



External costs in the transport sector 2014 **Summary**
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Summary

The Swedish Government has commissioned Transport Analysis to report annually on the social economic costs of the transport sector in relation to the imposition of taxes and other charges in various parts of the Swedish and European transport sector. This year's report highlights the importance of differentiating marginal costs and pricing geographically, in time, and by vehicle type. From the European perspective, we explain how social costs and internalizing taxes and charges for freight shipments appear for routes through Europe. The report also looks at how the internalization of the external effects of transport affects Sweden's competitiveness. The costs analysed are in practice primarily the short-term social marginal costs of the external effects of transport.

The estimated marginal costs of external effects are incomplete in many respects. Despite this, quality-assured and fairly reliable data are available in several areas, enabling us to draw some conclusions with sufficient certainty.

The effects of vehicle propulsion (e.g., fuel consumption, vehicle wear, travel time, accidents, air pollution, comfort, and availability) can be either external or internal. An effect is *internal* if the market actors (e.g., car drivers, transport operators, shippers, and travellers) recognize, when deciding whether or not to undertake a trip or shipment, that they are the source of these effects. If, in their decision-making, these effects are not recognized, they are *external*. An external effect can be *internalized* through taxes or fees. This means that the actors are persuaded to act as if they recognized the external effects. They are prevented in an "artificial" manner from the over-consumption that would normally result when not all transport costs are recognized. Taxes and fees that do not vary directly or indirectly with traffic volume (e.g., fixed annual fees) do not function in an internalizing manner, since they do not affect the decision as whether or not to undertake a trip or shipment.

The degree of internalization is a relative (i.e., unit-less) measure and, as such, can easily be misleading unless the absolute level of internalization is also taken into consideration, particularly in transport comparisons in which the external effects differ greatly in size. Calculations of the non-internalized costs of the external effects of transport can also give an idea of the amount by which internalizing taxes and fees need to be raised. Since the marginal costs of increased congestion have not yet been estimated, calculations can only be made for transport in environments that lack significant congestion. According to Transport Analysis' most recent calculations (assuming no significant scarcity or congestion):

- Freight shipping by heavy transport truck is the type of freight transport that to the least extent pays for its total social marginal cost per tonnekm. The non-internalized cost of heavy truck transport is SEK 0.05–1.76 per tonnekm (2013 price level). The price of SEK 0.05 per tonnekm applies to trucks with trailers on European roads and on national roads far from population centres. The SEK 0.05–1.76 per tonnekm interval corresponds to SEK 1–7.50 per vehicle-km, and it is heavy trucks without trailers in population centres that to the least extent pay for their external costs. For heavy trucks with trailers outside population centres, the non-internalized cost is SEK 1–2 per vehicle-km. The degree of internalization is in

the range of 15–65%, implying that heavy truck transport pays at most 65% of its external costs.

- Freight transport by ship and rail has non-internalized external costs corresponding to approximately SEK 0.03–0.05 per tonnekm. In other words, these freight modes are close to covering their total social marginal costs, based on tonnekm, at least in comparison with certain modes of heavy road transport. The degree of internalization is in the range of 23–50%, implying that freight shipped by sea pays slightly less than 50% and freight shipped by rail around 25–35% of their external costs.
- Passenger transport by petrol-fuelled passenger car in rural areas is a type of transport that more than fully pays its estimated total social marginal costs. In population centres, however, the environmental costs are greater, as more people are affected by air pollution and noise, resulting in a non-internalized external cost of SEK 0.12 per passenger-km. The degree of internalization is 77%. Air transport appears by and large to pay for its external costs; however, note that the calculations are based on uncertain data, and new knowledge that will be presented in November (by the Swedish National Road and Research Institute, VTI) may cause the current conclusion to be revised.
- Car transport by diesel-fuelled vehicle and passenger transport by bus or ferry pays for its total social cost to a lesser degree than does petrol-fuelled car transport, passenger rail transport, or passenger air transport. The remaining non-internalized external costs are estimated at roughly to SEK 0.1–0.2 per passenger-km for trips by diesel-fuelled car, bus, or ferry. The degree of internalization is slightly higher than 60% for diesel-fuelled car and ferry and lower for diesel-fuelled bus.

From the European perspective, Sweden has relatively low internalizing taxes and fees on freight transport on routes toward Rotterdam and Naples. The degree of internalization of the Swedish portion of the Oslo–Rotterdam railway line, for example, is around 50% compared with the average of 120% for all countries. On the road side, the difference in taxes and fees depends primarily on whether the Eurovignette system or road tolls are applied, with countries that apply a road toll having a significantly higher degree of internalization (e.g., Austria and Germany). For trucks, Sweden and Norway have the lowest degrees of internalization of the European countries. On European routes, sea transport is heavily under-internalized, the degree of internalization being in the range of 0–8%.

