

Implementing interurban road pricing reforms: consensus and constraints

Gunnar Lindberg

Swedish National Road Transport Research Institute (VTI)

Box 760

781 27 BORLÄNGE

SWEDEN

gli@du.se

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Abstract

The development of the Transport Policy in the European Union has awakened the idea of marginal cost based pricing and consequently the need for a more flexible distance based charging system.

The paper tries to summarize the basic features of recent estimates on marginal cost and it discusses the possibility to find a consensus on the estimates.

Furthermore, the paper evaluates the current European legislation, an adjusted legislation is proposed and an implementation path discussed. It is concluded that the current European legislation is a barrier for the introduction of marginal cost based pricing. In addition, it is noted that both the legislation on fuel excise duty and user charges/tolls has to be amended to ensure a well differentiated charging regime. It is suggested that the vehicle tax can be abolished. Finally, the possibility to introduce all these changes with a voluntary implementation path is shortly discussed.

1 Introduction

Already in 1964 a decision was taken that an investigation of infrastructure costs on rail, road and waterways should be undertaken¹. In 1968 the first proposal for an ‘adjustment of national taxation systems for commercial road vehicles’ was prepared². In 1971 the Commission submitted a new proposal for an introduction of a Common System of Charging for the Use of Infrastructure³. The proposal defines the principles of the system, which should be based on marginal social cost and budgetary equilibrium. The proposal suggests that the Council shall lay down the rules for calculating marginal social costs. Interim reports followed. In the definition of the marginal social costs, the paper includes the marginal cost of use, congestion and other external costs as noise, air pollution, and accidents⁴. Method for calculation the marginal social cost of road use was examined including the cost of operating, administering, maintaining and renewing infrastructure⁵.

We still await the latest step on this development. In the meantime, we present a paper as a base for discussion.

The near future will most probably include a km-tax system. Switzerland is already now running a scheme and Germany is planning to introduce a scheme by 2003. Switzerland introduced the Swiss Heavy Vehicle Fee in January 2001, which is distance related and differentiated according to weight and environmental characteristics⁶. All vehicles, passenger and freight, with a total weight above 3.5 tonne has to pay the charge⁷. As an implementation path the charge is 0.01 €/tkm in 2001, raising it to 0.016 €/tkm in 2005.

1 (COM(64)389)

2 (Com(68)567)

3 Accompanied by a Memorandum (O.J No C 62, 22 June 1971) providing detailed background.

4 (COM(75)493)

5 The method is described in Doc. R/2750/74 (TRANS 174) and a test calculation of the Member States are reported in Doc. SEC(75)1310. The marginal social costs of use of railway along the same line as for roads are described in Doc. CTI/GT1/05-2/74 and for waterways in Doc. CTI/GT3/04-2/74.

6 The introduction of the scheme was accomplished with an increased weight limit from 28 tonnes to 34 tonnes and a further increase to 40 tonne will take place 2005.

7 It exists exceptions for some vehicle categories (public transport) and special solutions for other (flat fee for coaches and mobile homes)

The charge is calculated by the distance driven on Swiss territory (km) and by the maximum permissible laden weight (tonne) adjusted with an emission factor.

Germany is the dominant player in the current Eurovignette system. After some years of discussion a decision has been taken⁸ to introduce a new kilometer based system (LKW-Maut) in the summer 2003. The kilometer-charge will be paid by all HGVs with a gross permissible laden weight above 12 tonne and is limited to the German motorways. The charge will be differentiated according to emission standard and number of axles. The charge will replace the Eurovignett and some percentage of the mineral oil tax. The average charge will be 0.15 €/vkm and will vary between 0.10 €/vkm and 0.17 €/vkm.

While the Swiss system is introduced on the whole road network the German system is limited to motorways due to EU legislation.

The purpose of this paper is to discuss to what extent it is a consensus today within the road sector as to how to measure the *price relevant cost* and to identify the principal issues in cost measurement needing further research. In addition, the paper examines if the current legislation in the European Union constrains an introduction of a more (marginal) cost based pricing policy. This section is based on a paper written for the MC-ICAM project (Lindberg 2002c).

With ‘price relevant cost’, we mean the external marginal cost of transport, which could be internalised with charges/taxes. The term external is based on an individual definition, i.e. we study a single decision maker (e.g. car driver) and examine the consequences of his decision that is not included in his weighting of pros and cons. With marginal, we mean the ‘extra’ consequences that fall from his decision and, implicitly we discuss a decision on an extra trip (or kilometre).

⁸ 15 August 2001

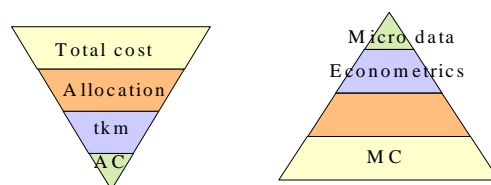
2 Do we have a consensus as to how to measure pricing relevant costs?

In a previous paper for IMPRINT⁹ we draw the conclusion that studies on price relevant costs has gone from a top down to a bottom up approach. We also concluded that the WTP approach seems to be more accepted than previously. In addition, it was suggested that we started to see lower marginal cost than previously thought. Among the reason was mentioned that the U-shaped cost curve is rediscovered. As many previous studies are based on average cost it is evident that some of the studies will give a lower cost. In addition, past policies to curb transport cost have had an effect on the magnitude of the external cost.

