

A LEVEL PLAYING FIELD FOR SHORT SEA TRANSPORT PROVIDERS?

A comparative analysis of costs and user charges for short sea and land based transport solutions

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1 BACKGROUND

Promoting short sea shipping as an alternative to land based modes of transport has been on the political agenda for several decades, and is currently supported by a number of EU R&D activities, e.g. the Marco Polo programme and its new enhanced focus on the Motorways of the Sea scheme. Creating a level playing field by harmonizing general pricing and financing strategies across countries and modes of transport has also been much focused over the past years.

1.1 Norwegian coastal and short sea shipping

Norway, with its 2 700 kilometre coastline and relative remoteness to central European markets should have natural advantages for establishing competitive short sea transport solutions. About 80% of the population lives less than 10 kilometres from the coast. Still Norway experiences the same trends with an ever growing road transport sector as one can observe on the European continent.

The coastal fleet, including vessels in local traffic, consists of about 1500 ships above 50 gt. Some 400 ships are engaged in scheduled operations. 150 of these are car ferries crossing the many fjords and connecting islands to the mainland. Around 80 fast passenger ferries is an important element of this coastal transport network (Norwegian Ports Federation 2006).

A main challenge for efficient transport operations in Norway is the directional imbalances of cargo flows (Figure 1). The general picture is that most of the exports from Norway is resource based commodities like oil, gas, iron ore and fish. The exporting industries are mainly localized along the western coast, which makes maritime transport the natural solution for most of these commodities. However, oil and gas is also transported by pipelines to other European countries, and fish exports (fresh, dried and frozen) often go by road-based alternatives. Still a very high proportion of Norwegian exports are carried by short and deep sea ship services. Whereas exports are much based on raw materials, and transported directly from the Norwegian west coast to its final destination, or to European hub ports, imports of

finished consumer goods mainly comes via Oslo, and is mainly distributed by road and rail services to its final destinations. This creates a directional imbalance making it hard for the seagoing alternatives to fill the capacity on the northbound legs, and equivalently the same problem applies to southbound legs for land-based modes. This picture is somewhat different in the market for temperature controlled transports, mainly related to the exports of fish and fish products.

Figure 1 Norwegian freight transport corridors (Hamre, Lofthus et al. 2004)

To some extent Norway faces the same challenges with respect to short sea shipping as the rest of Europe. Although shifting cargo from land to sea has been on the political agenda for several decades, shipping services are not able to keep up with the growth rates of land based transports. Partly the short sea shipping industry blames the current charging regime for coastal shipping for not being able to compete.

1.2 Paper outline

This paper first gives an overview of the current pricing and financing structure of both sea and road transport in Norway. Then we present empirical evidence available on the costs related to coastal and short sea shipping. Marginal cost pricing has been on the agenda of European Transport policy for many years, and in the fourth section of this paper we review the current status and prospects of implementing a marginal cost based pricing regime in European shipping. Although not a member of the EU, Norway is committed through the EEA-agreement to apply a non-discriminatory policy for freight transport, and will mainly have to follow regulations implemented by the EU in this field. Based on this, the prospects for a new charging regime for Norwegian coastal and short sea shipping is evaluated. Finally we ask the question whether there is a level playing field for short sea shipping under the prevailing conditions.

2 A COMPARISON OF CURRENT PRICING AND FINANCING STRUCTURE FACING SHORT SEA AND LAND BASED TRANSPORT PROVIDERS

To provide a necessary background for comparing the current pricing and financing regimes, we will give a short overview of charges and dues related to trucks and coastal or short sea shipping.

2.1 Charges and finances related to road transport

Since the infrastructure for trucks is shared with cars and buses, we will need to present some figures pertaining to road transport in general, and some figures relevant only to trucking. The Norwegian road network is financially divided into national roads, county roads, municipal roads and private roads. Apart from the private roads, roads are generally paid for through public budgets. However, an increasing part of new roads are funded through toll collection systems, either via the toll rings around the major cities, or through dedicated tolling stations at bridges, tunnels or other new road stretches.

In addition to the tolls collected, a number of road transport related special dues are issued, the most important ones are:

- Petrol and diesel duties
- Registration tax (new and used cars)
- Annual road tax (differentiated by weight for HGVs)

In 2005 the revenue from these charges added up to EUR 5.5 billion, in addition an extra EUR 0.5 billion was paid through the toll collection systems. In other words, total revenues from special road transport charges (excluding VAT) amounted to EUR 6 billion in 2005 (OFV 2006). How does this compare to public expenditures related to the public road network? Summing over investments, maintenance and operations of all three public networks, the total expenditure for 2005 is EUR 2.65 billion¹. The total revenue from road transport charges thus constitutes 226% of total expenditures on public roads.

