

The Economic Impacts of Road Tolls

How tolls can be a mechanism to reduce emissions from transport while raising revenue for the public budget

April 2017

Summary

In 2017, the European Commission are scheduled to review Directive 1999/62/EC for the third time since its inceptionⁱ. This piece of legislation, known commonly as the “Eurovignette Directive”, sets the parameters by which countries in the European Union can toll trucks for their use of road infrastructure.

Tolling vehicles for their use of roads can bring several benefits to a country; from generating revenue for the public budget to improving the efficiency of transport and reducing the external costs of road vehicles. The 2017 review of the Eurovignette Directive is an opportunity for the Commission to build on the benefits of tolls by including a CO₂ element to road charging so that trucks pay for their greenhouse gas emissions. There is also a need to extend the scope of the Directive to vans (specifically vans that are used for the professional carriage of freight) as such vehicles are being used increasingly in freight transport as a means to avoid laws that are applicable to trucks. Furthermore, the Commission should phase out the antiquated time-based systems that have been proven to be an inefficient means of road charging when compared to distance-based systems.

This briefing summarises a report by Fraunhofer ISI and the Polytechnic University of Madridⁱⁱ. The study looks at the economic and environmental impacts that tolls have had in Germany and Spain since their introduction. This briefing will focus on the German tolling system for trucks (LKW Maut) and how it has impacted the country since its introduction. The German example provides clear evidence of the benefits of road tolls while showing how opportunities exist to now build upon such a system. Tolling can be beneficial to society without placing an unbearable financial burden on freight transport. The research shows how tolls can positively impact freight transport in several ways, namely:

- **Transport efficiency can be improved.** Empty headings have been seen to decrease since the introduction of road tolls in Germany. Furthermore, tolls can reduce the vehicle km needed for freight transport as trucks improve loading rates as a result of pricing pressure.
- **Distance-based tolls can reduce the air pollution from road transport.** This comes as a result of logistic improvements, as well as an increase in vehicle upgrades. The German toll supports the purchase of cleaner trucks (EURO V and VI) as these vehicles pay a reduced price for using road infrastructure.
- **Tolls do not have a noticeable impact on consumer prices.** Transport costs commonly range from 1% to 5% of production costs in most industries. The impacts of the toll on actual product prices is so small that aggregated statistics would not show an effect.

- **Vignettes are an insufficient and antiquated system of tolling.** Distance-based electronic systems, whereby users pay for every km of road use, are a mechanism that recover greater revenue for the public budget while reducing the external costs of truck use.
- **Toll revenues can contribute significantly to transport sector funding.** The LKW Maut income constitutes the single most important source of revenue (around 4.34 out of 5.4 billion Euros) for the German Federal Ministry for Transport and Digital Infrastructures. Countries are not obliged to reinvest this money in the transport sector.
- **Many truck drivers can pass on the toll costs to their clients.** This shows how such a charging mechanism does not place an unmanageable burden on the road haulage sector.

1. Context

1.1. Overview

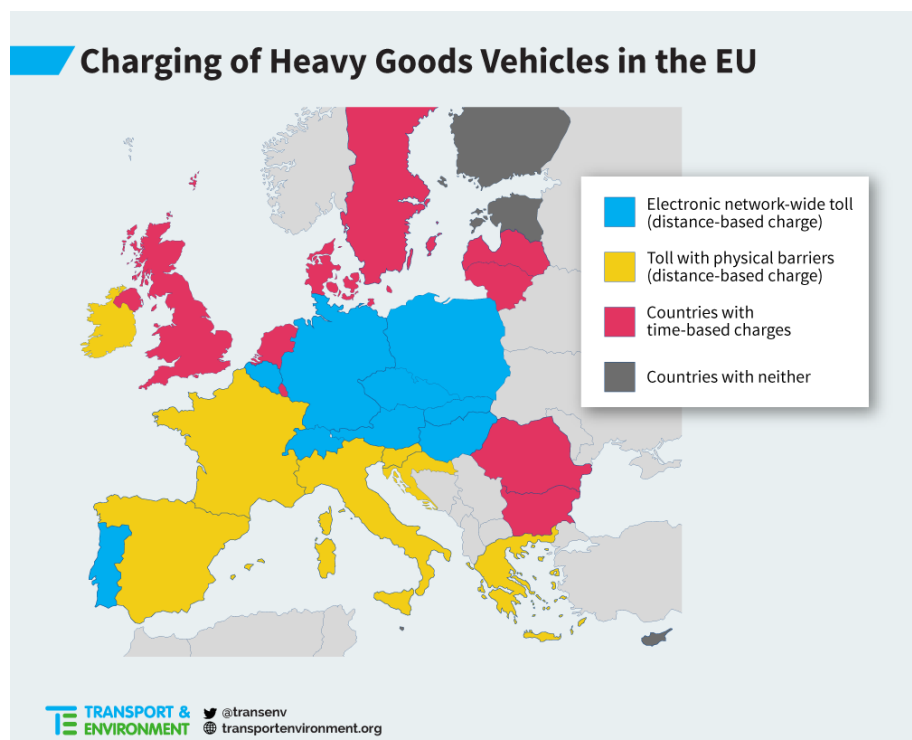
Fraunhofer ISI and the Polytechnic University of Madrid recently finalised a report that looked into the economic and environmental impacts of introducing and expanding road tolls for trucks in Germany and Spain. The report considers efficiency improvements, the impact of tolls on both the freight market and public revenues, as well as the extent to which tolls reduce air pollution and greenhouse gases.

