe. The operational incosts will cause an increase of 1.6% with a concerning pressure of inflation. As if the global competition avoids fiscal-cost-increases, this causes a bisection of the margins of the commercial economy in the biggest European economies. This effects insolvencies, reduces growth of economies and increases the unemployment.

5. Drastically increased road tolls would be create a location disadvantage with the accompanying weakening of the European position in global competition. A high price to pay for a small increase in rail transport.

6. A modal shift from road to rail will not be achieved by weakening road traffic through high pricing.

7. Contrary to this a shift from road to rail of up to 4.1% could be achieved by improving the quality and structures in rail freight transport. And this would be an increase of rail freight of approx. 196 million t or 40%!

Transfer of traceable quantities to rail can only be achieved by target oriented improvements in the offers of rail freight transport. The management of the railways should be concerned about their essentially available chances and potentials, instead of stressing the efficient competition of the road as a disadvantage for the economy. Private railway companies already show on some examples, e.g. Hinterland traffic, how efficient the rail can be.