The bottom up approach requires more detailed databases and delivers more differentiated results. This gives the possibility of a higher degree of differentiation and focus on the need to move towards a ‘micro policy’. The importance of inter modal efficiency may decline and intra modal efficiency may be more important. Another conclusion from some of the cost categories is that the marginal cost is higher on the low standard network. This is intuitively an obvious conclusion, but runs unfortunately often contrary to the current pricing practice.

Figure 1: Top-down and bottom-up approaches

- From TOP DOWN to BOTTOM UP



⁹ 'Recent progress in the measurement of external costs and implications for transport pricing reforms', Prepared for the IMPRINT-EUROPE (Implementing Pricing Reform in Transport – Effective Use of Research on Pricing in Europe), A Fifth Framework Thematic Network project for the European Commission (2001-2004). Brussels 2002-05-14

2.1 Infrastructure cost

Pricing related to infrastructure cost strikes one as the part that should be the least controversial; it has been discussed for a long time, the cost is observable and many charges has been based on the infrastructure cost. In the European Union legislation, infrastructure cost limits the level on tolls; *‘The weighted average tolls shall be related to the costs of constructing, operating and developing the infrastructure concerned’* (Directive 1999/62/EC Article 7.9). However, examining the latest (marginal cost) studies it does not look that easy.

The observable unit is expenditure for the production of roads and road services. The expenditure comes in a number of different forms; as reconstruction and resurfacing, winter maintenance, grass and hedge cutting etc. Roads and pavements have a long lifetime, which means that we need to annualise the expenditure. With standardized assumptions on lifetime, this is possible. However, already after this uncomplicated manipulation we do not have a simple relationship between observable annual expenditure and annual cost. Many models therefore ignore this step. From the annual cost two approaches can be found to estimate the cost per vehicle kilometre. The first is to use cost allocation where each subcategory of costs is allocated to different vehicle types (or vehicle characteristics as maximum weight, standard axles, PCU¹⁰ etc) with a factor. If the sum of all factors equals unity, we have allocated the annual cost. The second approach is to use a marginal cost approach, which tries to link the changed number of vehicle kilometre of different types to a changed annual cost. Both the level of the cost and the timing of the measure (resurfacing etc) will be affected and included in the cost estimate. In principle, the factors employed in cost allocation can be based on marginal cost studies.

Although infrastructure cost has been discussed for a long time and at the backbone for many pricing/taxation proposals, it is difficult to imagine that we have a consensus on the cost measurement. We may agree on annual expenditure but not on annual costs. We

¹⁰ Passenger car unit

may agree that nothing of the infrastructure cost is external but not on the marginal effect of different vehicle categories.

Looking at the current state-of-the-art vis-à-vis short run marginal infrastructure cost some conclusions can be drawn. First, it is obviously that the number of studies is limited. The most promising research seems to be within the UNITE project but conclusions are not presented yet. Secondly, the limited number of results is not (up till now) stable. Thirdly, to improve the cost estimates often the basic databases needs to be improved. It is more a question of storing the right data than collecting vast amount of new information.

What can we do to improve the situation, in addition to do more studies? The way forward could be to study what current estimates imply on the relationship between average and marginal cost on a detailed level. In an even more pragmatic version, we could try to link the annual expenditure to marginal cost with a set of (allocation) factors.

In addition, the common knowledge is to apply the so called forth power rule to estimate the cost for different vehicle categories with different axle loads. However, basic research on the applicability of the forth power rule is lacking. Finally, a cost component that often is forgotten in estimates of the wear-and-tear is the increased vehicle and comfort cost of subsequent road users as the road deteriorates. In principle this has been explored (Newbery 1989) and it has been shown that it is both a negative effect, the increased roughness, and a positive effect, the shorter lifetime give the users a new surface earlier. Modern estimates on these costs are lacking.

2.2 Congestion

The theory of congestion cost has been around for a long time. The principle of time differentiated charges are included in the current directive on HGV taxation. ‘..Member States may vary the rates at which tolls are charged according to: ...b) time of day,

provided that no toll is more than 100% above the toll charged during the cheapest period of the day' (Directive 1999/62/EC Article 7.10).

While the principle has been around for a long time, it is not straightforward to implement. Winners and losers come in a complex mix, which has proven it difficult to design a Pareto improving solution. To ensure that congestion pricing are increasing the welfare, the revenue has to be spend in a clever way and it is no predetermined rule that says it should be introduced to expand the capacity of the same mode. Congestion pricing is ready for introduction as far as the knowledge on marginal cost is concern; it could be possible to find consensus on speed-flow relationships and VOT. The recent developments are more about acceptability of pricing schemes and packages.

2.3 Environment

The knowledge around environmental cost shows the most astonishing development; from the most unknown and controversial areas of cost estimate to an area with almost consensus. The current legislation on HGV taxation in the European Union also accepts the principle that taxes and charges can be differentiated according to environmental damages. *'..Member States may vary the rates at which tolls are charged according to: ...a) vehicle emission classes, provided that no toll is more than 50% above the toll charged for equivalent vehicles meeting the strictest emission standards'* (Directive 1999/62/EC Article 7.10).

The principle is also included in the EU legislation on emission standards for HGVs. A member state can decide on tax relief for vehicles that fulfil certain stricter emission standards. The tax reduction will apply to all new vehicles that in advance fulfil the specifically indicated limit values. The relief will cease on the day that the application of the emission limit values for new vehicles becomes binding. The tax relief must not exceed the additional costs for the technical equipment that is required to comply with the limit values (directive 1999/96/EC).

