

Summary:

Competition between transport modes and intermodal transport in the Norwegian freight industry

Introduction

The basic purpose of freight transport is related to the production of goods and the need to transport these from their manufacturers to their users. In a modern society with a well-functioning transport sector, goods production will be done by a relatively small number of efficient units that exploit economies of scale. Freight transport is therefore a relatively major enterprise in a modern society with its high degree of specialisation and its productive units serving geographically large markets.

Data basis for the analysis

The analysis of freight flows in Norway is based on data from Norwegian State Railways (NSB), and Statistics Norway's (SSB's) Goods Vehicle and Maritime Census. The SSB statistics are samples, which means that they do not cover all the municipalities in Norway. They have therefore been supplemented by other statistics from SSB, namely the Primary Industry Statistics, the Manufacturing Statistics, the Wholesale and Retail Trade Statistics, and so forth.

The data are from a combination of the years 1993 to 1996, due to the fact that no Maritime Census has been held since 1993. However, the data should represent the activity in a single year.

The composition and development of the freight market

From 1980 and until 1995, the annual growth in Gross National Product (GNP) has been higher than the growth in transport work, but from 1995 transport work has had the highest annual growth. This development can be explained from the fact that the growth in services has increased faster than raw material production and visible trade, whereas since 1995 transport work increased rapidly in consequence of a period of buoyant economy and increased visible trade.

The relative importance of transport modes changes more or less continuously over time. Throughout the period 1970 to 1988, there was a steady growth in total freight

volume and transport work. Relatively speaking, transport work grew fastest, in consequence of an increase in average transport length. This increase may be explained inter alia in terms of recent years' clear trend towards chain formation, centralisation of production and wholesaling, and the fact that production is steadily being globalised, because labour - an immobile factor - is considerably cheaper in eastern countries.

Maritime transport's share of transport work declined until around 1988, and road transport has increased correspondingly. From 1988 until 1994 there were only minor changes in the composition of transport work; after 1995 sea transport's share of domestic transport work has been relatively constant, and in 1998 accounted for 41 per cent of total domestic transport work. In 1998 the road vehicle accounted for about 51 per cent of transport work, while rail took the remaining 8 per cent. Road transport has increased by as much as 54 per cent from 1990 to 1998, while the total growth in domestic transport work has been 31 per cent.

If we look at the composition of transport work in the European countries, Norway stands out with the highest share of transport work going by sea. Rail, however, has a considerably stronger position in Sweden and Finland than in Norway, and accounts for about 30 per cent of transport work in both. On the other hand, domestic sea transport is only a small fraction of Swedish and Finnish transport work, so that road transport's share of transport work is higher than in Norway.

Road transport is wholly dominant as regards short-range freight, approaching 100 per cent of journeys under 100 kilometres. The share of freight carried by sea rises with distance, and for distances in excess of 400 kilometres accounts for about 48 per cent of freight volume. Even if road freight is strongest in the short haul, its share of long-distance transport has also been rising.

For road freight we find that it is particularly general cargo, but also oil products transported up to 100 km, that is increasing the fastest. Both dry bulk and lumber/timber products are falling as a proportion of road transport for all distance categories. If we look at goods categories in greater detail, we find that it is particularly foodstuffs, drinks, tobacco etc., plus metals, carried by road that are increasing fastest.

The foreign trade statistics show that there has been a transfer of low-value general cargo from sea and rail to road. This redistribution has led to the average goods value per kilo falling for all transport modes from 1985 to 1997. In addition, we find that the share of imports, and particularly exports from and to Sweden has increased from 1992 to 1997. This may be explained by the fact that the last five years has seen a change in chain structure, from national to Nordic players (e.g. ICA/Hakon, Dressmann, Elkjøp, Narvesen, etc.). Stronger chain formation often leads to a change in role allocation between the producer and the wholesaler: chains take over the national distribution roles that used to be assigned to the producer. There is therefore a trend towards the closure of national distribution warehouses run by international goods producers, which makes the big chains more important as national and regional distribution channels, even for big international manufacturers. The big players' future organisation of their distribution systems may lead to national distribution being replaced by Nordic or North European, which in the long run may reduce the share of imports coming to Norway by sea.

