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# Impacts of increased rail infrastructure charges in Sweden

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ABSTRACT

The impacts of the already decided increase in rail infrastructure charges in Sweden are described for various market segments within the rail transport system and on the aggregate level for society as a whole. The need for complementary measures in the road transport system is also discussed. Likewise, the paper also mentions the impact of increased rail infrastructure charges on certain significant industrial sectors. An increase in rail charges may reduce social welfare even though the reduction in rail transport mileage is small. This is mainly due to large non-internalised absolute externalities for road freight. For commuter trains, the infrastructure charges' share of the costs of rail transport is expected to rise to 13 percent, which in an international perspective still will be small.



## 1. Introduction

### 1.1. Background and purpose

By international comparison, Swedish rail infrastructure charges are low and the government has decided to raise these charges. In the Swedish transport authorities' "Proposed National Plan for the Transport System 2010–2021" ("*Förslag till Nationell plan för transportsystemet 2010–2021*", Swedish Rail Administration, Swedish Road Administration, Swedish Maritime Administration, & Swedish Transport Agency, 2009), Swedish rail infrastructure charges are estimated to rise from a level of about SEK 600 million per year to an average of SEK 1.3 billion per year. At an incrementally increasing rate, the level in 2021 may approach SEK 2 billion. Charges imposed during the plan period 2010–2021 have to reach the total SEK 15.6 billion (at 2009 prices) determined by the government.

The impacts of the increase in rail infrastructure charges were not analysed in the course of preparing the national plan. At that time, the transport authorities determined that there were no adequate methods for analysing impacts on the transport system caused by changes in rail infrastructure charges.

Expanding the central government planning framework with alternative financing solutions constituted a significant aspect of the work with the national plan. Part of this process was to recommend increases in rail infrastructure charges in order to create the capacity to finance a more proactive rail operating and maintenance strategy, among else.

Another and considerably more important and economically justified argument in favour of increased rail infrastructure charges is that the charges are below estimated marginal costs, which entails efficiency losses. The ways in which this is a concern depend partially on pricing and marginal costs for alternative transport modes. Marginal costs show how transport changes affect emissions, noise, wear and tear and other factors; thorough understanding is necessary to enable the future proposal and implementation of an efficient structure for rail infrastructure charges in alignment with set objectives. EU regulations on infrastructure charges are linked to marginal costs, and the White paper (COM, 2011) argues that "transport charges and taxes must be restructured in the direction of wider application of the 'polluter-pays' and 'user-pays' principle". This will eventually force Sweden to increase the charges even more than already decided.

The purpose of this paper is to describe the impacts of the already decided increase in rail infrastructure charges totalling SEK 15.6 billion during the plan period. The impacts are described for various market segments within the transport system and on the aggregate level for society as a whole. The need for complementary measures in the road transport system is also discussed. Likewise, the paper also mentions the impact of increased rail infrastructure charges on certain significant industrial sectors.

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The paper is based on a report from the Swedish Transport Administration (2011b), in which more details can be found.

### 1.2. Method

The methods used were (i) a previously developed model adapted for assessing the impacts of changes in rail infrastructure charges and (ii) the new Logistics Model currently in development. Knowledge and opinions related to increases in rail infrastructure charges and the related impacts have also been acquired from stakeholders (rail operators, industry associations and others).

Model (i) deals primarily with the consequences for the rail transport market segment with a relatively detailed geographic distribution. The model also picks up volume changes. The transport structure and passenger and freight volumes used in the model are based on the Swedish Transport Administration's forecasts for passenger transport (the "Samkalk" line table) and freight transport ("Bangods"). Volume changes are calculated in the model using price and transport cost elasticities using the Transport Administration's method for analysing the social cost/benefit of minor infrastructure investments. The price elasticities used are line-specific and depend on the average trip distance on each line. The transport cost elasticities for freight transport were taken from the Logistics Model and vary depending on train type.

The input data needed to calculate the social impacts of the volume changes that the analysed charges entail were largely taken from BVH 706 (Swedish Rail Administration, 2009).