Germany and Spain were chosen for this study as both countries have strong logistics sectors and similar transport intensities with regard to ratio between tonne-km transported and GDP generated. Germany and Spain each have distance-based tolling systems, but to a different extent. Germany has an electronic toll that is applied on an extensive road network. Spain has some motorways that have a physical barrier toll. It is worth noting that Germany expanded the scope of their toll to avoid trucks from using secondary roads as a means to avoid paying the toll.

1.2. What is the Eurovignette Directive?

If a Member State of the EU wants to toll trucks within their country then that toll must be compliant with what's permissible within the Eurovignette Directive. Therefore, this Directive defines how trucks can legally be tolled in the EU. **The Directive is linked to both the 'user pays' and 'polluter pays' principles**, which aim to recover the damage caused by transport by the user/polluter by means of a tax or charge.

The Eurovignette Directive allows for two types of infrastructure charging to be applied in the EU. There is time-based charging, which is applied in nine EU countries (Bulgaria, Denmark, Lithuania, Latvia, Luxembourg, Netherlands, Romania, Sweden and the UK) and distance-based charging, which is applied in fifteen EU countries (Austria, Czech Republic, Belgium, Germany,



Hungary, France, Greece, Croatia, Ireland, Italy, Poland, Portugal, Slovakia, Slovenia and Spain). Time-based systems work by purchasing a vignette sticker for a period of time and then the purchaser is free to drive for an unrestricted distance within that time period. Distance-based systems work by paying a rate for every kilometer you drive on roads where tolls apply. Within distanced-based charging, there are countries that have roads with toll booths (e.g. Spain) and countries where the toll is electronic (e.g. Germany). It has been found that distance-based charging, particularly electronic network-wide tolls, are a mechanism that recover a greater percentage of infrastructure costs than time-based systemsⁱⁱⁱ.

The Eurovignette Directive defines that countries may charge trucks for certain external costs. These externalities extend to air pollution and noise. There are maximum charges at which different trucks can be charged for air pollution and noise; these are defined in the annex to the Directive. Furthermore, the infrastructure portion of the toll can be differentiated based on the EURO class of the road user's truck, which is linked to the air quality performance of the vehicle. **A lot of the Directive is opt-in and places no obligation on countries to establish tolls.**

The European Commission outlined in the 2016 Strategy for Low-Emission Mobility^{iv} that “across the EU, **charging should move towards distance-based** road charging systems based on actual kilometers driven, **to reflect better the polluter-pays and user-pays principles** (...) Moreover, the Commission will revise the Directive on the charging for lorries to enable charging also on the basis of carbon dioxide differentiation, and extend some of its principles to buses and coaches as well as passenger cars and vans”. It is expected that such changes to the Directive will be included in the Commission's proposal to review the Eurovignette Directive in May 2017.

2. The Benefits of Introducing a Road Toll

2.1. The Impact of Tolls on Logistics Efficiency

The operating cost of trucks varies greatly within the EU based on fuel taxes, wages, and tolls. Tolls increase the operational cost of trucks. This increase in cost has been assumed to impact the efficiency of how trucks are loaded as **pricing pressure decreases the likelihood of empty headings or suboptimal truck loads**. Currently, **20% of trucks are empty on European roads**^v while average utility of loaded vehicles is as low as 58% in some countries.

It's assumed that haulage companies look to operate at maximum capacity if the price of transport is at such a level that truck drivers cannot afford inefficient operations. Certain empty headings are unavoidable but a higher cost of transport can incentivise the use of internet applications or creative logistic practices that increase awareness of freight volumes in close proximity to an empty truck. There is huge potential for new technologies for fleet and consignment management, as well as new trends coming from the shared economy. Tolls are a means to increase the rate at which such technologies are used. **The benefits of such improved efficiency are shared by both the freight market and the shipper, as well as reducing congestion and other externalities from road transport.**

Since the introduction of the LKW Maut in Germany, distances per tons entered a stable state and started to decline after the onset of the world economic crisis in 2009. It is impossible to separate the impact of the financial crisis and the impact of tolls on this decline. However, if you compare the distances in Germany with France and Italy then you can see that it seems that **there is an impact of tolls on distances travelled, and thus on logistics efficiency**. Furthermore, **the introduction of the LKW Maut has contributed to further decreasing the share of empty headings in Germany by 1% to 2%**.