Trends in the international freight industry

The development of the Norwegian freight and logistics industry is to a large extent affected by what happens abroad, since Norway is a small country with an open economy.

Internationalisation and reduced barriers to international trade mean enhanced market access for foreign companies making competing products. This means that players will endeavour to exploit economies of scale by concentrating production in fewer geographical areas. At the same time, the pattern of consumption are trending in the same direction. More and more “global products” are being developed, that is, products marked under the same name and with the same quality all over the world. This increases the volume of international freight.

Stabenau refers to four phases of logistics. The first, in the 1960s, was focused on the optimisation of physical distribution with regard to price, quality and cost. These remain crucial criteria for choice of transport mode. In the 1970s the trend was to order-controlled production, while from the 1980s there has been a sharp reduction in in-house production. The 1990s have seen a sharp increase in the logistics processes involving several companies. In-house production has been further reduced, and an increased complexity of logistics functions together with a greater need to coordinate production between different companies has caused a rise in demand for professional third-party logistics contractors.

Competition between transport modes in the freight industry

If the freight users are faced with more than one alternative for the solution of their freight needs, we may speak of competition between transport modes. Competition in the freight market may apply between transport modes and between carriers. The most important competition parameters in a free market are freight price and freight quality. By freight quality we mean quality factors related to the transport, and the most important of these are transport time, delivery date reliability, frequency of any scheduled services, the risk of damage to goods in transit, the flexibility of the transport mode plus customer service.

On the basis of the Road Vehicle Censuses of 1993 to 1997 and the Maritime Census of 1993, we find that cargo weight and transport distance has a considerable effect on freight price per tonne carried. Relative price difference for changes in weight and distance is about two-thirds, but with opposite signs for weight and distance. These results accord perfectly with previous analyses of the Road Vehicle Censuses from 1988 and 1993, and appear to represent a basic correlation in the pricing of road transport, a correlation that is stable over time. For sea transport, we find a rather different relationship between freight prices and changes in weight and distance. The price difference for changes in transport distance is 21 per cent, while the equivalent for changes in consignment size is minus 34 per cent. This shows that sea transport has its own competitive advantage for large consignments to be transported over a long distance.

We also find that, all other things being equal, the freight price for road transport is 6 per cent lower related to parallel rail links. There is no corresponding result for

parallel sea connections, which it is tempting to interpret as meaning that sea is less of a competitor for road than is rail transport. This may be due to the fact that domestic sea transport covers a section of the market from which road transport is excluded, for example being particularly competitive for large consignments and goods with low unit values. On the basis of the Maritime Census we find no significant differences in freight prices between routes with and without parallel rail transport.

For road transport we find that general cargo has a four per cent higher freight price per tonne transported than for other goods, while for sea transport we find that, all other things being equal, the freight price is as much as 55 per cent higher for general cargo than for other goods. The higher price of general cargo per tonne than other goods may be due to the fact that it requires more cost-intensive handling than other goods, and that loading and unloading therefore take longer; also that they are more voluminous and thereby utilise the vessel's cargo capacity less efficiently than for example bulk goods. Moreover, general cargo is generally high-value goods and therefore tolerate a higher freight price than bulk without triggering the choice of a different transport mode.

