Abstract:
The paper presents the current pricing scheme on Swiss highway roads with a focus on the difference between passenger and freight transport and the historical framework of the Swiss transport policy. The Swiss highway system is financed by fuel tax, an annual charge of about 30€ on passenger cars (flat fee) and a weight and kilometer dependent charge on heavy goods vehicles. The paper further discusses the road charges against the background of the Swiss transport policy. The scope of the charge on heavy vehicles is to finance new (railway) infrastructures and to shift freight traffic from road to rail, in order to reduce the environmental impact. The authors assume that this policy approach has been shaped by the public perception of the problem of transalpine freight transport. The paper analyses in detail the case of the transalpine freight traffic, which has received considerable attention on the European level. The paper also raises some questions concerning the ambitious policy goals.

1. Introduction

The publication of the White Book “European Transport Policy for 2010: Time to Decide” in 2001 represents, one might say ironically, an important milestone in the Swiss transport policy. With this event the Swiss approach to pricing and financing transport infrastructures was definitely introduced in the European transport policy debate as a kind of textbook example and received, at least from the Swiss point of view, an ultimate legitimization. It refers, in particular, to the mileage related heavy vehicle fee and the financing mechanism of the new transalpine railway tunnels, noise protection measures as well as new connections to

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1 Istituto di Ricerche Economiche, Università della Svizzera Italiana. Corresponding author. Email: roman.rudel@lu.unisi.ch. Via Maderno 24, 6900 CH-Lugano.
the European railway network. It is the combination of the taxation of the heavy vehicles transport and the financing of new railway infrastructures conferring to the Swiss pricing scheme a particular appeal. 2.

So far policymakers were essentially concerned with the financing of transport infrastructure in Switzerland as well as in Europe. The utility of infrastructures has always been taken for granted. Even today cost-benefit analysis is left apart. The same argument applies to the New railway infrastructure, which is meant to reduce heavy road traffic and the environmental impact. However, recently, some serious doubts have been formulated concerning the chance to reach these ambitious goals, as follows.

1) Does the policy approach really addresses the most pressing problem in the transport system? Transalpine road traffic accounts for about 1.3% of the freight volume and 12% of the transport performance in Switzerland.

2) Is the construction of a new railway infrastructure the most efficient way to respond to the increasing environmental problems in the Alpine valleys with transit corridors? The introduction of new technologies (Euro norm 4) will help to rapidly diminish the emissions of trucks long before the opening of the new railway tunnels.

3) Is the construction of the new railway tunnels, increasing substantially the railway capacities on a trunk of the whole north-south connections, the most promising way to shift freight traffic from road to rail? The overall capacities of the railway network is determined by the weakest links in the whole system. There are serious doubts that the access to the tunnels and the necessary terminals are not ready in time and the full tunnel capacities can not be used. Furthermore infrastructure is hardly sufficient to shift freight traffic from road to rail so far as the service quality of the railways is far behind the service standard set by the road transport (Bolis, Maggi, 1999). Similar doubts can be expressed regarding a significant modal shift. The increasing costs of road transport can help to improve the competitiveness of the rail transport and intermodal services on the relative long distance across the Alps. However, it is not sufficient for intermodal transport to penetrate into new market segments, which depends more and more on transit time and punctual delivery in 24 hours service cycles across Europe in high value goods markets (Rossera, Rudel, 1999).

2 The availability of sufficient capital to build new infrastructures might not always be an advantage. It can even constitute a substantial risk, since it increases the ambition of policymakers to invest in megaprojects without too much concern for its future economic benefit (Flyvbjerg, et al. 2003)
4) Is the focus on road freight transport sufficient to trigger the environmental impact caused by the transport system? From a purely welfare economic point of view the focus on the freight sector is highly questionable. It can only be explained by the strong involvement of the population in the policy decision process. The outcome of different environmental related referendums clearly indicate an ambiguous ecological concern of the Swiss population. While the driving population ignores the emission of the own passenger cars, it is strongly concerned by the ecological impact caused by transit freight traffic. In this context urban environmental and traffic problems like congestion have been neglected for a very long time. The same is true for alternative policy approaches such as tradable permits and technological innovations (Truffer, Rudel, 1998).