This is the total picture for road transport in general. The bulk of these revenues are generated by fuel duties (37%) and registration taxes (41%). Heavy goods vehicles (above 12 tonnes) do not pay registration taxes, but they do pay diesel duties, which constitute 14% of the total revenues. In addition HGVs pay an annual weight differentiated road tax, but this only constitutes less than 1% of the total revenues. A rough calculation of the HGV share of overall diesel consumption, the relevant share of the diesel duties will be in the area of 19%. Based on this assumption HGVs pay in the area of 3.5% of total revenues from road based taxes, or just above 7% of total road expenditures.

2.2 Charges and finances related to sea transport

The available evidence with respect to coastal and short sea shipping does not match the description of the road sector above.

The port structure in Norway is based on municipal port districts, within which you can find both public and private port sections and quays. Each municipality is in charge of their port district under the Port and Seaways Act. The funding of port activities is based on the principle of self-financing. The Act prescribes that port funds shall be kept separate from the municipal economy and charges the ports collect should be used for the benefit of the port only. Even in public port areas, which are landlord owned by the respective municipalities, cargo handling operations are carried out by private operators and stevedore companies.

The current charging regime that faces ship operators comprises charges partly related to the use of ports, and partly related to financing the operation of fairways, ship surveillance systems etc. The general structure of the charging regime is:

- Fairway dues:
 - *Coastal fee*, all vessels above 500 gt must pay either per entrance or an annual/quarterly fee based on gross tonnage. The fee revenue from this fee covers 34% of the costs related to seamarking and lighthouses.

- *Pilotage readiness fee*, for all vessels passing through waters subject to dues, and payable regardless of actual use of pilotage. The fee is payable upon entry and departure and comprises one part dependent on gross tonnage and one part charged per nautical mile. Alternatively vessels may choose to pay an annual fee differentiated by gross tonnage.
- *Pilotage fee*, is payable for all vessels whenever it uses a state pilot. The fee is payable at an hourly rate, differentiated by gross tonnage. The pilotage readiness fee and the pilotage fee fully finance the state pilotage services in Norway.
- *Safety fee*, is issued in four harbour areas covered by Vessel Traffic Services, covering the operational costs of these services. The fees are different for the different areas, and are based on gross tonnage or cubic meters for gas tankers. Alternatively annual fees could be paid. The different harbour areas have different rules for which vessel are eligible for the fees.

The Norwegian Coastal Administration has an annual budget of about EUR 150 million. 45% of this is financed through the charges above, and 55% over governmental budgets. Pilotage and the operation of the Vessel Traffic Services are 100% financed by user fees, whereas the costs related to seamarking and lighthouses are 34% covered by user fees. The rest of the budget is spent on a long list of services related to safety, environmental protection, information services, statutory regulations, planning etc.

As mentioned above, the municipal ports are 100% financed through port and cargo dues. The structure and level of these dues may vary from port to port (Eidhammer 2004), but generally the charges are related to

- Port dues
 - *Wharfage* , normally issued for the use of the port's wharves per time unit
 - *Harbour charge*, normally issued for the use of the port's waterways per call
 - *Additional charges* normally reflect actual use of waste management, ice-breaking, harbour pilotage, mooring services etc.
- Goods charges
 - Payable for the use of the wharves and harbour areas and may be differentiated along several dimensions. Normally charged per tonne (or volume), and normally differentiated by commodity type

In addition to these special dues, vessels will also have to pay a CO₂-tax and a sulphur-tax on bunkers.

3 EMPIRICAL EVIDENCE ON MARGINAL EXTERNAL COSTS FOR COASTAL AND SHORT SEA SHIPPING IN NORWAY

Although the Norwegian government never has committed itself to following a marginal cost approach in the transport sector, Norway has a long tradition for estimating marginal external costs of transport modes. The first attempts date back to the mid 1970s, mainly focusing on road transport. Eventually the scope of these calculations has been extended, and the calculations updated and refined on several occasions, commissioned by the Norwegian Ministry of Transport - and up until 1999 carried out by the Institute of Transport Economics in Oslo. The last update of these calculations was, however, done by Econ Analyse in 2003 (Econ 2003). This report comprises calculations of external costs related to emissions to air (PM, SO₂, NO_x, VOC and CO₂), noise, accidents, time (congestion) and infrastructure wear for road, rail, air and seaborne transport.

