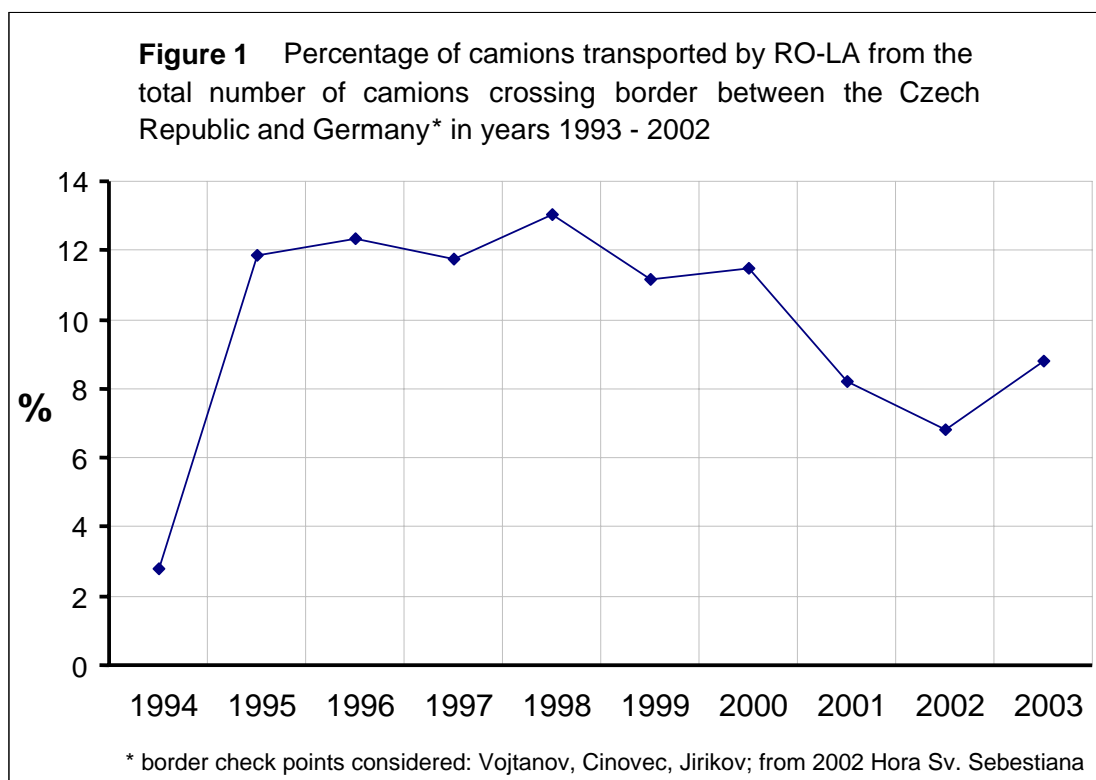


## Analysis of effectiveness of state funding of combined transport

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On Saturday 19<sup>th</sup> June 2004 the operation of RO-LA<sup>1</sup> line Lovosice [CZ] – Dresden [D] was cancelled. After ten years of running project was stopped that should have meant shift from road freight transportation to less environmentally damaging rail freight transportation on this route. There is no doubt that road freight traffic imposes huge external costs to society, i.e. costs that the whole society must bear and that are not paid for by anyone. The most important externalities of road freight are emissions of pollutants [both in local and global scale], increased noise