The paper is organized as follows. Section 2 presents the historical process of the current transport system. Section 3 presents some essential data about the evolution of the Swiss highway system. Section 4 is focused on the relationship between Switzerland and the European Union and the emergence of the transalpine freight problem, which is at the basis of the present pricing scheme. Section 5 deals in more detail with pricing regime, introduced in January 2001. Finally some conclusions on the impact of the new pricing regime with particular attention to the new railway infrastructure across the Alps and its potential to shift freight traffic from road to rail are drawn.

2. Historical and political background

In spite of its relative simplicity the present pricing scheme is the result of rather complex policy process, with many ingredients, which have to be kept in mind when looking at the Swiss case. In fact, the following factors are essential to understand the design of the present transport policy. In particular, we would like to mention shortly:

- The geographical and institutional situation of Switzerland in Europe. With the growing integration of the European Union and the tremendous increase in road freight traffic on the north-south corridors across the Alps during the 80ies and 90ties Switzerland, at the centre of the Alpine region and not member of the EU, came more and more under political pressure. Due to its central position in Europe, the neighbouring countries required from Switzerland to lift its 28 tonne weight limit for heavy freight vehicles, to abandon gradually the restriction to circulate during the
night hours and Sunday in order to reach the conditions to circulate in the European Union.

- The role of the Alps and the environmental concern of the Swiss population. During the same period a grass-root movement started to highlight the environmental impact caused by the growing freight traffic on the road and focused the public attention to the unbearable impacts for the sensitive ecosystem of the Alps. The movement - the so-called Alpeninitiative – started a popular initiative with the scope to reduce the transalpine freight traffic to about 650’000 heavy vehicles per year across the Swiss Alps, about half the figure of 2001, by the year 2007 and to prohibit the construction of new highways in the Alpine zone. This measure was clearly in contrast with the requirements of the European countries and would hardly have found their approval. Since it was perceived as discriminatory with respect to European hauliers. Nevertheless, with the popular vote in favour of this initiative in 1992 the Swiss population started a series of votes, which build today the cornerstones of the Swiss transport policy regime.

- The role of the direct democracy. In the field of transport policy the Swiss government was faced with an increasing internal and external pressure and had to find a way out of what has generally been considered a dead end road. The outcome of the negotiations was essentially a compromise between internal interests and European requests. At least seven popular votes in the last twelve years are part and parcel of the present transport policy regime. The most important part was the promise to construct a New railway infrastructure across the Alps, to lift the 28 tonne limit and to introduce the mileage related heavy vehicle fee.

- The mechanistic understanding of the shifting freight traffic from road to rail. Last but not least, we would like to mention that the official transport policy is basically driven by the firm conviction that the railway and in particular the intermodal freight traffic could easily be expanded to new market segments reaching the ambitious goal of the Alpeninitiative to significantly modify the present modal split.

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3 This applies in particular to the Gotthard highway tunnel, a serious bottleneck in the north – south corridor, especially during holidays and weekends. The request to double the two lane tunnel for safety reasons has been rejected recently in a popular vote.
3. The evolution and financing of the Swiss highway system

The origin of the highway network is based on a popular vote in 1958 in favour of the construction of the highway system and the way to finance it. The federal government has the task to create the highway system, while cantons are in charge of the construction and maintenance of the highways according to national obligations. Figure 1 shows the gradual extension of the highway network in Switzerland, which is based mainly on four lanes. The network has reached at the end 2002 more than 1’300 km (excluding 305 km of 2 lane highways and 96.5 mixed traffic national roads). Yet it has still do be considered uncompleted, as the lacking pieces constitute about 10% of the overall system.

![Development of the Swiss highway network](image)

**Figure 1**

*Source: Swiss federal office of statistics, Neuchâtel, 2004*

The highways in Switzerland are entirely public. The construction, the maintenance as well as the improvements of the highways are in charge of the federal government. The main financial revenue is the fuel tax. Only about 30% of the fuel tax revenue flow in the general budget of the federal government. The remaining 70% of these tax revenues cover the construction, operation and maintenance costs of the road system at the national and cantonal level and only a very small fraction is dedicated to the communal roads (Blöchliger, 1999). Up to 90% of the infrastructure costs at the communal level are in charge of the local government and taxpayers. Further financial means are levied on the heavy and light vehicles.
The first is a federal tax, meanwhile the taxes on passenger cars are collected at the cantonal level (Figure 2).