As for the European studies of marginal cost, the calculations for the maritime transport sector are flawed by a greater lack of data and research results than the other modes of transport. This means that there are no estimates for noise, congestion or infrastructure wear for maritime transport in this report. The valuation of emissions to air are all based on a presumption that these emissions from ships take place far from residential areas. Norwegian ports are generally not very congested, so omitting this factor is probably not a major problem. The report just briefly presumes that infrastructure wear is negligible for maritime transport, and does not address marginal costs related to the operation of ports, fairways and pilotage at all.

Type of vessel	Climate gas emissions ²	Local/regional emissions	Accidents	Total
Passenger vessel	0.16	1.05	0.07	1.28
Cargo ship	0.16	1.20	0.07	1.43

Table 1 External marginal costs for maritime transport, EUR per vessel-kilometre. (Based on Econ (2003) and converted from NOK to EUR using an exchange rate of 8.00 NOK/EUR)

The ECON report applies the following shadow prices:

- CO₂-emissions: EUR 5.63/tonne³
- PM₁₀ EUR 81.88/kg
- SO₂ EUR 1.75/kg
- NO_x EUR 1.88/kg⁴
- VOC 0.50 EUR/kg⁵

Evaluated at these shadow prices, emissions to air constitute approximately 95% of the estimated external marginal costs in this report (Table 1). The unit prices applied are generally lower than the ones applied in a previous study (Eriksen, Markussen et al. 1999), which partly is explained by new Norwegian impact assessments that conclude that the level of SO₂ and NO_x emissions are much lower, and that the likely

marginal impact of emissions is very modest. Shadow prices for these substances are therefore calculated based on the estimated costs for Norway to fulfil the obligations of the Gothenburg protocol. The applied shadow price for greenhouse gases is also significantly lower than the one applied in earlier studies. This unit price is based on a scenario of Norway fulfilling its obligations according to the Kyoto agreement, in a setting where USA is not taking part - and where JI/CDM activities and quota trading is allowed.

4 FAIR AND EFFICIENT PRICING IN EUROPEAN SHIPPING – AN ANALYSIS OF THE SCOPE FOR MARGINAL COST PRICING

Marginal cost pricing has been on the European agenda ever since the green paper on fair and efficient pricing was launched in 1995 (EC-DG7 1995) , and even some time before that. The following white paper (EC-DG7 1998) established the principle of marginal cost pricing in the transport sector, and launched a political agenda for a phased approach towards implementation of these principles. The policy was further developed in the 2001 White Paper on transport policy for 2010 (EC 2001). Here the EC committed itself to changing current charging principles towards a structure that reflected differences in infrastructure wear and tear, congestion, accident risks and environmental hazards. Most of the current charging systems were mainly motivated by the need to raise public funds, and not by the need to internalize such external costs.

A long range of supporting research activities has accompanied this political agenda towards fair and efficient pricing, most notable are PETS, CAPRI, MC-ICAM and UNITE, and currently the GRACE-project is most central in bringing this agenda forward.

Marginal cost pricing for European shipping (and aviation) has generally *not* been so much focused as land-based transport modes like, cars, trucks and rail. This is probably mainly due to the higher complexity of implementing such a scheme for these modes, and a more prominent lack of statistical information necessary to analyse and implement an efficient pricing scheme for these modes. The UNITE-project did in fact end up with some accounts for the maritime sector as well, but these were based on very inaccurate and incomplete sources of information (Bickel and Schmid 2002; Link, Matthews et al. 2005; Bonsall, Link et al. 2006).

As for the other modes of transport, a pricing scheme for maritime transport should reflect additional traffic-volume related costs imposed on

- The infrastructure provider
- Other infrastructure users, and
- Actors outside the transport system

Relevant cost components comprise maintenance and renewal of infrastructure elements, operating costs of infrastructure, time costs for delays (congestion), external accident costs and environmental costs.

4.1 Port and fairway pricing

The infrastructure relevant for the maritime sector is mainly related to ports and fairways (for inland waterways; also canals, locks etc.). Port pricing has therefore been the most focused topic within European maritime pricing research lately - and this is also a focal point of the current GRACE programme (Link, Matthews et al. 2005), where a number of case studies are being conducted to analyse cost structures in the port industry.