At the same time as the legislation accepts the principle of environmental costs (Although different definitions) the methodological development has been impressive. The common bottom-up approach used in Europe is the impact pathway approach described in Friedrich and Bickel (2001). The approach has been developed within a series of research projects financed by the European Commission (ExternE). The approach includes a sequence of events that links the emissions to the impact and subsequent valuation.

A consensus around the method has been developed. Questions may be raised around certain input functions and we have seen very few marginal cost studies. In addition, the basic valuations has the same uncertainty as in accident cost (discussed below).

2.4 Accidents

The external marginal accident cost has two distinct characteristics: A division between internal and external cost and congestion like effect. If the total accident cost during one year is divided by the annual traffic volume, the average accident cost is of course the result. Sometimes this has been labelled as the accident cost that should be charged to the user. However, if this is to be equal to the relevant marginal external accident cost, two assumption have to be fulfilled; all accident cost is external and the risk is constant. Neither of these is fulfilled.

The question of internal and external accident cost can be broken into two parts; i) does the user consider his own risk and ii) does the user consider the risk of others? If the users understand their own risk, related to their decision, the value-of-statistical-life will be internal. If they do not understand the risk related to their decision we have a pure information failure. It has often been shown that individuals overestimate small risk and underestimate large risks. This has as a corollary that they underestimate risk changes¹¹. However, exactly how individuals assess the *marginal* risk related to a change in driven distance or a new trip is unclear.

¹¹ See Viscusi (1998)

It is well known that when the traffic volume increases on a road the speed goes down and the average travel time increases. But what about the accident risk? As the number of vehicles increases the number of accidents will most probably increase; we have not seen any evidence on the opposite effect. However, exactly how the number of accidents increases is important, will the number of accidents increase in proportion to the increase in traffic volume, or will the increase be progressive or degressive?

The issue of the valuation of accidents is also complicated. However, nowadays the CVM method is an accepted method to find values on the so-called risk value, i.e. the users willingness-to-pay for a small risk reduction. This is often transferred to a value of statistical life but has nothing to do with a valuation of the life per se. While the use of this value today is in the mainstream, it should be noted that the method has some internal problems, which need to be solved in the future (see Beattie(1998) and Carthy(1999)).

The principle of external marginal accident cost is complicated and some issues still have to be resolved. However, many answers have been given in the most recent development.

The empirical developments of the estimates on external marginal accident cost mirrors the development of the infrastructure cost. The state-of-the-art approach is based on detailed databases on individual vehicles or crossings. The marginal cost falls short of the average cost and the estimates can be differentiated in detailed subgroups. However, more studies on the risk function have to be carried out before the marginal cost can be differentiated both on vehicle and on road type.

We know that the potential victims may react to the increased risk with a costly risk avoiding behaviour. The cost of this risk avoiding behaviour should thus be added. Finally, we should not only concentrate on the external marginal cost when internalisation of accident costs is discussed. Internalisation can result in an optimal

traffic volume under an in-optimal behaviour. The existence of externalities does also influence the behaviour of the driver. Furthermore, the liability system may transfer the responsibility for the cost from the victim to the injurer, the non-injured part in an accident. If we assume that, the injurer internalise this cost, the type of liability system and level of fines and compensation will affect the external marginal cost.

2.5 Summary

In the table below, we try to summarise what the discussion above imply for the possibility to reach consensus on the cost estimates. The table is divided into three columns. The first consider if it is possible to find consensus around the definition of cost/valuations. The second if it is consensus around the division external/internal and the last column describes if it is a consensus on the definition on marginal cost.

Table 1: Consensus on marginal cost estimates

<i>Category</i>	<i>Costs/valuations</i>	<i>External</i>	<i>Marginal</i>
Infrastructure	No. Discussion on expenditure/costs.	Yes. All costs external	No, studies not conclusive
Congestion	Yes.	Yes (if we take the individual perspective discussed here)	Yes
Air pollution	Yes (but same uncertainty as for accidents)	Yes, all costs	? (too few studies)
Noise	-	-	-
Greenhouse gases	No	Yes	No
Accidents	Yes (WTP approach used) but the actual level is uncertain	No (too few studies)	No (too few studies)

3 Current legislation.

The current directive on the charging of heavy goods vehicles for the use of certain infrastructures (COM(99)62) was adopted in June 1999, almost three years after the proposal from the Commission (Com(96)331). The scope of the Directive is limited to commercial vehicles intended exclusively for the carriage of goods by road and having a maximum permissible gross laden weight of not less than 12 tonne.

In addition to setting limits for taxes, charges and tolls (see below) the Directive sets out a ‘vision’ for the future charging system: *‘Existing distortions of competition cannot be eliminated solely by harmonising taxes or fuel excise duties; however, until technically and economically more appropriate forms of levy are in place, such distortions may be attenuated by the possibility of retaining or introducing tolls and/or user charges for the use of motorways, in addition Member States should be allowed to levy charges for the use of bridges, tunnels and mountain passes’*.

3.1 Vehicle taxes

The new directive follows the previous directive (COM(93)89) and regulates the minimum level of the annual taxation. The level and structure of the vehicle tax is unchanged. Some Member States still have the right to apply lower tax rates than the minimum during a limited period¹² (Article 6.1).

The minimum tax level, originally from COM(93)89, is based on the structure of the infrastructure costs in UK 1988/89. The annual average cost for HGV was estimated to be 60% higher in the European Union than in UK. Of the total cost, 65% were estimated to be variable cost, and from the variable costs the paid fuel excise duty (based on EU maximum level) was subtracted to estimate the *uncovered variable cost*. Furthermore, it was assumed that only 15% of the uncovered variable cost and in addition, 15% of the fixed cost, were to be recovered by the EU minimum level of taxation. In the final Directive (COM(93)89), this level was further adjusted downwards with 60%. A differentiation between suspension types was also introduced.