2.2. The Impact of Tolls on Haulage Companies

The operational cost increase that tolls cause for road transport operators or “hauliers” can be passed on to shippers when haulage companies are in a position strong enough to negotiate such demands. In the past decade, long distance transport has shown the lowest price increase (11%) in comparison with other transport services. Cost pressure is high in this market sector and aggressive competition lowers the prices. According to the German Trucking Association (BGL), **the price of operating a truck in Germany is around €1 per vehicle-km** (including driver, vehicle and fuel). The German toll is approximately 10% of this cost. **Hauliers can pass on the majority of tolls for loaded headings to shippers and forwarders**, the resulting cost increase remaining with the trucking business is 2% to 5%. This is presumed by Fraunhofer to be larger for small companies who are not in a position to negotiate with clients.

According to Euler-Hermes (2015), current profit margins are as low as 1% for SMEs, while they reach 6% for the big players in road transport. A lot of smaller haulage companies were purchased by the bigger players since the introduction of the LKW Maut. Some small haulage companies have become bankrupt. However, considering that the 2008 financial crisis occurred during this period, the bankruptcies cannot be directly attributed to the toll.

The recent one year anniversary of the Belgian road toll showed how the haulage companies have not been unduly impacted by the toll. Transport & Logistics Flanders reported that **85% of toll costs are passed onto clients^{vi}**. This means that tolls do not have to overly burden haulage companies as the shipper is the one who ultimately covers the cost.

The German toll has impacted the fleet renewal of haulage companies that operate in Germany. Tolls have been shown in Germany to increase the purchase of cleaner trucks as less air polluting vehicles are incentivised through a reduced toll on the LKW Maut network. The German government has been using revenue from tolls to provide discounts for hauliers to purchase less polluting trucks (i.e. EURO V and VI). Smaller companies get a bigger subsidy so the revenues are used to support SMEs when buying new trucks.

2.3. The Impact of Tolls on Modal Shift

In Switzerland, where tolls are intended to have a direct impact on the use of rail to transport goods, trucks are charged higher than in Germany and revenue is used to subsidise rail. Before 2001, the year in which the system was implemented in Switzerland, HGV traffic had an annual increase of 7%, whereas after the introduction of a toll, there was a notable decline. The Federal Custom Administration reports that without this system, in 2005 the HGV traffic would have attained 23% more than the current traffic. Rail holds 35% modal share in Switzerland.

The LKW Maut is unlikely to reach levels as high as in Switzerland. The Swiss toll is approximately 60 cents per km higher than the current German toll. **In the “High Toll Scenario” that is presented in the Fraunhofer ISI/UPM report, rail is expected to increase their share of freight transport by 3-5% in Germany.**

With the application of price elasticities found in literature, the LivingRAIL project^{vii} estimates that the extension of the Swiss heavy vehicle fee to all of Europe would result in an increase of freight volumes on rail by 20% to 30%. This would only be achievable by 2050 with the condition that respective infrastructure capacity extensions are implemented. Such capacity extensions would require substantially more earmarking of toll revenues for rail infrastructure.

2.4. The Impact of Tolls on Consumer Prices

For Germany, studies estimate a share of transport costs at production costs between 2% and 3%. Thus, an increase of toll costs that would lead to an increase of transport costs by 15% would only impact the overall

product costs by 0.5% on average. Therefore, **the impact of the toll on actual product prices is so small that aggregated statistics cannot show an effect.**

2.5. The Impact of Tolls on Reducing External Costs

Tolls have been shown in Germany to increase the uptake of cleaner vehicles as less air polluting vehicles are incentivised through the tariff that different truck drivers are obliged to pay. Between 2005 and 2009, the share of Euro IV and Euro V vehicles rose from 2% to nearly 62%. This was partly driven by the fact that the German government was using revenue from tolls to provide discounts for hauliers to purchase cleaner trucks. The size of the haulage company determined the size of the subsidy (with smaller companies getting more government support).

The computations performed by Fraunhofer ISI shows that, in Germany, **an abolishment of the LKW Maut in its current form would lead to an increase in the external costs of transport by 21.5 to 29 billion Euros annually.** This shows that the toll has had a positive impact on reducing the air pollution caused from road transport.