Model (ii) makes it possible to simulate the logistical choices made at the company level in the freight transport market. Briefly described, the model generates all potential transport chains in a relationship based on a predefined set of type chains for a specific demand and expressed in tonnes per product category between shipper and receiver. It calculates payload sizes and selects the most cost-effective transport chain among those generated. For more information about the new Logistics Model, see De Bok, Baak, and de Jong (2007), De Jong, Ben-Akiva, and Baak (2008), Edwards, Bates, and Swahn (2008) and Vierth, Lord, and McDaniel (2009).

In sections 2 and 3, the question of infrastructure charges is put into a theoretically relevant context and a simple comparison to European infrastructure charges is made. Section 4 shows what infrastructure charges may look like in the future and how the analysed charging structure is designed. Section 5 reports the impacts and consequences of higher infrastructure charges and the possible need for complementary measures in the road transport sector. Key conclusions are summarised in section 6.

## 2. Why are infrastructure charges necessary and how high should they be?

Pricing of the rail transport infrastructure is regulated in the Swedish Railways Act (2004:519). The main principle for imposing rail infrastructure charges is that of marginal social cost pricing; that is, charges should correspond to the external marginal social cost of transport. The marginal cost-based charges should, however, be related to corresponding charges and marginal costs for competing transport modes. In addition to the marginal cost-based charges, surcharges may be imposed provided they are compatible with economically efficient use of the infrastructure and that market segments is not suppressed by the surcharges. Additional charges for congestion, booking charges and discounts are also permitted. Pricing of other services is normally based on the market price if a functioning market exists; otherwise, cost recovery pricing is applied.

There is no equivalent in the form of legislation for pricing other transport infrastructure beyond the general principles of transport policy. The principle that transport should be priced according to its social cost is established in Swedish transport policy (Government Bill 2005/06:160) and applies to the entire transport sector. Pricing of road transport is accomplished mainly via fuel taxes, consisting of energy tax and carbon dioxide tax. A carbon dioxide-differentiated vehicle tax is also charged for all vehicles in road use, regardless of mileage driven. Congestion charges are necessary only in very large cities.

### 2.1. The social cost of road and rail transport

The marginal external cost of transport refers to the impact on the rest of society caused by a user, but where the behaviour does not constitute a cost for the user. Marginal costs are usually related to infrastructure, air pollution, accidents, noise and congestion. All marginal costs except for carbon dioxide are largely place- and situation-specific. In addition, many marginal costs are dependent upon vehicle characteristics. In spite of this, there is a need to use average calculations of marginal external costs in connection with more general, overall analyses.

A measurement often used in the discussion of internalisation of external costs is the "degree of internalisation". This is calculated by putting the corrective taxes or charges in relation to the cost of the externality (the quotient between taxes or charges and marginal costs is calculated). Only the externalities that vary with production or consumption volume are included in the degree of internalisation. Likewise, only the taxes or charges that vary with production or consumption volume are included.

To achieve efficient use of the infrastructure, the degree of internalisation should be equal to 1. The price, that is, the taxes or charges, should be set at a level equal to the marginal cost. A price above the marginal cost may entail a social loss due to under-utilisation. A price below the marginal cost leads to transport volumes greater than the level of social efficiency, resulting in a decline in social welfare and misallocation of resources. Under-pricing leads to higher costs in the form of externalities (air pollution, carbon emissions, accidents, noise, wear and tear to the infrastructure, congestion, etc). When transport volume is too high, this also leads to an excessive need for investments, operations and maintenance due to the problems caused by the high transport volumes.

### 2.2. Rail infrastructure charges as an incentive towards efficiency

The pricing of transport infrastructure is an important incentive with respect to total traffic and transport volume, distribution among transport modes and their various vehicles and distribution in time and space. The objective is to use existing infrastructure capacity as efficient as possible while simultaneously increasing total social welfare. For this to be achieved, pricing across transport modes must be harmonised and pricing for each transport mode must be differentiated as far as possible with respect to place, situation and vehicle characteristics (VTI, 2011).

When it comes to noise from train vehicles, the cost of disturbance depends on how many individuals are exposed to the noise, the speed, train length, vehicle type and type of brakes. Available input data on how much different types of rail vehicles contribute to wear and tear on the rail infrastructure should be used in rail track pricing.

Congestion is by nature highly place-specific and time-specific but neither place-specific nor time-specific marginal costs have been calculated in Sweden. With regard to rail traffic, which is