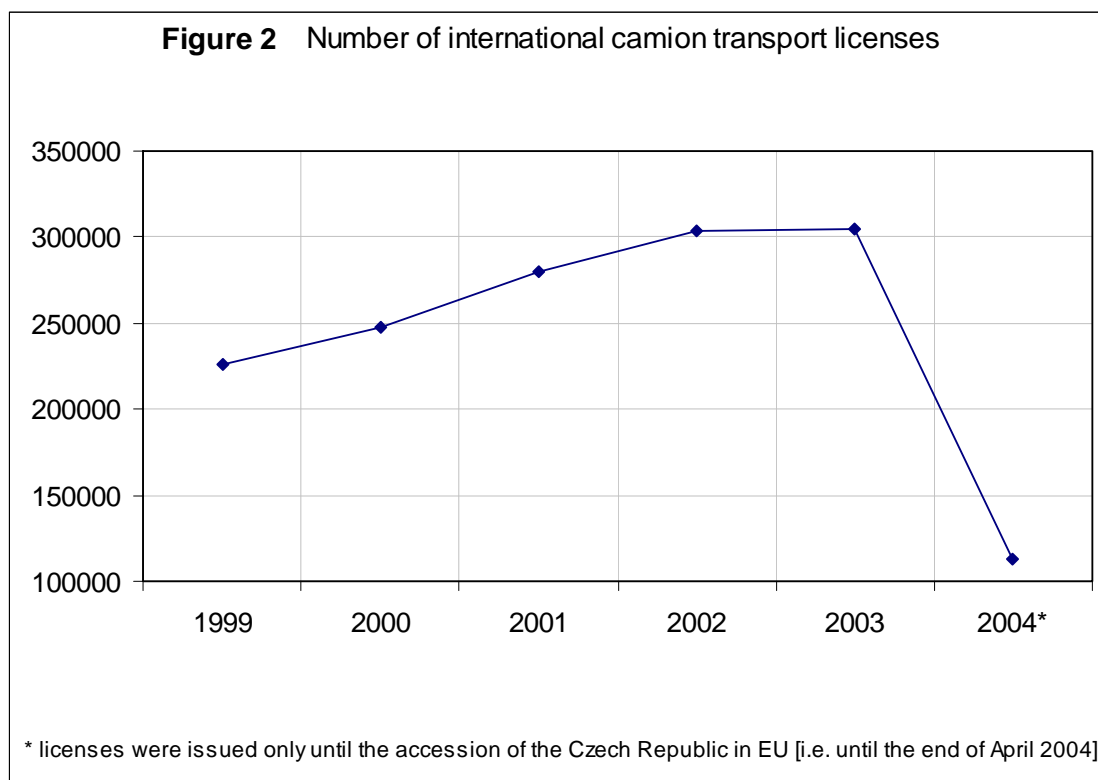


<sup>1</sup> RO-LA is an abbreviation of German “Rollende Landstrasse” and denotes so called “accompanied combined transport”, i.e. transport of the whole camions together with their drivers – thus accompanied – by rail.

annoyance and higher risk of traffic accidents. One of the ways considered for abatement of these adverse effects and implied external costs is shift towards combined transport<sup>2</sup> [COM-2001-370; MD 2004]. In its report, International Union of combined Road-Rail transport companies [UIRR, 2003] analyses the contribution of combined transport towards reduction of carbon dioxide emissions in the European Union.

One of the corridors for combined transport in the Czech Republic was the Lovosice-Dresden RO-LA line [107 km]. Trains capable of carrying up to 23 camions relieved the municipalities along the road to German border from heavy freight transport [routes to border checkpoints Vojtanov, Jirikov, Cinovec and from 2002 Hora Sv. Sebestiana as well]. In the years 1995-2000 RO-LA transported in average 12 % of camions crossing border to and from Germany. In 2001 there was a drop to 8.2 % and next year further to 7.2 % [see figure 1].

The decrease in the interest in the RO-LA transport is in reciprocal proportion to the number of international camion transport licenses available for Germany. With every increase in the number



<sup>2</sup> i.e. combination of several modes of transport during one shipping, e.g. container transportation or transportation of camions by rail; the underlying principle is that substantial part of the shipping is made by rail or navigation, initial and terminal shipping is made by road freight.

of licenses there was a decrease in the interest in RO-LA<sup>3</sup>. Estimates of the operator of RO-LA – Bohemiacombi s.r.o. – were that about 40 % of freight forwarders would have another motivation to use combined transport than merely the lack of licenses to cross the border [e.g. make better account of drivers' working time]. This figure was also supposed to become the rate of utilization of RO-LA after accession of the Czech Republic into the European Union and related abolishment of international freight licenses. However, the reality did not verify this presumption. It turned out clearly that the rapid drop in the interest in combined transport was caused by change in customs clearance after the Czech Republic joined EU.