These revenues even finance projects having an indirect relation to the road network.\(^4\)

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Evolution and composition route traffic revenues (in Mio. CHF)}
\end{figure}

*Source: Swiss federal office of statistics, Neuchâtel, 2004.*

The introduction of a heavy weight vehicle fee in 1978 for national trucks over 3.5 tons, represents the first financial regulatory instrument in the Swiss freight transportation market. The tax was differentiated on the basis of the vehicle weight ranging initially from 800 CHF – 1300 CHF. The foreign hauliers paid a fixed charge. The cost for crossing Switzerland from Basle to Chiasso (300km) for foreign trucks was about 40 CHF. This amount had to be considered as extremely cheap, compared to the passages at the Brenner or Mont Blanc. However, this price was applied under the 28 tonne limit scheme. A major consequence of this regime was a considerable traffic flow of empty trucks, deviated form the Brenner and Mont Blanc route.

Finally, in 1994 the so-called “Autobahnvignette” (highway tag/batch) was introduced. It is a kind of an annual permit for driving on highways. Contrary to most European countries, using the Swiss highway network is based on an annual tax independent of the driven kilometres,

\(^4\) Some are designed to protect the environment and the landscape while others to support the combined freight traffic.
the vehicle category or energy consumption. This kind of very low flat tax represents the main regulatory instrument for private cars. In spite of the relatively consistent levies in the road freight traffic and the environmental concern, various attempts to stronger regulate or limit private car use had no chance to be approved in a popular vote being the majority of the Swiss population car drivers.

Figure 3 shows the evolution of the expenses for transport infrastructures. Until the mid 90ties the expenditure for the highway network went in parallel with the railway infrastructures, rapidly increasing since 1998, when the construction of the new railway infrastructure across the Alps (Lötschberg and Gotthard) started\(^5\).

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\(^5\) The Gotthard railway tunnel constitutes the longest tunnel worldwide. See also www.Alptransit.ch.
investments were relatively stable, in terms of GDP, ranging between 1.56% and 1.77% (Carron, 2003), reassumed in the following figure.

![Road account: revenues, expenses and coverage (in %)](image)

**Figure 4**
*Source: Swiss federal office of statistics, Neuchâtel, 2004.*

Since 1997 the balance between expenses and revenues has a positive sign, indicating that the road system, contrary to the railway, is financed on the revenues generated by the road traffic itself.

### 4. EU-Switzerland and the emergence of the transalpine freight problem

The geographical situation and the dimension of Switzerland is relevant for the Swiss regulation approach and the freight transport market. The national railway company yielded considerable rents due to their position on the shortest north-south connection across the Alps. At least until the mid 70ties, the Gotthard corridor represented a real cash cow for the railway company. The road regulation with the 28 tonne limit and the prohibition to circulate during night hours contributed essentially to this position. Certainly it helped to maintain the high market share to a considerable extent until now. Indeed, one of the most prominent characteristics in the transalpine freight market is the high share of rail transport in Switzerland (Figure 5).
The favourable position of the railway was taken for granted and many policymakers were literally blind for the rapid changes in the transalpine freight market. As long as the freight traffic was expressed in terms of volume, it was difficult to recognize the rapid changes in the freight market. Yet, the opening of the highway tunnels across the Swiss Alps in 1980, intended to promote the private passenger mobility, became a major driving force of these changes (Ratti, R., Rudel, R. 1993). In 1980 only a few thousands lorries passed the new highway tunnel. This figure rapidly increased up to over 1,2 Mio of lorries a year in 2000 (Figure 6).  

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6 The rapid growth of road freight traffic also across the Swiss Alps was in line with the major crossings in France and Austria.
In spite of this evolution, the European Union pressured Switzerland to open up the “transit corridor” and to lose the severe restrictions. They could even help to reduce the environmental burden of freight road traffic thanks to an enhanced productivity. The majority of the Swiss population, however, conceived open road freight traffic along the shortest transalpine route as both an invasion and an ecological disaster. Forecasts (Vittadini, 1992, Graf, 1995) predicting a doubling of the freight traffic in less than twenty years supported this perception. In 1992 the Swiss population voted in favour of the Alpeninitiative, to reduce road freight traffic and of the construction of two new railway base tunnels across the alps.

With the vote of the Alpeninitiative, the Swiss government realized that it would be politically untenable to loosen the restrictive regulation in the transalpine market. However, the government was forced to find a way to reduce the pressing European request and to offer an alternative to the discriminatory limitation proposed by the Alpeninitiative. In the negotiations to the bilateral agreements between Switzerland and the EU, the countries found a mutually satisfactory solution. The cornerstones of the agreement are the construction of the new railway infrastructure (NEAT), the gradual abandoning of the 28 tonne limit and to
introduce a **mileage related heavy vehicle fee** (LSVA). Further measures should ultimately help to shift freight traffic from road to rail.