Geographically, there are major differences in freight price per tonne. For road transport, we find that the freight price for journeys to and from Norway's three northernmost counties (Nordland, Troms and Finnmark) are about 19 per cent higher than for journeys within Eastern Norway, while journeys in the rest of the country are 11 per cent more expensive than those within Eastern Norway. If the transport is headed for Oslo, then all other things being equal the freight price is 11 per cent higher than for journeys in the opposite direction. The reason for this is an asymmetry in the flow of goods; more goods leave Oslo than come in, and so it pays the carriers to take cheap return cargo rather than go home with an empty vehicle. For domestic sea transport we find that the freight price per tonne for trips to, from or within the three northernmost counties are about four per cent higher than for journeys within Eastern Norway, while in the rest of South Norway the freight price is about 20 per cent lower than for maritime transport in Eastern Norway. There are several reasons for the sharp regional difference in prices. One may be operational conditions; small freight volumes and thus few assignments, poor capacity utilisation and long-term asymmetry of direction are all factors that conduce to higher operating costs and thereby higher prices, if the carriers are to stay in business long-term. In other words, a higher price level may be the precondition of there being a freight service in the rural districts at all. Another factor may be that there is simply less competition, which means that the carriers can take higher prices in areas with a sparse customer base. This illustrates the existence of geographical differences in industry's transport costs.

On the basis of the Road Vehicle Censuses of 1993-1997 we have calculated the annual relative price changes. In both 1996 and 1997 freight price per tonne transported was 7 per cent higher than in 1993, but in 1994 and 1995 we do not find that freight prices per tonne transported were significantly different from 1993. The consumer price index for the same period increased by 20 per cent in the same period, so that the freight price has fallen in real terms, and the freight price was therefore a lower proportion of the value of the good in 1997 than in 1993. This may be explained on the basis of the foreign trade statistics, which show that low-

value general cargo and high-value bulk have been transferred from sea and rail to road.

Intermodal transport

Competition in the freight industry often concerns a choice between transport solutions involving more than one mode of transport. Such transport solutions mean at least one cross-loading or terminal handling somewhere in the transport chain. It is the total of the efficiency of all the operations in the transport solution that dictates how efficient and competitive the transport solution appears to the users.

There are many reasons for employing intermodal transport. The original idea was to relieve the badly overcrowded European road network by transferring some of the traffic from road to sea and rail transport. Another goal, of more relevance to Norwegian conditions, was that transfer from road to sea and rail means environmental gains.

On the basis of the cost functions in NEMO, we have calculated the shortest transport distance for the combination road vehicle/ship and road vehicle/rail when economically profitable in relation to road transport door-to-door. If a 5-kilometre road delivery is included at both ends of the chain, this means two cross-loadings. The minimum distance for sea transport is then about 550 km for general cargo, whereas for timber it is 190 km, 220 km for bulk products and 160 km for petroleum products. The minimum distance when rail transport is combined with a 5-kilometre road delivery at both end of the chain, the minimum distance is calculated to 520 km for general cargo, 390 for timber and petroleum products and finally 630 km for bulk products. This shows that costs related to delivery and cross-loading must be reduced if intermodal transport is to grow in scope.

Distribution of modes of transport between geographical areas

We find that general cargo transported by rail today is restricted to distances over a minimum of 300 kilometres, and is mainly transported between the main towns at the termini of the railway lines. On several of these routes rail is the dominant mode of transport for general cargo. More than 80 per cent of the general cargo transported between Oslo and Nordland county goes by rail. Other routes with a high percentage of rail freight are Oslo to Hordaland county (the county seat, Bergen, is 479 km by rail), accounting for 70 per cent of the general cargo, Oslo to Rogaland county (Stavanger, 586 km) accounting for about 50 per cent, and from Buskerud county (Drammen) to Rogaland and Hordaland, with 60 and 70 per cent respectively.

The distribution of transport modes for timber and lumber is quite different from that of general cargo. For these goods, the proportion carried by rail is 20 per cent for all journeys of 100 kilometres or more, while 15 per cent of the timber is carried by sea. As much as 78 per cent of the group timber and lumber carried by rail comes *from* Hedmark county. This is mainly timber being carried to the wood-processing industry.

For dry bulk we find much the same as for general cargo; there is practically nothing of this group that is carried by rail for distances between 100 and 250 kilometres. On routes of 250 kilometres or longer, 7 per cent of the dry bulk is carried by rail. These rail routes run mainly from Oslo and the counties of Østfold, Hedmark, Buskerud, Telemark, Møre og Romsdal, Sør-Trøndelag and Nordland, while the most important destinations are in Oslo and the counties of Østfold, Vest-Agder, Rogaland, Hordaland, Sør-Trøndelag and Nordland.