The aim of this paper is to analyze effectiveness of public funding devoted to support operation of RO-LA line in an effort to bring down the burden on the environment. By shifting a portion of road freight to rail using combined transport some external costs were avoided. However, rail freight also have negative impacts on the environment, but these are substantially lower indeed [see tab. 3].

Governments of CR and Saxony subsidised operation of RO-LA to ensure its competitiveness to road freight. The question this paper would like to answer is if the cost for society [subsidies of Czech and Saxony governments] were lower than benefits in the form of avoided external costs.

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<sup>3</sup> lack of licenses occurred between 1997/2000; after that period the number of licenses continuously increased [see fig. 2].

## Subsidies

The RO-LA was heavily supported by Czech and Saxony government from the very beginning. Czech party devoted about 80 mil. CZK [2.5 mil. EUR<sup>4</sup>] annually whilst the Saxony party added up about 200 mil. CZK [6.3 mil. EUR]. Investment from public sources was also made in support of combined transport. Overview of Czech investment is displayed in Table 1. Table 2 displays operational subsidies into RO-LA.

It is obvious that public funds in the support of combined transport were not negligible. However, there is not [or is not published] any assessment of efficiency of these subsidies. In other words the Czech Ministry of Transport probably only intuitively assumed that by supporting combined transport the burden on the environment would be abated and did not assess how far the burden would have been abated in comparison to funds involved [see also the report of Supreme Audit Office of the Czech Republic, NKU, 2002].

Table 1 Investment subsidies in combined transport

<b>Investment subsidies Czech government /mil. CZK/ (railway only)</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>Total</b>
Acquisition of wagons	0	58	115	100	50	234	0	100	0	0	657
Building of transshipment station RO-LA Lovosice	35	0	0	0	0	0	0	0	0	0	35
Introduction of system of swap bodies	0	0	0	19	38	53	0	0	0	0	110
State granted loans					200*						
<b>Total</b>	<b>35</b>	<b>58</b>	<b>115</b>	<b>119</b>	<b>88</b>	<b>287</b>	<b>0</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>802</b>

\* not included in total

Source: (Capka, 2003b, CDV)

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<sup>4</sup> 1 EUR  $\cong$  32 CZK

Table 2 Operational subsidies in RO-LA Lovosice - Dresden

<b>Operational subsidies /mil.CZK*/</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Total</b>
<b>Czech party</b>	37.0	68.5	70.5	85.0	84.3	84.7	83.7	72.3	586.0
<b>Saxony party</b>	270.5	210.1	209.0	336.0	189.7	166.8	160.1	162.6	1 704.8
<b>Total</b>	307.5	278.6	279.5	421.0	274.0	251.5	243.8	234.9	2 290.8

*\*subsidies of Saxony converted in DEM [EUR] exchange rate in respective years*

*Source:(Chaloupkova, 2003)*

Investments displayed in Table 1 appertain in particular to un-accompanied combined transport [containers shipping]. It includes acquisition of special container wagons and support of introduction of swap bodies. Wagons Saadkms, series 690 [or 741, 742] used on RO-LA are the property of German Railways [Deutsche Bahn]. Price of a new single wagon is estimated to be about 5 mil. CZK [0.16 mil. EUR]. There were five trains consisting of 23 wagons in operation in 2003<sup>5</sup>. It follows from that Saxony party invested at least 575 mil. CZK [18 mil. EUR] to acquire the wagons. According to available information there is a need for general repair of these wagons. Estimated costs of general repair are 120 000 CZK [3 750 EUR] per wagon which makes roughly 14 mil. CZK [0.44 mil EUR] in total.

Anyway, due to the lack of detailed data on Saxony government's and Deutsche Bahn's investment allocated into the RO-LA system, these investment costs will not be considered in further analysis. Also investment made by Czech government will not be taken into account due to problems with their allocation to the RO-LA itself among other combined transport systems. Yet it is obvious that there have been substantial investment involved in promoting the RO-LA. The resulting estimate of costs will therefore be underestimated, i.e. biased in favour of combined transport.

