SUMMARY OF ROME WORKSHOP

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Conclusions of Rome Workshop on Rail Infrastructure Charges

1. Introduction

This report seeks to summarise the findings of the workshop on rail infrastructure charges held in Rome on July 9 2004. It does not go through the presentations paper by paper. Rather it seeks to pull together key findings under the headings of principles and practice.

2. Principles

It was clear from the presentation that there are essentially two different philosophies behind the setting of rail infrastructure charges in Europe. The first starts with the estimation of marginal social cost, as being the socially optimal pricing system in the absence of constraints, such as budgetary constraints or distortions elsewhere in the economy. To the extent that such problems are perceived to exist, departures from pure marginal social cost pricing will be necessary, but these should then be made in the least distorting way possible. This approach to pricing may be referred to as marginal cost pricing with mark-ups.

The second philosophy starts from the position of the infrastructure manager as a commercial organisation needing to recover its costs. Whatever costs are not funded directly by the state need to be shared out between users of the infrastructure in an efficient and equitable manner. This approach to pricing can be referred to as full cost recovery after receipt of grants.

Whilst these may be presented as totally different approaches to the setting of charges, in practice there are strong commonalities between them. Firstly, even a purely commercial organisation has an important reason to study its marginal private costs as these determine the company’s pricing floor. Traffic unable to pay this price should not be carried. Given the presence of high fixed costs in rail transport, it will be necessary for an unsubsidised commercial body to charge traffic considerably above marginal cost on average, and a purely commercial organisation will seek to discriminate between types of traffic according to their willingness and ability to pay, in order to achieve the highest margins possible.

But within Europe even those rail infrastructure managers who see themselves as having an essentially commercial remit (such as DB Netz or Network Rail) are not unregulated profit maximisers. Rather they are public or regulated private organisations whose charges are limited to what is necessary to meet their financial requirements. To this extent, they face essentially the same budget constraint as that faced by an organisation that starts with the philosophy of marginal cost pricing - there is no suggestion that pure marginal cost pricing is desirable if it leaves the infrastructure manager without the necessary funds to maintain and renew the system.

Thus there is no necessary contradiction between the two philosophies; full cost recovery after receipt of grants and marginal cost pricing with mark-ups are completely consistent with each other. Where the difference does appear to lie in practice is in the degree to which the full cost recovery after grants approach seeks to identify marginal cost as its pricing base, as opposed to allocating costs on other grounds such as average costs shared out among infrastructure users according to train-kms of path allocated. This may reflect differing perceptions of the relative importance of efficiency and equity in cost allocation. It is often argued that the fairest way to finance infrastructure is to share out the total costs according to some set of indicators, reflecting cost causation when this is feasible, and simply reflecting use in the case of genuine joint costs. This argument is often challenged, however, on the grounds that it is both inefficient and regressive (for instance, research in the UNITE project suggested that at least in some countries in
Europe: a move to average cost pricing across all modes would make all income groups worse off, with the poorest suffering the biggest proportional cost).

So far we have only considered marginal private cost – that is the costs borne directly by the infrastructure manager. These generally comprise wear and tear costs, train planning and operations costs and congestion or scarcity costs. Strictly, congestion costs are borne directly by train operating companies, rather than the infrastructure manager, so they are not part of the marginal private cost of the infrastructure manager. But they may directly affect the demand for track access, and also there may be conditions requiring the infrastructure manager to compensate train operators for delays. In either case there will be a cost, or a loss of revenue, to the infrastructure manager.

In addition, use of rail infrastructure imposes external costs of noise, air pollution, global warming and possibly some elements of accident costs. Marginal social cost pricing requires these costs to be charged for in the form of Pigovian taxes. But it is not necessarily appropriate that these charges should go to the infrastructure manager, for that will give an incentive for them to earn more money by attracting more polluting trains. Rather the receipts from Pigovian taxes should be imposed by and go direct to the state.