Port pricing has been a subject in the infrastructure pricing literature for many years. Major contributions have developed theoretical models, and to some extent provided empirical evidence based on case studies (Jansson and Rydén 1979; Jansson and Schneerson 1982; Jansson and Lindberg 1997; Suykens and Van de Voorde 1998; Strandenes and Marlow 2000; Haralambides and Veenstra 2003; Meersman, Van de Voorde et al. 2003; Strandenes 2004). The issue of port pricing is a complex one due to many factors. Firstly, defining what is meant by a port in this setting is far from simple. The literature has examples of definitions that comprise large parts of a whole logistics chain, including hinterland transport networks - and, on the other hand, quite myopic studies that only focus on the core business of ports related to the loading and unloading of cargo. Secondly, the issue is complex due to different objective functions of the different players in the port business: national or regional governments would regard ports to act as “engines for regional development”, or they would want to limit environmental hazards from port operations. Port authorities on the other hand would like to maximize profits and attracting business, whereas port users would emphasize low direct (e.g. port dues) and indirect costs (waiting time). Thirdly, the fact that most European authorities have deregulated, and partly privatized, their ports - combined with a very competitive environment for port operations - leaves very little room for direct control over the pricing policies of the ports. Any such initiatives would have to come from supranational institutions (like the EU) in the form of mandatory international regulations, which may be very hard to pass through the necessary political processes. This competitive and deregulated environment also presents researchers with an extra problem related to obtaining cost data for evaluating the true cost relationships prevailing in this business, as this is often regarded competition-sensitive information.

Most ports will have to cover their costs through the port dues, and due to the fierce competition between European ports, the EU has also put strong limitations to government support to the ports. Any such support will have to be generally available, and not restricted to individual ports. Even though ports have to raise necessary revenues from the port dues and charges, there are still many different pricing policies that could be followed. The general rule about charging according to short term marginal costs is not the only principle that could be followed. Such an approach would mean that costs would be very dependent on time and place, and

port dues would have to vary very much. Adding to this is the problem of a financial deficit that typically would arise in cases where there is little congestion (i.e. external time costs) and low environmental externalities. Following a long term marginal cost approach is therefore sometimes advocated as a second best option, making charges more stable.

In practice the real world pricing policies are gaining a stronger and stronger element of *strategic pricing*. In such a situation price levels are more oriented against the prices of main competitors than own cost structures, and we can also see a much more frequent use of negotiated discounts and less transparent pricing structures.

Current port pricing policies in Europe vary considerably, and implementation issues related to a marginal cost based pricing policy are many. However, current research efforts (like GRACE) may bring us closer to understanding the underlying cost structures in the provision of port services. This is a necessary first step in order to approach efficient pricing schemes for European ports, but the way forward still seems to be long and cumbersome.

Fairway dues

Apart from ports, most of the other infrastructure elements necessary for shipping could be related to the safe and efficient provision of fairways. Costs related to pilotage, ice-breaking, navigational aids, search and rescue services, surveillance systems etc. would fall under the broad category 'fairway costs'. Some European countries finance these services partly or wholly through fairway dues (e.g. Sweden, Finland and Norway), collected from ships calling at these nations' ports. Other countries finance such services entirely over government budgets. As long as these charges are collected for services offered, and only within the territorial waters of the respective nations, this is in accordance with international law (UNCLOS). In Sweden these charges have also become differentiated by the environmental performance of the vessels.

This far, fairway dues have not been made dependent upon distance travelled, although this was considered as an option when the Swedish fairway dues were last evaluated (Näringsdepartementet 2003). Such a distance based fairway due could be one way of charging vessels for external costs related to emissions to air.

4.2 External accident costs

In the UNITE project a case study of reported Swedish maritime accidents was conducted in order to analyse the potential significance of external accident costs in this sector (Lindberg 2002). Although the number of fatalities were surprisingly many, the proportion of external accident costs seems to be very limited. Depending on the presumptions made, external accident costs were estimated to constitute only between 0.4 and 5.0% of the current Swedish fairway dues. This effectively means that the external accident costs amount to between EUR 3 and EUR 40 per ship call on average (Berglund and Ericsson 2003). It is, however, premature to totally disregard this cost component based on a single case-study. There are for example

far more congested waters than the Baltic sea, and similar estimates for the Channel or for the Malacca strait might have given a somewhat different result.

4.3 Maritime emissions to air

Apart from port pricing, there has also been a growing focus on dealing with maritime emissions to air. Annually, more than 30 000 ships (over 500 gt) are visiting European ports, and the activity level is rising (Harrison, Radov et al. 2005). If only emissions within a 200 mile zone in Europe is considered, more than 2.3 million tonnes of SO₂, and 3.2 million tonnes of NO_x is emitted by this fleet. If no regulations or incentives are implemented these emissions will match corresponding landbased ones by 2020 (op.cit.). Apart from NO_x and SO₂, emissions of particulate matter (PM) and CO₂ are the main concerns with respect to marine emissions to air.