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<sup>5</sup> [Capka, 2003a]

## **Infrastructure costs**

In ideal case every user of transport infrastructure would pay a fee for using it, be it road or rail. The fee should comprise share of cost of building and maintaining the infrastructure involved. According to mainstream economics it would also comprise external costs incurred. Whereas on railway there is a fee for using infrastructure on road we are witnesses of first infrastructure pricing schemes being implemented on large scale. Until now road transport have had advantage over rail.

While analysing the cost and benefits of RO-LA infrastructure costs of road must be taken into consideration as well. Otherwise the results would be biased due to the advantage road transport possess nowadays. It is quite difficult to estimate these costs, though. These days freight forwarders use the E55 road and border check point Cinovec in particular. Excessive burden incurred by heavy freight traffic becomes evident in early road destruction, static damage to bridges on the route and to buildings along the road as well. Indeed, to estimate this damage would be very difficult if not impossible.

To estimate the costs of road infrastructure an approximation according to the cost of highway D8 that is under construction on the same route as RO-LA. Motorway D8 should carry freight traffic between CR and Germany. The cost of building relevant part of D8 is estimated at 27 000 mil. CZK [844 mil. EUR]<sup>6</sup>. Assuming zero discount rate and lifespan of 20 years, 65 % share of repayment made by freight transport [35 % made by passenger traffic], freight intensity of 3 500 trucks per 24 hours and average load of 16.11 tons the result would be 468 CZK / 1000 ton km [13.4 EUR]. One journey from Lovosice to Dresden would be priced 641 CZK [20.0 EUR] in average. This is the sum freight forwarders would have to pay as costs of infrastructure under a pricing scheme. Their costs would rise approximately by about 7.54 CZK [0.24 EUR] per km driven.

With respect to the fact that building and maintenance of road infrastructure is funded solely from public budgets in the Czech Republic, the figure above can be regarded as hidden subsidy to road freight.

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<sup>6</sup> according to the budget of State Fund of Transport Infrastructure for 2004 [SFDI, 2004]

## External costs

The main expected benefit of project of combined transport line RO-LA was shift of road freight to rail and consequent abatement of burden on environment. To achieve this, a new system of accompanied combined transport was subsidised. When compared, avoided external costs [i.e. difference between external costs of road freight and rail freight] and funding provided a cost-benefit ratio of subsidies can be obtained.

The crucial input into analysis is estimate of external costs. External costs considered are as follows: pollutant emissions [both local and global scale], noise and traffic accidents. One of OECD reports [OECD, 2002] estimates the external costs of road freight to be about 1 750 CZK / 1 000 ton km [54.7 EUR], whereas only 564 CZK / 1 000 ton km [17.6 EUR] in rail freight<sup>7</sup>.

In the case of road freight the above estimate seems to be quite high in comparison with results of analysis of CDV<sup>8</sup>. Its estimates are about 521 CZK / 1 000 ton km [16.3 EUR] [CDV, 2003]. Other results are available from COZP UK<sup>9</sup>. According to their estimates only the emissions from road freight traffic account for external costs of 540 CZK / 1 000 ton km [Kutacek, Foltynova et al., 2003]. If this is recalculated using the same ratio of different types of external costs as used in [OECD, 2002], the total external costs of road freight according to [Kutacek, Foltynova et al., 2003] would be 700 CZK / 1 000 ton km [21.9 EUR].

Also for rail freight the estimate of [OECD, 2002] seems to be high. In spite of the lack of data for rail estimate of its external costs needs to be done. Using the same analogy as in road freight the external costs according to [CDV, 2003] would amount to 26.4 CZK / 1 000 ton km [0.83 EUR; note: only diesel traction considered], according to [Kutacek, Foltynova et al., 2003] 69.5 CZK / 1 000 ton km [2.17 EUR] and finally 17.4 CZK / 1 000 ton km [0.54 EUR] according to [Friedrich, Bickel, 2001; note: only electric traction considered].

As it is obvious in Table 3 estimates of external costs of road freight range from 201 CZK to 1750 CZK / 1 000 ton km [6.28 - 54.70 EUR] and of rail freight from 17 to 564 CZK / 1 000 ton km [0.54 – 17.63 EUR]. Averages of estimates in Table 3 were used in the further analysis of costs and benefits. These averages can be found in last column of the table.