3.2 Tolls and User Charges

The Directive also regulates the use of tolls and user charges. Toll is defined as a charge on a vehicle that travels between two points while user charges refer to a charge paid for the use of a certain defined type and network of infrastructure.

¹² In the current directive Greece, Italy, Portugal and Spain has the right to apply a tax 65% of the minimum level in two years. In the previous directive, France, Greece, Italy, Portugal and Spain had the right to apply a tax 50% of the minimum level until December 1997.

Tolls and user charges can only be levied on motorways, or other multi-lane roads with similar characteristics, or bridges, tunnels and mountain passes (Article 7.2a). However, in Member States or regions where no motorway network exists, tolls and user charges can be levied on other road types (Article 7.2a). In addition, charges can be levied on roads for safety reasons (Article 7.2b).

Tolls and user charges cannot be imposed at the same time for a single road section except for bridges, tunnels, and mountain passes (Article 7.3).

The ‘weighted average toll’ shall be related to the costs of constructing, operating, and developing the infrastructure network concerned (not only the road segment between two points) (Article 7.9). The toll is allowed to vary with emission standard and time of day within certain limits (Article 7.10)¹³.

Compared to the previous directive the regulation of user charges has been developed into a matrix that tries to mirror road damage and environmental cost instead of the previous single rate (1.250 €annually). The user charge is regulated with a maximum level (Article 7.7). The charge shall be levied in proportion to the duration of use for monthly and weekly charges. The daily maximum charge is limited for all vehicles to 8 €per day (Article 7.8 and Annex II). A vehicle equipped with a non-euro engine have a user charge 11% above Euro I vehicles and vehicles with Euro II technology has a charge 11% below Euro I vehicles.

Table 2 Maximum annual user charge (€per year)

	<i>Maximum three axles</i>	<i>Minimum four axles</i>
Non-euro	960	1.550
Euro I	850	1.400
Euro II and cleaner	750	1.250

¹³ Environment: no toll should be above 50% of the toll levied on equivalent vehicles meeting the strictest standard. Time of day: no toll should not be higher than 100% of the toll charged during the cheapest period.

3.2.1 Eurovignette

As in the previous Directive, two or more Member States may cooperate in introducing a common system for user charges and other Member States may join the common system (Article 8).

Six Member States (Germany, Denmark; Belgium, Netherlands, Luxembourg and Sweden) have formed a common system that is called the 'Eurovignette'. Strictly speaking, the 'Eurovignette' system is not a question for the Commission, under the condition that the user charge follows the Directive. The revenue from the 'Eurovignette' system is collected by the Member State where the user charge is sold. The revenues are adjusted according to the balance in distance travelled by vehicles between pairs of Member States¹⁴. Revenues from user charges sold to vehicles registered outside the 'Eurovignette' countries are allocated with a certain percentages to each member in the system. The 'Eurovignette' countries have chosen to have the Commission as administrator of some of these tasks.

3.3 Other charges

In addition Member States may levy taxes on registration of vehicles, specific urban traffic charges or regulatory charges specifically designed to combat time and place-related traffic congestion (Article 9.1).

In addition to the regulation of vehicle taxes, tolls and user charges COM(92)82 of October 1992 regulates the minimum rate of excise duties on mineral oil to 0.245 €/litre (§5.1). The accompanying Directive COM(92)81 specifies a number of exemptions.

3.4 Discussion

The charging structure includes two principles; *nationality* and *territoriality* charges. The former is based on country of registration while the latter is linked to the network where the vehicle drives. Nationality charges are limited from below to curb tax

¹⁴ Correction = Annual charge/130000km * (Distance by vehicles from A in B's territory – Distance by vehicles from B in A's territory).

competition, while territoriality charges are limited from above to limit the abuse of monopoly power.

Figure 2 below shows the minimum vehicle tax, minimum fuel excise duty and maximum user charge by vehicle configuration and gross vehicle weight (2+2-31 = 2 axle truck, 2 axle trailer and weight from 31 tonne to the next class)¹⁵.

The (unweighted) mean minimum vehicle tax over the configurations and weights in the figure is approximately 0.50 €100 vkm and the mean fuel excise duty is 9.51 €100 vkm. The vehicle tax is only 5% of the total minimum taxation for this mean HGV. The mean maximum user charge for a pre-euro vehicle is 2.17 €100 vkm. This user charge is 18% of the total minimum taxation.

The current legislation allows very little spatial differentiation. In the proposal from the Commission in 1996 the term sensitive routes was introduced. The aim was to allow higher charges on certain road segments.