Mention has already been made of the notion of scarcity charges, which are charges to be levied when demand exceeds capacity, and it should be noted that there are two competing philosophies of how to calculate these. In the pure short run, when selling slots on the spot market, it is the cost of pushing another service off the tracks, or into an inferior slot, that is relevant. In a longer term track access agreement which grants specific access rights, it may be more appropriate to think in terms of the costs of providing capacity for those additional slots. These two approaches are known to economists as short run and long run marginal cost pricing respectively. When capacity is optimally adjusted, and in the absence of indivisibilities, the marginal cost of additional capacity is equal to the value of the marginal additional train, so the two costs are equal. But given the long time scales of rail infrastructure investment that is often not the case, and a choice has to be made. Charging short run marginal social cost gives the correct incentives to train operators for the optimal use of existing capacity. Charging according to actual expenditure on increased capacity gives the correct incentives to the infrastructure manager to expand (or contract) capacity. (In both cases, this assumes that the revenue earned by the train represents its social value, so there must be appropriate taxes and subsidies in place to represent any external costs and benefits of the train in question for the incentives to be correct). It is not possible with a single charge to get both sets of incentives correct. A choice has to be made as to whether to charge at short run marginal social cost, and rely on other measures\(^1\) to achieve optimal investment, or to sacrifice some benefits in terms of current infrastructure utilisation to get the investment incentives right. The problem with the second, long run pricing, approach is that some traffic able to pay its short run marginal costs (and therefore productive from a socio-economic perspective) will be priced off the system, or conversely there may be excess demand at existing levels of capacity which the price system does not serve to ration.

Most of the planning of rail services and most decisions on the allocation of access rights relate to the timetable period. Thus it is costs that vary over this period of 1-2 years rather than a very short run approach to costs that is most relevant, even if a short run marginal social cost pricing approach is decided upon.

One final comment may be made on matters of principle. If there were no costs attached to the setting and use of complicated tariffs, then it would be desirable for tariffs to reflect all the factors that cause each

\(^1\) For example grants based on social cost benefit analysis or regulation where the Regulator has powers to require the infrastructure manager to undertake worthwhile investment. In Britain, it is a licence condition that Network Rail should undertake investment agreed as part of the Network Management Statement.
element of costs to vary – train weight, speed, type of rolling stock etc. To the extent that complicated
tariffs are seen to have an additional administrative cost (for instance in collecting the relevant data), and
that train operating companies may fail to react appropriately to them, there may be a case for more
simplicity. Moreover the balance of advantage between simplicity and complexity may vary with the mix
and nature of the traffic on the system in question – a system which is very homogenous has less need of
complicated tariffs than one with much greater diversity of traffic.

3. Practice

Having thus set the scene by means of a brief discussion of the principles on which track access charges
may be based, we now proceed to examine the actual track access charges now in place in Europe and how
they relate to these principles. We approach this by taking each element of cost in turn, discussing how it
should in principle be reflected in charges and looking at how it is treated in practice. But first we highlight
some particular issues of definition of fixed and variable costs.

Fixed costs are generally defined as those costs which do not vary with output. Which costs vary with
output depend however on the time period over which we are looking. In the very long run, the only costs
falling into this category are the sunk costs of past investments which do not need to be renewed, as
represented by inherited debt. In the very short run, most costs other than power and wear and tear may be
fixed. Different approaches between different railways may therefore arise because they have a different
time period in mind when setting the charges and when defining fixed and variable costs.

The definition of fixed costs also depends on the range of output changes under consideration. Infrastructure
managers appear to fall into two groups that define the relevant outputs in very different
ways and the fact that rail costs may rise with output in a non linear fashion, and indivisibilities may
introduce steps into the function, exacerbates the differences in pricing that can result:

a) Some railways consider any extra costs incurred when traffic is non zero to be variable costs. In
this case all maintenance and renewal costs would be variable costs, as well as signalling and
train planning, since it is unnecessary to do these unless the system is to be used to move traffic.

b) Other railways (for instance Network Rail and the Rail Regulator in Britain) regard as fixed
those costs which would be incurred regardless of traffic levels given that particular types of
traffic are using the system, and within a certain band around existing levels of traffic.
Consequently these railways treat as variable only those costs which change when traffic
increases beyond a certain range. Many, and perhaps most, elements of maintenance, signalling
and train planning costs may then be considered to be fixed.

In general one would expect the latter approach to give an average variable cost which was a much better
approximation to marginal cost than the former, although there is a risk of always failing to take account of
the ‘steps’ in the function, reflecting discrete changes in the resources needed when some discrete change
in facilities or maintenance standards becomes necessary. These ‘steps may be represented by the notion
of avoidable costs – the avoidable costs of a particular type of traffic being the variable costs given that
such traffic is running plus any fixed costs that would be avoided if the traffic in question ceased. For
instance some costs of providing for high speeds may be fixed as long as high speed trains are using the
system, but avoidable if only slower trains are running.