Regulating emissions to air has could be done by direct regulations, like the ones established within the IMO MARPOL convention, where maximum sulphur content levels of marine fuels are established. These regulations are, however, not very effective since the maximum allowed level of 4.5% sulphur is much higher than the estimated average for the world fleet. In the Baltic and North Sea however, a stricter limit of 1.5% is established as these areas have been designated Sulphur Emission Control Areas (SECAs).

The DG Environment of the EC has recently commissioned two studies of economic instruments suitable for reducing ship emissions in the EU. The first study is documented in Harrison et. al.(2004), and evaluates the potential of six different economic instruments, three of which are alternative charging scenarios. In 2005 a follow-up study (Harrison, Radov et al. 2005) was conducted, further narrowing down the recommended instruments to two:

1. A credit based trading approach, and
2. A consortium benchmarking approach

None of these are regular charging alternatives. The charging alternatives were not recommended mainly due to expected political and legal implementation problems. The most promising charging alternative (according to these studies) was a scenario where port dues were differentiated by the environmental performance of the vessel. This alternative is quite similar to the system that was implemented in Sweden in 1998 (Swahn 2002). Although deemed a success, the Swedish system is, however, a part of a wider set of measures, including differentiated fairway dues, subsidy programmes for environmental investments etc. The environmental impact of the system may therefore be due to other parts of the scheme than merely the differentiated port dues. Harrison et. al.(2005) suspects that a scheme which only comprises such differentiated port dues will not be effective because the incentive is too weak, given that the overall level of the port charges is the same.

A credit based trading approach

The credit based trading approach proposed by Harrison et. al. will provide tradable emissions credits to sources that voluntarily reduce emissions below their “business as usual” (BAU) levels. Such a programme would allow shipowners to reduce emissions and sell the emission reduction credits either to land-based sources or to the government. The first option would require a land-based ‘cap-and-trade’ programme to be established for the relevant emission types, whereas the second would build upon a subsidy programme for buying ‘surplus credits’. A critical element in such a scheme is to set the baseline for the allocation of credits. One would like to avoid ‘giving away’ credits for improvements that would have taken place regardless of these incentives, on the other hand - a very thorough control regime to avoid this may be very costly. Harrison et. al. suggests that the EC Marine Sulphur Directive could form a starting point for defining a baseline for SO₂-emissions, and that the IMO NO_x-curve could serve the same purpose for NO_x-emissions. This scheme would be entirely voluntary, which would make it easier to pass through political and legal processes necessary. The main challenge would perhaps be to establish the required accompanying programmes of a land-based cap-and-trade system and/or a government subsidy programme.

A consortium benchmarking approach

The other alternative promoted by these studies is a so-called consortium benchmarking approach. This is also a voluntary programme, where vessels could join a consortium that commits to achieving a specified average emissions rate (i.e. the ‘benchmark’). Trading credits is allowed within the consortium, which would make it possible to operate vessels that otherwise would not meet the established minimum standards. The benchmark would of course have to be set considerably lower than the regulated standard which normally applies to all vessels (i.e. those vessels that have not entered into such a consortium) if the programmes should succeed reducing overall emissions. Whereas setting the baseline for credits was the main challenge in the credit based trading programme, setting the benchmark for the consortia is the corresponding challenge in this alternative. Once again the EU Marine Sulphur Directive and the IMO NO_x-curve could serve as reference points for this.

Both of the above mentioned alternatives will necessitate some sort of monitoring and enforcement programmes to be developed and operated. Normally such monitoring could be based on internal control and reporting regimes, combined with audits and surprise inspections. In the case of consortium benchmarking this would be more challenging because individual members of the consortia will not have to comply directly with the regulations, as the commitment is related to the average performance of the whole consortium.

The impact of the emissions is generally very dependent of where the emissions take place (apart from CO₂ which is related to global warming). An efficient incentive system should therefore account for these regional differences. In the credit based trading approach this could be done by establishing some sort of exchange rates

which effectively put a higher value on emission reductions in sensitive areas. A similar approach could be used in the consortium benchmarking alternative, but an alternative would be to form regional consortia, e.g. only comprising vessels that trade in the Baltic ocean. The problem is that any limitation of the freedom of vessels to join the consortia will limit the efficiency gains of such a system. An additional concern is of course the fact that the challenges of surveying the incentive system increase with the degree of regional differentiation.