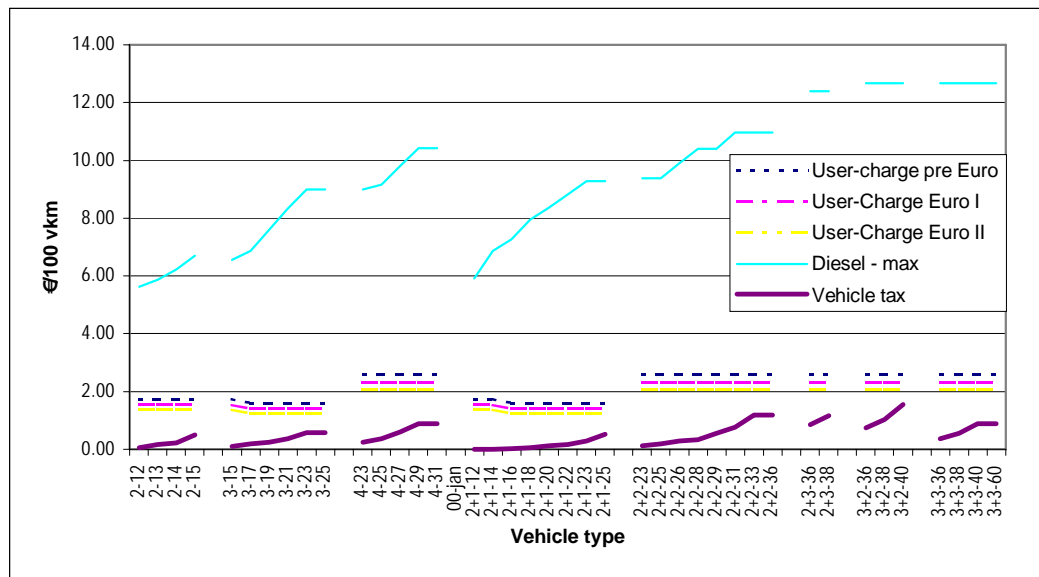


Figure 2: Minimum level for vehicle tax and fuel excise duty and maximum level of user charge (€100 vkm)

¹⁵ The used fuel consumption and annual distances are presented in Annex III.

4 Is European Union legislation a barrier?

Based on the survey of the current European Union legislation and the indication of the marginal cost of HGVs we will in the following discuss if the current legislation is a barrier to the introduction of marginal cost based pricing for HGVs.

Irrespectively of the level of the marginal cost we have some considerations, based on principles, which first will be discussed before the limits in taxation is compared with the costs and the allowed differentiation in taxation is compared to the variability in marginal cost.

4.1 Principle considerations

Irrespectively of the level of cost estimates and taxes/charges, some principle comments on the possibility to apply marginal cost based pricing under the umbrella of current European legislation are given below.

4.1.1 Abolish the vehicle tax legislation

The marginal cost principle does not include any fixed cost. With an introduction of a differentiated km-charging system the vehicle tax has no role anymore. The legislation that regulates the minimum level (Chapter II, article 3-6) can be abolished.

In addition, if a two-part tariff system is retained, the structure of the vehicle tax does not need to reflect the marginal cost. The tax can be chosen to be one single rate or designed to ensure efficient revenue rising.

4.1.2 Include km-charges

The directive does not forbid introduction of km-charges but any km-charge will be seen as a user-charge or a toll. The km-charge will consequently be restricted with a maximum annual level if it is seen as a user charge and restricted to only include infrastructure cost if it is seen as a toll.

4.1.3 Allow for charges on *all* roads

The directive limits the use of tolls and user charges to motorways and similar roads (Article 7.2a). The survey of marginal cost indicates that other inter-urban and urban roads have higher costs. The incentives given by the directive goes thus in completely wrong direction. User charges should be allowed on all roads.

4.1.4 Allow toll levels up to the total marginal cost

The Directive limits the toll rates to the infrastructure cost of the network concerned. An appropriate limit would be to limit the toll to the total marginal cost of the road link concerned. The regulation of toll could be identical to the user charge/km-charge regulation.

4.1.5 Is the scope optimal?

The directive is limited to commercial vehicles of a gross laden weight above 12 tonne (Article 2d). This will create a distortion in the market around the 12 tonne limit. The directive could be extended to goods vehicles above, say 3.5 tonne.

4.2 Consideration of the level and structure of charges

4.2.1 Taxation and marginal cost

In the figure below, an image is given of the current charging system and the marginal costs discussed above. The tax is based on minimum fuel excise duty and maximum user charge. It should be noted that noise and congestion costs are not included in the marginal cost.

The charge structure follows well the cost structure and it is only the heavier Pre-Euro vehicles that are under-priced on all roads except for highways. The cleanest trucks (Euro IV) are mainly over-priced. While the marginal cost may underestimate the cost on many roads, it certainly exists roads with substantial HGV traffic where noise and congestion cost are insignificant. The inter-urban road network in large part of north of Sweden is of this type and will thus often face over-pricing if a clean HGV is used.

The variability of the marginal cost is large. However, the largest part of the tax consists of fuel excise duty, which cannot be differentiated according to emission standard, road type or fully the consequence of vehicle configuration.