It is also worth mentioning the concept of joint costs, i.e. costs that are only avoidable if more than one
type of service is withdrawn. For instance suppose that a particular double track route is used by local
passenger, fast passenger and freight services, and suppose that it may only be reduced to one track if two
of the three types of train are withdrawn. In this case the costs of maintaining a second track are joint, and
will not enter into the avoidable cost of any single type of train.
## Classification of Fixed and Variable Costs by Infrastructure Managers

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<tr>
<th>Country</th>
<th>Short run time horizon (years)</th>
<th>Historic debts</th>
<th>Interest on debt</th>
<th>Loans</th>
<th>Investments (if not covered in previous 3 columns)</th>
<th>Maintenance</th>
<th>Renewals</th>
<th>Train Planning and Operations</th>
<th>Power</th>
<th>Congestion</th>
<th>Scarcity</th>
<th>External Accident Costs</th>
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**Notes**
- * applied through separate performance regime
- ** New charge under consideration (variable? Fixed?)}
a. Maintenance and renewals

Econometric studies of the marginal cost of track maintenance and renewals in European conditions (UNITE D15 Guidance on Adapting Marginal Cost Estimates) generally show these to amount to between 10 and 30% of average cost.

Evidence was produced that for Finland, the marginal cost of maintenance and renewals is some 20% of average variable cost. It should be noted that under the Finnish definitions most maintenance costs are deemed variable (Finland belongs to category a) in the preceding section. It should also be noted that we consider the bringing forward of renewals to be a part of the short run marginal cost of maintaining the existing capacity even when that cost may not be actually incurred for many years to come.

Econometric studies typically use a single measure of output, gross tonne kilometres, so a simple charging system for these elements of cost would be a charge per gross tonne kilometre. However, it is believed that maintenance and renewal costs also vary with the design of the rolling stock (e.g. axle weight, unsprung mass) and the maximum speed of the train, as well as the characteristics of the track, so it is appropriate to have a charge which is differentiated by these characteristics (as in Great Britain, where a simple engineering model is used to derive relative wear and tear costs for different types of rolling stock according to these characteristics). In this case, the differentiated charge could still be expressed per gross tonne kilometre, or alternatively per vehicle or train kilometre.

Britain uses average variable cost as an approximation of marginal cost of maintenance and renewals, but it is important to realise that this is in the context of a definition of variable costs which include only those costs thought to vary with output in the vicinity of current output levels; it gives a cost elasticity not greatly out of line with econometric evidence for other countries and may therefore be a reasonable approximation to marginal cost, but more evidence would be welcome.

In practice, of the countries presenting at the workshop, Finland and Switzerland levy charges per gross tonne kilometre, Great Britain per vehicle kilometre differentiated by vehicle type, and Germany per train kilometre differentiated both by type of train and by track characteristics. Italy does not charge for track maintenance and renewals, this cost being borne entirely by the state. Slovenia and Romania are both proposing differentiated charges per train kilometre.

b. Train planning and operations

There was more controversy surrounding the marginal cost of train planning and operations, some countries (Finland and implicitly Great Britain) regarding it as totally fixed. Where it is regarded as part of marginal cost, it seems appropriate to charge per planned path, with some adjustment according to the complexity of the task of planning the path. The latter may relate to the distance the train travels (so a charge per train kilometre is another possibility), the number of connections that need to be planned or the number of congested nodes it needs to be fitted through. Switzerland and Italy both levy a charge per train kilometre for train planning and operations; both also have a charge per node, although this may be purely a congestion charge. Slovenia is proposing an additional charge for use of lines outside the normal hours of operation. The charge per train kilometre in Germany varies as to whether the path sought is express, regular interval or economy. Switzerland has a surcharge for dangerous goods.

c. Power

In principle this should simply be a case of passing on the charges levied by the power supply companies, which themselves are likely to be differentiated by time of day. In addition there is an argument for
charging electric trains for wear and tear on the overhead line. This may be achieved by differentiating the basic charges between electric and diesel, as in Finland (but there are other reasons for doing this, such as air pollution costs), or by a supplement on an explicit charge for power.

d. Congestion and scarcity

Congestion arises where one train delays another. In a planned system such as a railway the timetable is designed to prevent this from happening, but it remains the case that at high levels of utilisation, the presence of an additional train on the tracks may lead to additional delays to other trains by reducing the ability of the system to recover from delays.