4.4 Marginal cost pricing in European shipping - still a long way to go

We have seen that an initiative towards implementing marginal cost pricing in European shipping still will have to pass many hurdles. The *current knowledge about cost structures is quite limited*. We have seen advances in theoretical approaches to port pricing, but still lack credible evidence on the relevant cost structures. The current body of literature suggests that the major pricing relevant marginal costs are related to cost items like cargo handling, mooring, pilotage and ice-breaking. If the knowledge about these direct costs related to port and fairway services is limited, what we know about system-external costs related to environmental hazards is even further from what we would need for implementing an efficient pricing scheme. Here the local variations in the impacts of given emissions will make estimations of external costs very challenging. We do have a few studies suggesting that external accident costs are negligible, but this needs to be corroborated - and tested in congested waters.

Adding to this knowledge gap are the challenges in designing a concrete charging regime that provides the right incentives, and implements an optimal level of sophistication and control. The legal and political challenges are also more complicated in shipping (and aviation) compared to other modes of transport, partly because it is absolutely necessary to seek harmonized supranational - and possibly global - agreements behind some of the relevant actions.

5 PROSPECTS FOR A NEW PRICING REGIME FOR NORWEGIAN COASTAL AND SHORT SEA SHIPPING

5.1 The ongoing pricing project commissioned by the Ministry of Fisheries and Coastal Affairs does not focus on marginal cost pricing

On behalf of the government the Norwegian Ministry of Fisheries and Coastal Affairs has asked the Norwegian Coastal Administration (NCA) to review their dues and charges with the aim of creating a system that stimulates the shift of cargo from road to sea, and which facilitates fair competition. In this commission there are no references made to marginal cost pricing, and this far it seems that the NCA only considers changing the structure of the charges, not the overall level of charges in general.

The shipping industry claims that the high level of user payment for infrastructure and services does not offer short sea shipping a level playing field in the competition against land based transport modes. Another criticism that has been raised is the arbitrary distribution of the burden of the charges. Allocating costs based on gross tonnage could not be justified in a cost-based approach, and the current system involves a lot of cross-subsidiation between ship types and operations in different waters, it is claimed. The regional accounts of the NCA show that charges collected in West Norway to some extent subsidize services offered in North Norway, whereas the South East and Mid-Norway are more or less in balance. This far, however, there has been a political will to keep fairway dues and charges for pilotage the same for the whole coastline.

5.2 The scope for a new pricing regime based on marginal cost pricing principles

There has not been a lot of focus on marginal cost pricing related to Norwegian port and fairway dues this far. The general charging and financing structure has, however, been much focused both within general transport policy documents, and especially in settings where the promotion of short sea shipping has been discussed. The current evaluation of the fairway dues *does not* seem to address e.g. differentiation of the dues by environmental performance criteria a la the Swedish scheme. The high degree of user payment with respect to the provision of fairways, pilotage and port infrastructure and services seems to keep placing issues related to short sea shipping as a minor element in many transport policy papers, since this sector does not show directly in the governmental budgets like the road and rail sectors do. If one were to switch to a pure first best marginal external cost based pricing alternative for ports and fairways, this would certainly lead to a need to finance much more of this sector over government budgets, which may explain the limited political interest for such a scheme. Most Norwegian ports and fairways are not congested, and local and regional environmental impacts are of a very modest magnitude. This means that charges based on marginal costs are likely to fall much short of average costs - thus creating a financial deficit.

We have seen that there is still a very long way ahead for implementing marginal cost based pricing at the European level, and certainly the empirical basis for implementing such charges in Norway is not much better. The existing estimates of marginal costs reported above are based on a relatively weak foundation, and are e.g. not differentiated by region.

It is still possible, based on the information and considerations given above to give some broad recommendations for adjusting the current charging system in a way that probably would improve it's economic efficiency:

- The emission of *greenhouse gases* is generally best covered by a general tax on fuel like the current system.
- The existing *sulphur* charge on fuel does generally contribute to integrating external effects in general. The external marginal impact of sulphur emissions

is, however, considered to be very low in Norway - the main rationale for keeping this fee is therefore related to meeting Norwegian obligations related to the Gothenburg protocol.