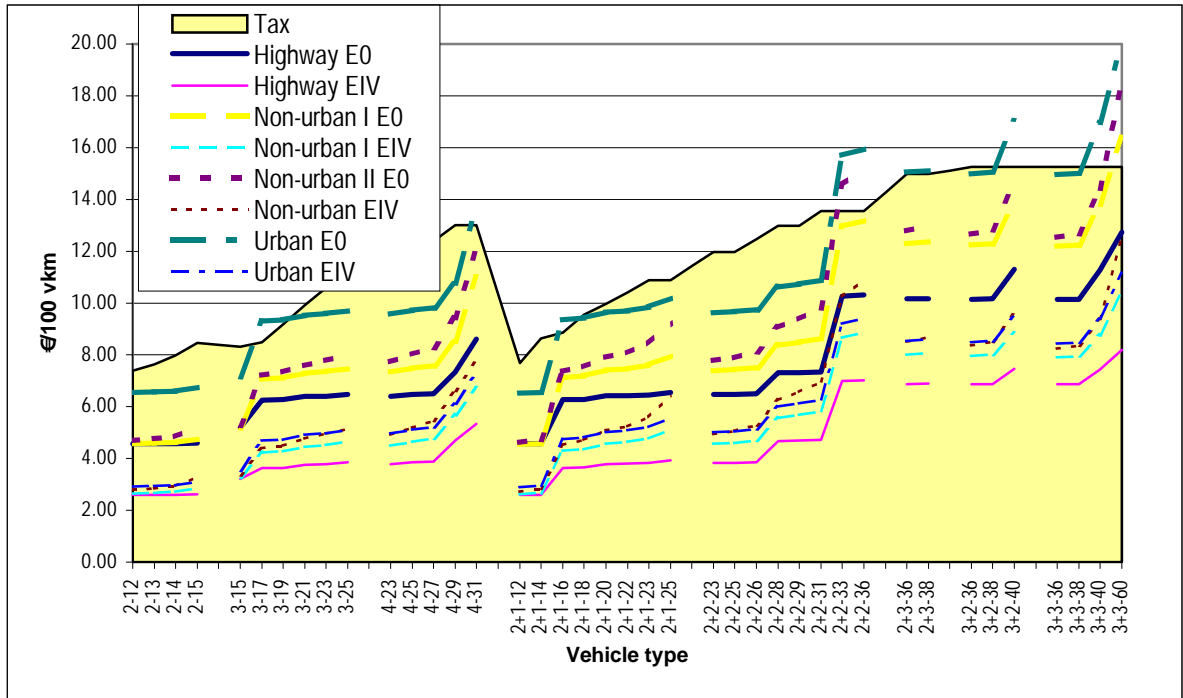


Figure 3: Indication of marginal cost for Pre-euro and ‘Euro IV’ vehicles on Highway, Non-urban and Urban roads compared to taxation with minimum fuel excise duty and maximum user charge, €100vkm.

4.2.2 A new two level fuel excise duty which include a Carbon-dioxide tax

The high fuel excise duty is a problem for a better charging system. A switch *from high fuel excise duty and low user charges to low fuel excise duty and a high km-tax* would facilitate a more differentiated charging system. However, the disadvantage of this system is that vehicles outside the km-tax regime would face a too low cost.

Disregarding administrative complications, a two level fuel excise duty could be possible. One low excise duty for vehicles that uses the km-tax and one higher level for

other vehicles. The low excise duty could preferable be based on the cost of green house gases.

4.2.3 The environmental differentiation of the user charge is too small

The environmental differentiation has to be cared for by the user charge/km-tax. The difference in the user charge is around 0.20 €/100vkm between Pre-Euro and Euro I and 0.35 €/100vkm between a Pre-Euro and Euro II for three axle vehicles. For four axle vehicles, the difference is approximately 0.25 €/100vkm and 0.50 €/100vkm.

For the lightest group of vehicles where environmental cost is estimated (7.5 – 16 tonne) the difference is 0.6 €/100vkm between Pre-Euro and Euro I on inter-urban roads and 1.0 €/100vkm on urban roads. If we examine a Euro II vehicle the difference is 1.0 €/100vkm and 2.3 €/100vkm in urban areas. The cost difference is three times higher than the difference in the user charge for three axle vehicles. For the heavier group (average of 16 – 60 tonne) the difference in marginal cost is six times higher than the difference in the user charge for 4 axle vehicles.

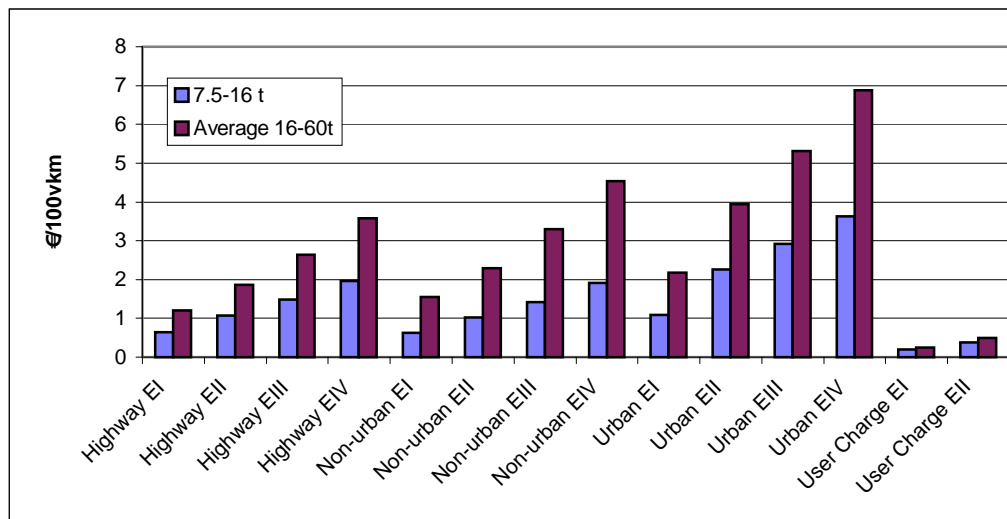


Figure 4: Difference in environmental cost and User Charge for different emission standards compared to a Pre-Euro vehicle (€/100vkm).

4.2.4 A maximum 50% reduction of toll for cleanest vehicle is reasonable

The Directive prescribes a maximum reduction of 50% of the toll rate compared to Pre-Euro vehicles for environmental more friendly vehicles. The regulation of the toll rate is not compatible with marginal cost based pricing and a reduction is difficult to judge.

The environmental cost for the cleanest vehicle (Euro IV) is between 57% and 43% of the environmental cost of a Pre-Euro vehicle. If the toll would be based on the total marginal cost the limitation in the reduction is not a barrier for implementation of marginal cost based pricing.