Scarcity costs arise where the presence of a train prevents another train from operating, or requires it to take an inferior path.

While congestion costs only arise when a train actually operates, scarcity costs are incurred whenever a path is reserved for its use. Thus there is a case for the latter to be charged for by means of a reservation fee, but which would only apply where capacity was tight. Obviously both forms of charge should be differentiated in time and space according to the level of capacity utilisation, and according to the capacity the train itself requires, which depends upon how its speed relates to those of other trains.

Only Great Britain has a congestion charge per train kilometre explicitly related to estimates of congestion costs. However, charges per train kilometre in Italy and Germany vary by train speed and type of route. In Germany there is an explicit utilisation factor, with a higher charge for heavily used lines. Italy uses a simple but effective approach of setting standard speed profiles for each route designed to optimise the line, and charging higher prices for paths that deviating from the profile, either by seeking faster or slower paths that disrupt the optimal service profile. Slovenia is proposing an off peak discount. Reference has already been made to the fact that there is also a charge per node in Switzerland and Italy.

None of the countries examined in the workshop has a reservation fee although France and some other countries have such a fee. Switzerland has a train path cancellation charge. This seems a curious way of dealing with the issue, as it is likely to hamper rather than help the reallocation of paths to higher value uses. Germany (and the proposals for Slovenia) charges more for ad hoc paths than for regular paths, which is rather the opposite of a reservation fee, but may be justified in terms of costs of train planning. A special train running in the peak hours on a single occasion could actually require as much or more planning as a regular path used every day throughout the timetable period, so the cost of this type of train-kilometer may be greatly higher. On the other hand, a one-time train in the middle of the night may only require dispatching effort that is already needed for other purposes, so this type of ad-hoc train might be less costly than a regularly scheduled train.

Congestion charges should be distinguished from the costs of delays imposed by the infrastructure manager or by one train operator on another. Where these are charged for, they are part of a separate performance regime. Such regimes exist in Great Britain and Finland, other countries are examining them.

e. Other services

In addition to the basic track access charges, some systems have charges for the use of stations, depots and marshalling yards, or for other supplementary services.
f. External costs

Environmental charges need to be based on gross tonne kilometres, vehicle kilometres or train kilometres, and differentiated according to the environmental performance of the rolling stock as well perhaps as location and time of day. There are some examples (e.g. Finland). Regarding other external costs, it is generally the case that train operating companies are liable for all accident costs they cause. However, there could still be an external element if an increase in train kilometres caused an increase in the risk of accidents for other operators or road users, or if some elements of the cost (e.g. pain and suffering, medical expenses) were borne by third parties. These costs are likely to be small and do not therefore require a specific element in infrastructure charges. No examples of accident charges exist in the countries represented at the workshop, although it is known that such a charge is levied in Sweden for the cost of accidents at level crossings. These tend to be in remote areas on little used lines.

g. Mark ups

The need for mark-ups on marginal social cost varies enormously within the countries examined. In Finland, infrastructure charges cover only 14% of infrastructure costs, but it was noted that budgetary constraints were delaying renewals as well as new investment so there might be a case for higher cost recovery through charges. In Switzerland, the current level of cost coverage was 29%, but this is a temporary situation resulting from explicit subsidies for freight; as the distance related Heavy Vehicle Fee for road haulage is raised in a scheduled series of steps, these subsidies will be phased out. Without them cost coverage would be 46%. In Italy, cost coverage is 40%. In Britain, following major increases in infrastructure spending in recent years, the figure is similar and in Germany, where all costs except certain investment costs have to be covered by charges, it is higher. Budgetary circumstances in the new EU Member States and Associated States, may lead them to seek a high level of cost recovery; for instance Slovenia is aiming to move in steps from its current situation of zero cost recovery to 100% cost recovery by 2010.

Mark ups come essentially in two forms; fixed charges as part of a two part tariff and variable charges. The latter will be a charge per train kilometre (or vehicle or gross tonne kilometre) varying with the nature of the traffic the train carries.