- Catering for the impacts of *NO_x-emissions* is a major challenge, and could not be handled well by charges related to fuel consumption. The alternatives launched by the NERA-reports (see section 4.3) related to variants of a credit based trading system seem to rely upon a long series of actions, and must be implemented at a supranational level in order to be efficient. Some efficiency gains could probably be easier to achieve by implementing a scheme similar to the Swedish system with a combination of differentiated fairway and port dues and subsidies for engine modifications.
- Marginal external *accident costs* are probably of very limited magnitude, and the current safety charges could be regarded as charges related to accident risks.
- Marginal costs related to the provision of fairways are probably negligible, which means that the general coastal fee should be dropped.
- Marginal costs of providing pilotage are mainly related to the actual use of the pilots, and is probably relatively well reflected in the pilotage fee. The pilotage readiness fee, however, does generally not reflect marginal costs and should be dropped in a pure marginal cost charging regime.
- There is no solid empirical evidence on the marginal costs of port services in Norway, however one study suggests that almost 90% of the costs may be regarded as fixed (Halseth, Pettersen et al. 2001). The current harbour dues, wharfage and cargo dues would therefore probably not be justified in a marginal cost setting. Other charges related to harbour pilotage, mooring, waste disposal etc. may be more justified from such a perspective. The same goes for the cargo handling dues.

Basing a new pricing regime on these considerations will, as earlier noticed, leave a huge financial deficit, both in the municipal port administrations and for the NCA. If funding these deficits through governmental budget is not considered an option, one should apply second best pricing alternatives like Ramsey pricing or two part tariffs.

6 A LEVEL PLAYING FIELD FOR SHORT SEA SHIPPING?

The question about a level playing field in the competition between short sea shipping and heavy goods vehicles could in principle be analysed by comparing the pricing and financing regimes relative to the cost structures of the two modes of transport. The question is: How should we define a level playing field? Does this mean that both modes pay the same share of the total infrastructure costs, or the same share of their marginal cost responsibility? It is not possible to give a firm answer to this. From an economic efficiency point of view, applying pricing theory, a general conclusion is that if prices deviate from marginal costs in one sector, it would be optimal to deviate with the same proportion in other sectors. However, taxation prescribes that distorting taxes should be issued in the most inelastic markets. Combining these results from economic welfare theory means that one should not necessarily end up in a situation with the same relative cost coverage. Still - the

notion 'level playing field' may be related to some understanding of 'fairness' which could be interpreted as equal average or marginal cost coverage in two competing sectors like this.

6.1 Marginal costs and marginal taxes for heavy goods vehicles

If we study heavy goods vehicles (HGVs) in an external marginal cost setting, only the road provision costs related to traffic volumes are relevant. In addition we will also have to consider marginal external costs related to accidents, environmental hazards and congestion. The most recent Norwegian calculations of marginal costs and charges for HGVs is reported in Econ (2003) and reproduced in Table 2. Note that these figures are average figures for the whole road network, and that both environmental impacts and congestion will be significantly lower for the rural case, and significantly higher for cities. Allocating the right proportion of road costs is a complicated issue, and new evidence suggests that the cost responsibility of the HGVs have been exaggerated in Norwegian studies (Hjelle 2002; 2003; 2006). This is the largest component of the estimated external costs of the heaviest HGV configuration, which means that a lower estimate for this component will significantly affect the calculated total external marginal costs. The marginal charges that apply to HGVs are a general CO₂-tax and the dues on diesel. Calculated as an average charge per 100 vehicle km, the charging level in 2003 was approximately EUR 15 for the 16-23 tonne HGV and EUR 19 for the above 23 tonne HGV (Econ 2003). Judging by these figures, HGVs on average cover 67% and 60% respectively of their marginal external costs through current special marginal taxes. As mentioned above, marginal costs vary considerably by time and place, but current charges are general and not sensitive to shifting traffic conditions and population density. This means that in a rural setting without congestion current charges constitute 127% and 103% of the calculated marginal external costs for HGVs, but in a congested city network, current charges far from reflect the externalities imposed. Calculated relative figures for such a situation are 14% and 17% respectively⁶.

Vehicle type	Climate gases	Local emissions	Noise	Con-gestion	Acci-dents	Road wear	Total
HGV 16-23 tonnes	0.38	4.13	5.38	2.00	3.25	7.38	22.50
HGV > 23 tonnes	0.50	5.13	6.75	2.50	3.38	13.25	31.63

Table 2 External marginal costs of HGV transport in Norway. Average figures for the whole road network. EUR per 100 vehicle km. Based on (Econ 2003)

6.2 Marginal costs and marginal taxes for sea transport

The marginal costs for sea transport are not so easily compiled from the few existing sources of information. Based on Econ (2003) we have a starting point (see Table 1), giving rough estimates per vessel-km for climate gases, local emissions (outside residential areas) and accident costs. To complete the picture we should have

information about marginal costs related to the various elements of port use and pilotage. This information is currently not available. Considering marginal taxes, some taxes and charges are marginal with respect to the number of port calls, some with respect to fuel consumption. Several of the charges that apply per port call could, however, be replaced by annual charges - which is typically done by frequent users. Then these charges could not be regarded as truly marginal in our setting.