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<sup>7</sup> both estimates for 1995

<sup>8</sup> Centrum dopravního výzkumu – Transport Research Centre

<sup>9</sup> Centrum pro otázky životního prostředí Univerzity Karlovy – Charles University's Centre for Environmental Issues.

Table 3 External costs of road freight transport and rail freight transport – overview (CZK / 1 000 ton km)

	(OECD 2002)	(CDV 2003)	(Kutacek, Foltynova et al., 2003)	(Friedrich, Bickel, 2001)	Average
Road freight	1750	521	708*	201-728*	862
Rail freight	564	26*	70*	17*	169

*\*calculated by authors*

### Further inputs

The analysis of costs and benefits is related to one journey from Lovosice to Dresden. The distance is 107 km by rail and 85 km by road. Important input is also capacity of one RO-LA train which was 23 trucks. However, there is necessary to take into account the actual rate of use to capacity, which was 69.73 % in average of 2001. To find out the actual operational subsidy on one journey of the RO-LA train we used data of 2001: operational subsidies of both Czech and Saxony governments according to Table 2, number of trains in both directions 5 228<sup>10</sup>. The average weight of one truck was 29.93 ton<sup>11</sup> and the average weight of one camion's load [16.11 ton]<sup>12</sup>.

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<sup>10</sup> [Chaloupkova, 2003]

<sup>11</sup> average weight of transported camion; including empty camions that made up to 4,25 % of all vehicles transported [Chaloupkova, 2003]

<sup>12</sup> *ditto*

## Results of analysis

Table 4 Costs and benefits in the analysis

	CZK per single trip of one camion	EUR per single trip of one camion
<b>Costs (C)</b>		
Subsidies	2 907	90,8
External costs of rail freight	542	16,9
<b>Benefits (B)</b>		
Avoided external cost of road freight	1 180	36,9
<b>Differential (B-C)</b>	- 2 269	- 70,8

The objective of government was to lower damage done by heavy road freight transport by shifting part of it to rail freight. However, there has been no analysis on efficiency of generous support received by combined transport. From the results in Table 4 it is clear that the cost was too high in comparison with benefits in terms of lower external costs of transport.

Based on above data one journey of one camion was subsidised in reference year 2001 2 907 CZK [90.85 EUR] in average. External costs of road freight were 1 180 CZK per one journey per one camion [36.88 EUR]. This figure must be subtracted the external costs of rail freight per journey per camion which was 542 CZK [16.94 EUR]. In total there are 2 907 CZK of costs against 638 CZK of avoided external costs. Every 1 CZK of

public funding thus returned sheer 0.22 CZK of benefits.

For the sake of wide variation in estimates of external costs in both road and rail freight transport it is necessary to carry out a sensitivity analysis.

In Table 5 there are displayed values of low, middle and high estimates of external costs. The lower and upper boundaries are taken from data in Table 3. However, the best costs benefit ratio results when using average values of external costs.

Table 5 External costs – sensitivity analysis

	Low estimate		Middle estimate		High estimate	
	CZK / 1 000 ton km	%	CZK / 1 000 ton km	%	CZK / 1 000 ton km	%
Road freight	201	- 76	862	100	1750	+ 203
Rail freight	17	- 90	169	100	564	+ 333
<i>Ratio benefits / costs</i>	<i>0,08</i>		<i>0,22</i>		<i>0,20</i>	

## Conclusion

Analysis of effectiveness of funding of accompanied combined transport RO-LA Lovosice-Dresden revealed that benefits of shifting a portion of road transport to rail were far away from balancing the costs in form of subsidies. Every Czech crown returned only 0.22 crown of benefits. The analysis is biased in favour of combined transport by not taking into account investment costs. What is more, public finance was involved in subsidizing more harmful road transport by providing infrastructure free of charge. If costs of building the D8 motorway would be taken as a proxy, then the fee for kilometre of camion driven would have to be up to 7.54 CZK [0.24 EUR].

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