Table 1 presents the different referendums dealing with the issues of transport policy and the transalpine freight traffic.

<table>
<thead>
<tr>
<th>Date</th>
<th>Object</th>
<th>Share of yes votes</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.09.1992</td>
<td>NEAT-project</td>
<td>63.6%</td>
<td>Two alpine tunnels can be built</td>
</tr>
<tr>
<td>6.12.1992</td>
<td>European economic space</td>
<td>49.7%</td>
<td>Switzerland remains outside the European economic space and must regulate its relation with bilateral agreements</td>
</tr>
<tr>
<td>20.02.1994</td>
<td>Alpeninitiative</td>
<td>51.9%</td>
<td>The goal to reduce alpine road freight traffic is established in the Swiss constitution</td>
</tr>
<tr>
<td>27.09.1998</td>
<td>LSVA</td>
<td>67.8%</td>
<td>Introduction of the mileage related heavy vehicle fee</td>
</tr>
<tr>
<td>29.11.1998</td>
<td>Finöv</td>
<td>63.5%</td>
<td>Creation of a public investment fund to finance the railway infrastructure</td>
</tr>
<tr>
<td>21.05.2000</td>
<td>Bilateral agreements</td>
<td>67.2%</td>
<td>Agreement with the EU on the Swiss land transport policy</td>
</tr>
<tr>
<td>8.02.2004</td>
<td>Avanti (Counterproposal)</td>
<td>62.8%</td>
<td>No further road infrastructure in the Alps and urban agglomeration</td>
</tr>
</tbody>
</table>

**Table 1**

*Source: Adaption from ARE (2002).*

It emerges a strong bias in favour of new railway infrastructures and the charging of the heavy (transalpine) freight traffic according to a general principle of external cost pricing. So far, for obvious reasons of political opportunity, the charging scheme of private traffic has been modified. Unlikely a majority of the Swiss population could vote in favour of a similar mileage related fee to cover external costs of private traffic. However, the whole package to regulate transalpine freight traffic constitutes the basis of the present pricing regime, described in more detail in the next section.

### 5. The present pricing regime and the target of Swiss transport policy

In June 2002 the land transport agreement, part of the overall agreement between Switzerland and the EU, came into force. The transport policy is essentially an answer to the rapidly
growing freight traffic on the road. The problem of the freight traffic is in Switzerland a prominently international one and a key factor in the relationship with the European neighbour states. The solution adopted in the agreement mainly signs a shift form a regulation scheme (28 tonne limit, low fixed transit charge) to a scheme compatible with the European transport policy. It particular, is should be mentioned that the EU has recognised the goal of the Swiss transport policy. Moreover, both parties agreed on the introduction of a heavy vehicle fee (for vehicle with a total weight over 3.5 tonnes passenger and freight) on all Swiss road. The introduction is neither limited to the highway system nor to the transit corridors. This is one of the main difference to the German “Mautsystem”. Domestic and foreign vehicles are treated in the same way and the fees comply the non-discrimination principle.

The new regime is introduced and implemented according to the following steps:

<table>
<thead>
<tr>
<th></th>
<th>Before 2001</th>
<th>2002-2004</th>
<th>After 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land transport agreement</td>
<td>In force</td>
<td>In force until 2013</td>
<td></td>
</tr>
<tr>
<td>Weight limit (in tonne)</td>
<td>28</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>Heavy vehicle fee (CHF/tkm)</td>
<td>Fixed fee</td>
<td>0.017</td>
<td>0.025</td>
</tr>
<tr>
<td>NEAT</td>
<td></td>
<td></td>
<td>2006/07 opening of the Lötschberg 2012/13 opening of the Gotthard</td>
</tr>
</tbody>
</table>

Table 2

Source: Adaption from ARE (2002).

The setting of the fee is somehow ambiguous. The fee is supposed to be fixed on the rationale of external cost pricing based on studies in 1998. The initial fee was about the double of the present fee after the negotiation process between Switzerland and EU. In the land transport agreement it is clearly stated that the fee is set in way that the resulting fee for a transit of a heavy vehicle form Basle to Chiasso (about 300 km) should not exceed the price of CHF 325 or approximately 200 Euro (ARE, 2002). This transit price is comparable to the fees currently applied on the Fréjus (217 Euro for 346 km) and slightly higher than those on the Brenner pass (105 Euro for 335).