As regards Sweden's competitiveness, earlier studies demonstrate that the consequences of internalizing the external effects of transport are perhaps not that serious for the forestry industry. If full internalization were implemented, there would apparently be losers in the short term, but the long-term effect of taxes and fees corresponding to the external effects of transport on Sweden's competitiveness and growth could be either positive or negative. That would depend on how they were implemented and on other developments in the surrounding environment. It should also be mentioned that, in particular, industrial clusters with "agglomeration externalities" could have major implications for Sweden's competitiveness. A study initiated by Transport Analysis suggests that there are no particular reasons why Swedish heavy primary industries should be more dependent than other industries on low

transport costs. Transport subsidies, in the form of under-priced infrastructure, for example, are not necessarily an effective policy means to internalize agglomeration externalities.

There is a conflict of goals between the short-term maintenance of Sweden's competitiveness and Sweden's climate policy, given Sweden's high cost-valuation of carbon dioxide emissions. Climate policy implicitly reflects how we view the marginal cost of carbon-dioxide emissions. The same marginal cost for carbon dioxide should be applied to the sector trading with emission rights as outside this sector. Given today's extremely low price for emission rights combined with taxation and other measures, we cannot currently expect to reach our established climate objectives.

In Sweden, the National Transport Administration plans to implement increased rail track charges up to and including 2025, to fund operation and maintenance while internalizing, to a greater extent, the external effects of rail transport, in order to meet the minimum requirements of EU directives. The transfer of freight transport from railways to roads, which, according to completed analyses, can occur if rail track charges increase over the long term, is undesirable from a social economic perspective. There is therefore a need for measures to facilitate heavy road transport. Systematic implementation of such measures requires quality-assured marginal cost data that include vehicle type and geography. Vehicles vary in their environmental characteristics, resulting in different degrees of road wear; moreover, roads vary in their bearing capacity.

Apart from road wear, which varies geographically and depends on vehicle type, noise cost also has a strong geographic connection. Noise disturbs people, so its cost is significantly higher in population centres. Finally, congestion also displays strong geographic and temporal variation. On the road side, congestion fees have been introduced in Stockholm and Gothenburg; however, there is still no actual congestion charge on the railway side, despite congestion and an awareness of its existence. The marginal external congestion cost is still not estimated. An advantage of congestion charges is that they can be introduced and gradually increased until congestion has declined to the desired level.

Transport Analysis would like to stress that the application of internalization requires analysis of estimations and valuations of a range of effects associated with uncertainties of various types and scopes. All results should therefore be interpreted with caution. The main points of the results presented here can, however, be considered robust. The same tendencies have appeared in the five most recent analyses of a similar nature that Transport Analysis and, previously, SIKÄ carried out, although the marginal costs on which the analyses are based were, in each analysis, corrected and adjusted in light of the latest research findings.

The reported marginal costs and taxes and the calculations of remaining external costs consist largely of average values for different transport modes and for both passenger and freight transport. The spread around the average values we use in our calculations can, as demonstrated, be significant. Certain transport users or operators may end up paying too much or too little in relation to the external effects caused by particular trips or shipments. The eventual goal is to determine the right price for each trip or shipment. At the same time, charging systems should not be so complicated that users cannot easily understand their overall structure, otherwise the systems are likely to lose their ability to shape behaviour and technical change. Analysing internalization and calculating remaining external costs, the cost data used should be as differentiated as possible. The differentiation should primarily consider place, time, and vehicle type. Quality assurance and updating of differentiated marginal costs are necessary to enable differentiated fees that might function as relevant tools and instruments with which to shape behaviour and give incentive for technical change.

On the railway side, noise and track wear should be differentiated on the appropriate route level for different train types. On the road side, both environmental (including noise) and road wear-related characteristics should be determined for different heavy vehicles for, say, two or three road types. On the sea and air transport side, primarily the bearing between aircrafts and sea vessels to emissions must be updated and/or quality-assured. The external costs of sea transport relate primarily to air pollution and carbon-dioxide emissions; on the air transport side, the cost of greenhouse gases accounts for over half of the external costs.



Transport Analysis is a Swedish agency for transport policy analysis. We analyse and evaluate proposed and implemented measures within the sphere of transport policy. We are also responsible for official statistics in the transport and communication sectors. Transport Analysis was established in April 2010 with its head office in Stockholm and a branch office in Östersund.