4.3 The 'optimal' European legislation

We assume the objective for the transport policy and fiscal policy is to introduce marginal cost based pricing in the transport sector. The following changes should be considered to align the directive to this objective. The suggestions are minimum requirements and will leave the system with three options - tolls, user-charges and kilometre-charges. The limitation in the levels of kilometre-charges is below very liberal.

4.3.1 The 'Eurovignette' directive.

Article 2	In Article 2 a definition of km-charges has to be introduced. A new subarticle could read; <i>'kilometre-charge' means payment of a specified amount for a vehicle travelling a distance of one kilometre on the infrastructure referred to in Article 7.2.</i>
Article 2d	The weight limit could be changed to 3.5 tonnes.
Article 2 e-f	In Article 2 also the emissions standards are defined which should include at least the latest defined standards.
Article 3 - 6	The Directive will leave it to Member States to decide on the level of the vehicle tax if they want to have such a tax. The whole Chapter II with articles 3 to 6 can be abolished.
Article 7.1	The Directive needs to include the word <i>kilometre-charge</i> when it discusses toll and/or user charges in some of the articles in Chapter III.
Article 7.2	Article 7.2a should be amended; <i>'Tolls, kilometre-charges or user charges can be imposed on users of all type of roads'</i> .
Article 7.3	This article allows tolls to be levied on roads with user charges. If the kilometre-charge is based on total marginal cost no extra charge should be allowed and no changes should be made to this article..
Article 7.5	A specification of the interface between different technologies for kilometre-charges could be introduced.
New Article 7.11	<i>The kilometre-charge shall be related to the total external marginal cost generated by the charged vehicle category on the road where the charge is levied. The total external marginal</i>

	<i>cost includes the marginal infrastructure cost, the marginal cost of air pollution (excluding the cost of green house gases), the marginal external accident cost and the marginal noise cost. The charge can also include the marginal external congestion cost.</i>
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4.3.2 Fuel excise duty

If the kilometre-charge is set equal to the total marginal cost, excluding the green house effect, the existing mineral oil directive has to be changed. For vehicles that pay kilometre charge the excise duty is limited to a carbon-dioxide tax.

Directive 92/82/EEC New Article 5.1b	<i>As from 1 January 200X, the minimum rate of excise duty on gas oil used as propellant of vehicles set out in Article 8, paragraph 3d, of Directive 92/81/EEC shall be fixed at 56 €/1000 litre.</i>
Directive 92/81/EEC New Article 8.3.d	<i>(d) for vehicles that pay kilometre-charge in accordance with Directive 1999/62/EEC</i>

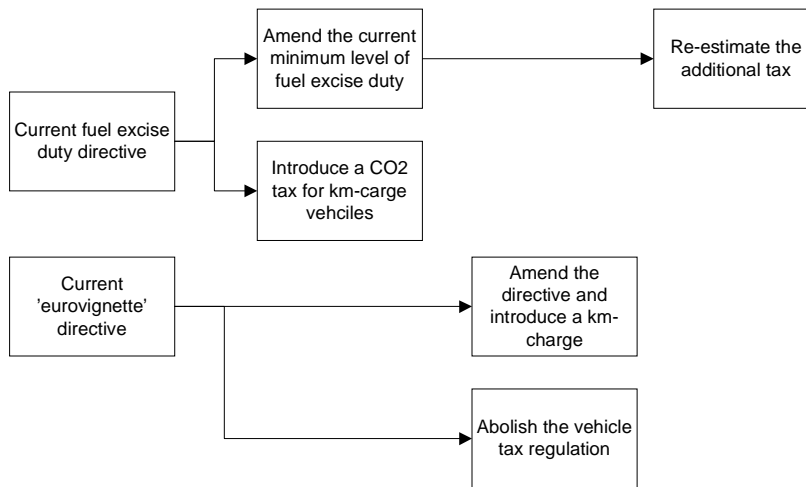
5 Discussion on implementation path

It is a bold strategy to go from the current system with a high uniform fuel excise duty and a low user-charge to a system with low fuel excise duty and a high kilometre-charge. In this section, we briefly discuss some possible implementation paths.

5.1 Voluntary strategy

One strategy would be to base the system on voluntary participation. The first step would then be to define a two level fuel excise duty. The low level equals the cost of green house gases and in the high level has an additional component been added to make the total tax close to (some) average of marginal costs. The level could be around the current maximum tax or higher. In the second step, a kilometre-charging system is voluntary introduced. Vehicles, of any kind, that buy and install an on-board-unit will pay a kilometre-charge based on the marginal cost excluding the cost of green house gases. In compensation, they will only pay the low fuel excise duty. In the third step the fuel excise duty will be re-estimated as the average cost of the remaining vehicles will increase when users with low cost vehicles chooses the km-charge system instead.