The difference between the flat rate fee of the “old” regulation scheme and the new mileage related fee introduced in January 2001 is illustrated by the following table:
Swiss pricing regime

<table>
<thead>
<tr>
<th>Flat rate fee in the year 2000</th>
<th>Heavy vehicle fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Fee</td>
<td>Maximum</td>
</tr>
<tr>
<td>CHF 1‘300-1’800/year</td>
<td>2.75 cts/tkm</td>
</tr>
<tr>
<td>Euro 870-5‘300/year</td>
<td>1.8 cents/tkm</td>
</tr>
<tr>
<td>(depending on weight class)</td>
<td></td>
</tr>
<tr>
<td>Staggering</td>
<td>According to weight class</td>
</tr>
<tr>
<td>According to weight class</td>
<td>According to:</td>
</tr>
<tr>
<td></td>
<td>- Weight class</td>
</tr>
<tr>
<td></td>
<td>- Emission category (Euro norm)</td>
</tr>
<tr>
<td></td>
<td>- Distance travelled</td>
</tr>
<tr>
<td>Transit price Basle-Chiaasso</td>
<td>Maximum</td>
</tr>
<tr>
<td>CHF 40/day</td>
<td>CHF 325</td>
</tr>
<tr>
<td>Euro 25</td>
<td>200 EURO</td>
</tr>
<tr>
<td>(Daily fixed rate for all weight classes)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Swiss federal office for spatial development, Berne, 2002.

Contrary to the very sophisticated Mautsystem in Germany based on satellite technology the heavy vehicle fee in Switzerland requires only a simple on-board unit connected to the tachograph in order to register the driven distance. Foreign truck drivers use a smart card recording the driven distance on Swiss roads at the border stations. The smart cards or the data from the on-board unit are sent once a month to the custom authority for the billing process. The collection of the electronic fee is therefore very simple and hardly interrupts the transport flows. Enforcement is through customs checks at the borders, roadside checks and checks in the accounts of Swiss haulage companies (Perkins 2004).

The revenues of the heavy vehicle fee accounted in 2002 for about **CHF 770 millions** (Euro 500 millions). It has to be emphasized that the fee is paid by foreign as well as be Swiss hauliers. Two thirds of revenue is directly flows in a the special investment fund for financing the New transalpine railway infrastructure, as well as three other major railway projects. Further financial resources of the special fund stem from earmarked revenues of the fuel tax, 0.1% of the VAT and the rest is granted by a loan from the Confederation.
6. Concluding remarks

The Swiss approach to pricing freight traffic and financing new infrastructures has gained a considerable popularity among policymakers on the national as well as the European level. The heavy vehicle fee was designed to reach multiple goals: it generates a handsome revenue earmarked for the construction of the new railway infrastructures across the Alps, favours the modal shift from road to rail and helps to reduce the environmental impact in the Alpine regions.

A closer look at the “genesis” of the different interplaying elements clearly demonstrates that the present policy regime is the outcome of a long and complex process with different stakeholders and parties involved. It would be certainly unfair and too early to express a final judgement on the success or failure of the whole approach. The first effects of the new pricing scheme with a weight and emission dependent fee has clearly induced the road haulage sector to renew their fleet and adapt it to the new conditions. A similar change in the composition of the fleet of lorries could be observed with the introduction of the eco-point system in Austria. A second effect regards the internal transport industry and its reaction to the sharp increase in the road charges. In general, the major transport costs could be compensated by the higher productivity of trucks due to the lift in the weight limit. In 2001 and 2002 the long term trend in the constantly growing number of road freight traffic has broken as a further effect of the new charging scheme. The effect on the modal shift is less evident. However, the figures and available data seem to support the Swiss transport policy so far.

Yet, the preliminary effects of the new pricing scheme are not sufficient to eliminate the serious doubts raised in the introduction. Increasing congestion problems on the Swiss highway system, other than on the north-south corridor across the Alps, are rapidly increasing and urban transport requires new investments. Moreover, the question of the connection of new railway infrastructure with Italy remains still to be answered and the modal shift is limited by terminal infrastructure capacities as well as low service quality of railway transport.
Literature


Alpinfo. Swiss federal office for spatial development, Berne.


Helpful homepages

www.Alptransit.ch
www.are.admin.ch
www.bfs.admin.ch
www.zoll.admin.ch