Of the countries presenting in the first workshop, only Great Britain and Italy have two part tariffs. Two part tariffs are attractive inasmuch as they permit mark ups without distorting the incentives to train operators regarding the number and types of trains to run. However, the fixed element may create distortions by preventing some operators from accessing the system at all and by biasing the terms of competition between large and small operators. To avoid this problem, companies in other sectors with large fixed costs to recover provide a “menu” of two part tariffs. A small operator can in this way select a package with a small or zero fixed charge and a higher variable charge. DBAG did this for a time, offering the choice of a two part tariff or a single higher charge, but the availability of the two part tariff was challenged as being anti-competitive and was dropped. Two part tariffs can be set up to match cost incidence more closely to use, thus offering the potential user the most accurate cost signals, and offering the infrastructure operator a more stable source of income that is accurately related to use. Fully variable tariffs potentially offer the advantage of less discriminatory impact, but offer less accurate price signals. Choosing between these alternatives is a matter of balancing of objectives and either outcome might be fully justifiable, so long as the issue of potential discrimination is clearly defined and resolved.

In Britain, the fixed element is charged only to passenger franchisees, and covers their avoidable costs (i.e. not just variable costs but also any fixed costs that would be avoided if the particular set of services were no longer running) plus a share of all remaining joint and fixed costs. This charge is simply reflected in the
payment (positive or negative) the franchisee receives for operating the franchise, and therefore there is no need for differentiation according to ability to pay at the level of individual trains or train types. The Franchise system allows fixed costs to be passed on in a fixed charge without any distortion of competition. In Italy the fixed charge varies according to the characteristics of the route used, being higher for higher quality infrastructure. Since it has to be paid by all operators it certainly may deter some operators from entering the market at all.

Elsewhere (e.g. Germany, Switzerland) mark ups take the form of variable charges and are generally related to the types of traffic, although some cases (Finland, Switzerland) were noted of additional mark ups being proposed to help finance new routes. These differences in charges may reflect differences in willingness to pay, and therefore raise the necessary revenue in the least distorting way, but they may reflect other principles (e.g. the avoidable costs of the category of traffic, or the route, in question).

It should be noted that the number of identified categories of train, and therefore the degree of price discrimination available, is usually quite small. The infrastructure manager has much less ability than the train operating company to differentiate price, for instance between passengers or containers on a given train, and that is why two part tariffs may distort prices less than mark ups on the variable charge for infrastructure use even when they require train operators to recover more than marginal costs in the final market.

On final point should be made regarding mark ups. There is always a fear that dominant operators will use their market power to secure favourable treatment, and this fear is particularly strong where the dominant operator is part of the same organisation as the infrastructure manager. Straightforward discrimination between particular operators is of course illegal under EU legislation, but it is possible to design mark-ups that favour the dominant operator, for instance through two part tariffs or by unfavourable treatment of traffics in which the threat of entry is strongest. Similar effects may be achieved by manipulating the charges for individual services, and particularly services which the dominant operator provides for itself.

4. Conclusions

A wide variety of structures of charges has already been found in the countries examined, with some countries having a simple charge per gross tonne kilometre with little differentiation, and other countries highly differentiated charges per vehicle or train kilometre, sometimes as part of a two part tariff. A key question is whether it is possible to reach any conclusions on best practice, or whether these differences simply reflect different circumstances in the countries in question.

Some factors are already obvious. In countries where there is little or no competition (e.g. Finland), congestion and scarcity costs may be irrelevant to the charging system as they are already internalised to the single operator (who will nevertheless need to examine their magnitude to make sensible decisions). Moreover, in Finland, there is little mark up on marginal social costs in the tariff – the state pays 86% of infrastructure costs. Thus it is not surprising to find a much simpler tariff in Finland than in, say, Great Britain or Germany, both of which countries have many different operators and a requirement to fund a much higher proportion of infrastructure costs through access charges.

In future meetings, as well as widening the number of countries considered, it is important to try to gain a better understanding of the reasons for these differences, and to examine the possibility of identifying ‘best practice approaches’, perhaps varying with the circumstances of the country concerned.
The other question to answer is what the impact of the different charging systems on creating efficient and affordable international train paths is likely to be. Clearly here the presence of two part tariffs is likely to be a particular barrier, as it is likely that an operator from another country seeking a path will be operating on a small scale in the country concerned. But the simple fact of the diversity of charging systems greatly complicates and reduces the transparency of charges for international paths, so anything that can be done to reduce this diversity is likely to be helpful to international traffic.