The only taxes that could relatively easily be assessed per vessel-km are the CO₂-tax, the distance related part of the pilotage readiness fee, and the sulphur tax for a given bunker quality. The CO₂-tax constitutes approximately EUR 0.47 per vessel km and the distance based part of the pilotage readiness fee would amount to EUR 0.56 per vessel km⁷. These charges alone cover approximately 72% of the marginal cost responsibility related to the calculated emissions to air and accidents. (The current CO₂-tax far exceeds the shadow price for CO₂-emissions applied in Econ (2003)). The evaluation of local and regional impacts of air emissions is done for ship activities outside residential areas. This means that this cost component typically would be much higher in many harbour areas.

Cargo charges and port dues are marginal with respect to the number of port calls. Unfortunately we do not have corresponding estimates to marginal costs of a port call, but in the relatively uncongested ports of Norway, this element is probably very small.

Evidence on marginal cost and marginal taxes for sea transport is - as we can see - very fragmented and not well founded. The figures that we do have suggests that sea transport probably more than covers its marginal cost responsibility, even if we consider the bulk of fairway dues not to be marginal taxes.

6.3 Coverage of average infrastructure cost responsibilities

We have seen that most of the infrastructure provision and related services in Norwegian coastal and short sea shipping is based on user payment. If we exclude the more administrative tasks of the NCA, a very high proportion of the budgets are financed through user payment. The exception is the fairway infrastructure which is only financed by 34% user payment. This brings the coverage of average infrastructure costs for shipping very close to 100% in Norway.

The corresponding coverage for HGVs is not as easy to estimate, due to the fact that most of the relevant infrastructure is jointly used by HGVs and other vehicles (LGVs and passenger vehicles). Allocating these truly joint costs will be arbitrary regardless of method used. However, from section 2.1 above, we have seen that HGVs only cover approximately 7% of the road expenditures which is probably a low proportion even considering the fact that the network is jointly used by cars and other vehicles. However, goods vehicles only constitute 4% of the total number of vehicles using the road, and represent 12% of the annual vehicle kilometres.

7 CONCLUSIONS

We have presented the current status for marginal cost pricing in the short sea and coastal shipping area in Europe and with special focus on Norway. We have concluded that a full implementation of pricing regimes still is far away due to

- Lack of knowledge related to cost structures and levels
- Numerous challenges with respect to political and legal obstacles
- Very challenging implementation issues which may effectively limit the feasible number of charging schemes actually implemented.

However, there should be a scope for improving the efficiency of the current Norwegian charging regime by applying marginal cost criteria to the current structure of charges. Implementing an environmentally differentiated system of fairway and port dues - similar to the Swedish system should be feasible in the near future. Further adaptations would require a more severe change of the current financing structures.

Current marginal cost estimates for shipping services are very rough and incomplete. This makes a comparison of cost coverage between HGVs and shipping hard to accomplish. Current estimates suggest that HGVs on average cover 60-70% of their marginal cost responsibility. Similar figures are hard to calculate for short sea shipping, but comparing current distance- or fuel-based charges to rough estimates of external costs related to air emissions and accidents outside harbour areas give approximately the same relative figure. In addition shipowners pay port and cargo dues that depend on cargo volumes that certainly far exceed marginal costs related to a port call.

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NOTES

- ¹ This figure includes EUR 0.4 billion of toll road investments and an estimate of the expenditure for municipal roads based on an extrapolation of reported figures from 2000 to 2003.
- ² The climate gas emissions comprise CO₂-emissions plus CH₄-emissions transformed into CO₂-equivalents.
- ³ All EUR-figures based on the ECON-report has been transformed from NOK using an exchange rate of 8 NOK/EUR, which is very close to the prevailing exchange rate in mid August 2006. NOTE: This exchange rate is applied for all figures originally given in NOK throughout this paper.
- ⁴ Based on the assumption that all NO_x-emissions are emitted far from concentrated residential areas.
- ⁵ Based on the presumption that current concentration levels of NO_x and VOCs are low, which combined with low average temperatures make the problems related to ground level ozone very small in Norway.
- ⁶ All these calculations are based on a combination of figures that could be found in Econ (2003) and a NOK/EUR exchange rate of 8.00.
- ⁷ The part of the pilotage fee that is time-dependent could - e.g. by assuming an average speed of 17 knots - could be evaluated at EUR 3.60 per vessel-km for a 3 500 gt vessel. However, since this charge could be expected to be cost based as it is, and since the costs for pilotage are not included in the calculated marginal costs, we leave this element out of the comparison.