Sea transport is the dominant mode of transport for general cargo to the three northernmost counties; about 50 per cent of the general cargo originating or bound for these counties is carried by sea on routes 400 kilometres or longer, but ship is also an important mode of transport for general cargo from Rogaland in the south to Finnmark in the north, almost 30 per cent.

Sea transport of timber and lumber is also restricted to a handful of counties: mainly from Sogn- og Fjordane (15 % of the sea transport starts here), Møre og Romsdal (31%), Sør-Trøndelag (20%) and Nordland (15%). The counties to which the goods are bound are Østfold, Buskerud (the Tofte plants at Hurum) and Nord-Trøndelag (the Skogn and Holla plants).

For dry bulk, sea is the dominant transport choice, even for journeys between 100 and 249 kilometres, and accounts for 51 per cent of the quantities carried over these distances. In contrast to transport of both general cargo and timber/lumber, sea transport of dry bulk is significant also for goods originating in or bound for Eastern Norway. Dry bulk is mainly loaded at industrial quays along the coast, which means that the entire transport chain is seaborne from sender to recipient. As much as 75 per cent of the dry bulk journeys start in the counties of Telemark, Rogaland, Hordaland and Nordland. Most of the dry bulk carried by sea goes from Grenland to Oslo and Buskerud, from Rogaland to both Rogaland and Hordaland, from Hordaland to Rogaland and Sogn og Fjordane, plus within the counties of Møre og Romsdal and Nordland.

The data are specific to transport mode and consequently does not cover transport chains. So that they do not allow us to say anything about the length of the supply transport to sea and rail carriers .

An estimate has been made regarding the proportion of the goods carried longer than 100 kilometres and using more than one mode of transport in their transport chain. On the basis of our assumptions, we conclude that about 25 per cent of all goods carried 100 kilometres or longer are cross-loaded between different transport modes at least once. Of these cross-loadings, almost 70 are from sea to road, whereas from rail to road accounts for about 30 per cent. In addition, we have made a rough estimate of the potential for goods that are theoretically transferable from road to intermodal transport solutions, namely a further 8 per cent of all goods carried 100 kilometres or more. Such a transfer will, however, lead to an increase in short-distance road transport; but it will depend on a material reduction in the costs of cross-loading between transport modes.

Conclusions

Norway's geographical extent, combined with its scattered production and population, means small concentrations of goods which are in themselves an obstacle to intermodal transport solutions.

Road transport is in principle the most flexible and time-effective form of transport. The professional literature, however, indicates that many people demand overnight transport because the service is available, and not necessarily because they really need the good delivered next day.

On the basis of the Road Vehicle Census, we find that transport prices are significantly lower on routes where there are parallel rail services, while there are no equivalent differences in transport prices on routes offering alternative sea transport. This shows that rail is a real alternative to road transport, while sea transport largely serves a different market. Sea transport is dominated by large consignments to be carried over great distances.

In general, we have found that rail does not become a real transport alternative until distances greater than 300 kilometres. Timber and lumber are the only goods that to any extent are carried by rail for distances shorter than 300 kilometres. These transports are almost always special timber trains. General cargo between the termini of the railway lines, that is, between the big cities (e.g. Stavanger/Oslo, Bergen/Oslo, Bodø/Oslo, etc.) is carried mainly by rail, where the railways account for more than half the cargo carried between Oslo and the counties in which these cities are situated.

If rail is to be competitive over shorter distances, conditions must be created to reduce the costs of the road delivery phase. Examples of such measures are siting of the terminals and changes in taxation of road transport, but also more cost-effective operation of the terminals. An alternative to a reduction of the costs of the delivery phase is reducing the costs of the transport on the main route. For example, the costs of locomotive power are higher on the Norwegian railways than in other counties.