The European Commission are considering to extend the toll to allow for differentiation based on the CO₂ performance of trucks, which would allow for countries to offer discount tolls for trucks that are more fuel efficient. Such a system would likely be based on VECTO, tool developed by the European Commission to measure fuel efficiency of trucks, which is expected to be operational before the end of the decade. Trucks represents some 30% of road transport greenhouse gas emissions. Tolls are an effective means to encourage the uptake of cleaner vehicles while promoting more efficient logistics. **Tolls could have a positive impact on reducing greenhouse gas emissions if such charging was enabled by the EU.**

2.6. The Impact of Tolls on Public Budgets

Tolls are an efficient means for countries to raise revenue for their respective public budgets. The Eurovignette Directive allows for Member States to use the revenue collected from tolls for whatever they so choose. The Commission recommend that road user charges are earmarked in order to create funding “to benefit the transport sector and to promote sustainable mobility in general. Such projects should therefore relate to, inter alia, facilitating efficient pricing, reducing road transport pollution at source, mitigating its effects, improving the CO₂ and energy performance of vehicles, developing alternative infrastructure for transport users, optimising logistics or improving road safety”.

The LKW Maut income constituted the single most important source of revenues (around 4.34 out of 5.4 billion Euros) for the Federal Ministry for Transport and Digital Infrastructures (Bundesministerium für Verkehr und digitale Infrastruktur, BMVI) in 2014. This shows the extent to which tolls can contribute to the public budget.

Toll revenues may constitute an important part of the transport sector funding. Switzerland use such revenues to fund the infrastructure of alternative modes while Germany use the majority of the money for road maintenance and construction. It is up to member states to decide how to spend the revenue but it can undeniably be an efficient means of generating more revenue which can contribute to decarbonising transport if the Member States choose to invest the money accordingly.

3. Conclusion

Road tolls can contribute to making transport more efficient in Europe. **Tolls can help to reduce the negative impacts of road transport while incentivising the smart use of clean vehicles.** Tolls can generate revenue for national budgets without adversely impacting the movement or price of goods. The Eurovignette Directive is a toolbox in which countries can draw from to improve their national system. This Directive should never limit the positive things that members of the EU can do with their tolls. It should

rather be the driver of smart road charging systems that help countries in transitioning to smarter and cleaner transport systems.

The European Commission should phase-out time-based charging systems and include the tolling of trucks based on CO₂ performance in the review of the Eurovignette Directive. This would allow for countries to use tolls to reduce the greenhouse gas emissions from transport. There should also be an allowance made within the Directive for mark ups for so-called “mega-trucks” as such longer and heavier vehicles are set to increase on European roads. Furthermore, there should be more liberty granted to member states for the maximum amount they can charge for external costs.

Tolls will become an inevitability if countries want to move to clean and smart transport systems. Tolls are a financial mechanism that can promote zero emission vehicles and smart transport behaviour; all while raising money for the public budget. The benefits have already been shown in countries that make full use of the Eurovignette Directive. **There exists now the potential to build upon the existing policy and make all of road transport both cleaner and more efficient.**

Further information

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Endnotes

ⁱ European Commission, Annex to the European Strategy for Low-Emission Mobility. {SWD(2016) 244 final}

ⁱⁱ Doll, C., Mejia-Dorantes, L. and Vassallo, JM. (2016): Economic impact of introducing road charging for Heavy Goods Vehicles. Study commissioned by Transport and Environment (TT&E), Fraunhofer-ISI, Karlsruhe and UPM, Madrid.

ⁱⁱⁱ Ricardo-AEA; DIW econ: CAU, 2014. Update of the Handbook on external costs of transport, London: Ricardo-AEA.

^{iv} European Commission, Communication on a European Strategy for Low-Emission Mobility. {SWD(2016) 244 final}

^v Improve road haulage rules for industry, drivers and the environment, says Commission (Available at http://europa.eu/rapid/press-release_IP-14-425_en.htm)

^{vi} 1 jaar kilometerheffing: transporteurs rekenen meer door dan verwacht, klanten wachten nog te lang met betalen (Available at <http://www.transportenlogistiekvlaanderen.be/nl/publicaties/persberichten/1-jaar-kilometerheffing-transporteurs-rekenen-meer-door-dan-verwacht-kl>)

^{vii} Biosca, O., A. Ulied, C. Doll, L. Mejia-Dorantes, A. Kühn, F. Jürgens, J. Skalska, D. Fiorello, P. Gützkow, A. Nash and A. Klecina (2014): Societal Implications, land use and urban policy. Deliverable 4.2 of the research project LivingRAIL (Living in a sustainable world focussed on electrified rail) funded under the 7th framework programme of the European Commission.