Figure 5: A voluntary strategy

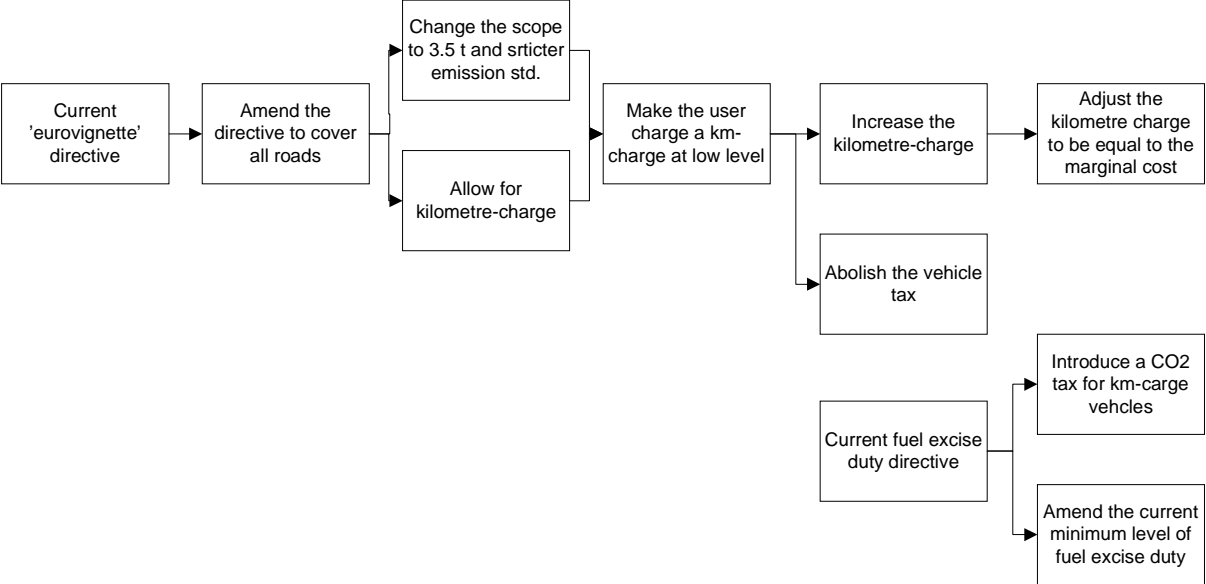


5.2 A traditional step-wise introduction

A number of possible step-wise approaches can be envisaged. One alternative, which implicitly tries to minimize conflicts due to sudden cost increases, is presented below.

The first step should be to amend the 'Eurovignette' directive to allow user charges on all roads. In a second step, or third depending on the choice of order, the scope of the directive could be expanded to cover lighter vehicles and vehicles of stricter standards than Euro II. The third step, or second, reform the user charge to a kilometre charge. This charge will be low, around 2 €/100vkm. The average cost of an operator will be unchanged. In a fourth step the vehicle taxation is abolished and the kilometre-charge increased so that the sum of the fuel excise duty and the kilometre charge equals the total marginal cost. In a fifth step, the fuel excise duty is reduced to a carbon dioxide tax and the kilometre charge adjusted to cover all other marginal costs.

Table 3: A traditional step-wise approach



References

- Balmer, Ueli (2001), *Kilometre charging in practice: Swiss HVF*. PM, Deputy Head of Sector Transport, Official for Spatial development, Switzerland
- COM (75) 493, *Commission's Interim Report to the Council of Ministers on Charging for the Use of Transport Infrastructures*.
- COM(64)389, O.J No 102 p1598, 29 Jun 1964.
- COM(68)567, *Adjustment of National Taxation Systems for Commercial Road Vehicles*, O.J No C 95 p41, 21 Sep 1968
- COM(71)268, *Common system of Charging for the Use of Transport Infrastructures*, O.J No C 62 p15, 22 June 1971, O.J No C 62, 22 June 1971.
- COM(86)750, *Elimination of Distortions of Competition of fiscal nature in the Transport of Goods by Road: Study of Vehicle Taxes, Fuel Taxes and Road Tolls*
- COM(87)716, *On the charging of transport infrastructure costs to heavy goods vehicles*, O.J No C 79 p8, 26 Mar 1988
- COM(90)540, *Amendment to the proposal for a Council Directive on the charging of transport infrastructure costs to heavy goods vehicles*, O.J No C 75, 20 Mar 1991
- COM(92)81, *On the harmonization of the structures of excise duties on mineral oil*, O.J. No L 316, 31 October 1992.
- COM(92)82, *On the approximation of the rates of excise duty on mineral oils*, O.J. No L 316 p19, 31 Oct 1992.
- COM(93)89, *On the application by Member States of taxes on certain vehicles used for the carriage of goods by road and tolls and charges for the use of certain infrastructure*, O.J. No L 279 p32, 12 Nov 1993.
- COM(96)331, *On the charging of heavy goods vehicles for the use of certain infrastructure*, Brussels 10.07.1996.
- COM(99)62, *On the charging of heavy goods vehicles for the use of certain infrastructure*, O.J. No L 187 p42, 20 July 1999.
- Department of Transport, UK (1994), *The allocation of road track costs 1995/96*, December 1994
- Doll, C. and W. Rothengatter, *Requirements for an environmentally oriented road user charge for heavy-duty vehicles*, summary of study No 200 96 130 for the Federal Environmental Agency, Berlin.
- Hickman, A.J. (ed) (1999), *Methodology for calculating transport emissions and energy consumption*, Project Report SE/491/98, Deliverable 22 for the MEET project, TRL
- Kågesson, Per (2000), *Bringing the Eurovignette into the Electronic Age: The need to change Directive 1999/62/EC to allow kilometre charging for heavy goods vehicles*. European Federation for Transport and Environment, June 2000.
- Lindberg, G (2002a), *'Marginal cost of road maintenance for heavy goods vehicles on Swedish roads'*, Working paper written for the UNITE project, European Commission

Lindberg, G (2002b), *External Accident Cost of Heavy Goods Vehicles* Working paper written for the UNITE project, European Commission

Lindberg, G (2002c), *Charging of Heavy Goods Vehicles in Europe* Background paper for task 4.3. MC-ICAM, May 2002.