THE RELATION BETWEEN PORT COMPETITION AND HINTERLAND CONNECTIONS

THE CASE OF THE 'IRON RHINE' AND THE 'BETUWEROUTE'

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Abstract

This paper discusses the relationship between port competition and hinterland connections. The analysis presented is based on expected trends in maritime transport and the likely consequences for seaports. The inauguration of the Betuweroute in 2007 offered the port of Rotterdam additional rail capacity to Germany. The port of Antwerp, meanwhile, is pressing for the reactivation of the Iron Rhine, a direct rail link to that same German hinterland. Research has shown capacity to be the key to success, both in maritime throughput and in hinterland transportation services.

Keywords

Port competition , hinterland connection, capacity, Iron Rhine, Betuweroute

1. Introduction

Within the Hamburg-Le Havre range, the ports of Antwerp and Rotterdam are engaged in a competitive struggle involving two railway lines to the German hinterland. In 2007, the Netherlands inaugurated the so-called Betuweroute, connecting Rotterdam with the Ruhr Area in Germany. Belgium, for its part, intends to reactivate the Iron Rhine, an existing line between Antwerp and the Ruhr. So here we have two transport projects to the same destination zone: a perfect illustration of how port competition can manifest itself on the battlefield of hinterland transportation.

In this paper, we take a closer look at two hinterland projects, more specifically in the context of inter-port competition. From a transport economic perspective, the Iron Rhine and the Betuweroute are also very much port projects, in the sense that it will achieve two things that will inevitably affect hinterland transport services:

- Additional capacity shall be created for goods flows to and from Antwerp and Rotterdam;
- In comparison with the existing and operational railway lines the new lines will cut transport-related expenses, through lower out-of-pocket and time costs; in principle, a comparatively lower cost for rail transport should impact on the modal split.

Hence, it is important that forecasting in the field of hinterland transportation services should take due account of the aspect of 'port competition'. The relationship referred to is twofold. First, the reactivation of the Iron Rhine may improve the relative competitive strength of the

directly affected ports of Antwerp and Zeebrugge, and, to a lesser extent, Rotterdam as well. Second, the appeal of those ports shall inevitably impact on the utilisation rate of available rail transport capacity, including on the Iron Rhine.

In this paper, we attempt to gain better insight into some of the principal aspects affecting port competition. To this end, four elements are put forward:

1. An outline of the competitive environment from the perspective of the ports of Antwerp and Rotterdam. Which factors affect port competition, both within the Hamburg-Le Havre range and between different ranges? How may we expect inter-port competition to evolve in the future? What is the nature of the mutual power balance between the various actors involved in the choice of both port and hinterland connection, in terms of both mode and route?

2. An evaluation of which goods flows are likely to be affected. More specifically, we are concerned with flows between between the Ruhr region in Germany and the ports of Antwerp and Rotterdam respectively.

3. An analysis of the growth perspectives, as well as an assessment of the likely limits to growth (e.g. in terms of available terminal and throughput capacity).

4. An assessment of how port competition may be affected by the reactivation of the Iron Rhine and how this would impact on the choice of port.

2. SURVEY OF PORT COMPETITION

Global ports are often regarded as engines of economic growth, and with good reason. At the same time, though, they lie embedded in a highly competitive environment. Hence, insight is required into the factors that affect port competition and competitiveness.

The ports of the Hamburg-Le Havre range have, in recent decades, generally performed well. Huge growth has been recorded in terms of not only throughput but also employment and added value. For a long time, this growth was taken for granted: it was seen to be the logical consequence of the location of these seaports and the presence of knowledge and skilled workers, which is translated into high productivity.

In more recent years, however, this self-evidence has evaporated. While some ports have continued to grow in absolute terms, they have suffered a decline in market share in container throughput, a crucial subsector in freight logistics. Other ports have seen a significant downturn in specific market niches, such as break bulk.

In what follows, we take a closer look at the competitive environment in which ports operate. We deal consecutively with forecast trends in maritime transport and the likely consequences for ports, future focal points for the maritime sector, and the relationship between port competition and hinterland transport services.

2.1 Trends in the maritime logistics chain and their consequences for ports

First and foremost, it should be noted that the world economy has changed in a quite fundamental way, as international trade (and hence maritime transport services) has expanded enormously in a trend characterised by a worldwide redistribution of labour and capital and an integration or globalisation of markets. It should be noted that this altered world economy continues to drive the maritime sector today (Meersman and Van de Voorde, 2001; Meersman and Van de Voorde, 2006).

Ever-larger shipping companies are increasingly manifesting themselves as strategic customers of ports. On the one hand they attract traffic and industrial activity to the port, while on the other they are attracted by such industrial activity. Freight passes through the ports, after which drayage may be taken care of either by the ocean carrier (i.e. 'carrier haulage') or the shipper (i.e. 'merchant haulage'). We have also witnessed substantial scale increases on the part of shipping companies in recent times. This has been achieved first and foremost through horizontal cooperation and/or mergers and takeovers. Additionally, shipping companies have set their sights on terminal operators and hinterland transport services, as operations are increasingly approached from the perspective of complex logistics chains, whereby each link must contribute to the constant optimisation of the entire chain. This has altered the competitive balance in the market, as shipping companies have acquired greater overall strength through their control of logistics chains.

Within the ports themselves, we have also witnessed an important structural evolution: traditional stevedoring firms are increasingly developing into more complex terminal operating companies, as a lack of working capital induces mergers, takeovers and externally funded expansion projects. External capital is sometimes also provided by shipping companies. Port authorities, for their part, initially chose to watch rather passively from the sideline as these evolutions unfolded.

In view of the above, the question arises which scenarios are likely to play out in the future. Will economic growth persist? And if it does, will it continue to translate into greater demand for maritime transport? Or will economic growth manifest itself in services rather than in industrial output? And will the previously described scale increases on the basis of horizontal and vertical integration also continue? What are the likely consequences of the deployment of ever-larger vessels, particularly in the container business? What kind of timeframe may shipping companies be looking at in their search for new partnerships? And which strategies may the other market players deploy in response[1]? Put differently, will shipping companies

[1] In recent years, most port and higher public authorities have concentrated mainly on the container business. The question arises whether this is or has been a wise strategy. After all, not all cargo can be containerised. Moreover, the added value and profits realised in, say, project cargo are usually significantly higher than in containerised cargo.

Consider the following two (related) examples:

1) The petrochemical industry is extremely important to the ports of Rotterdam and Antwerp: it provides significant employment and represents substantial added value. It is, moreover, a non-footloose industry that also fulfils an important supply function to other companies and sectors. At the same time, however, it is sensitive to changes in environmental legislation and industrial policy.
2) The revenue realised by the major ports usually consists in a cyclical and a non-cyclical component. Revenue from concessions (to both industrial concerns and terminal operating companies) are relatively stable in the short to medium term, i.e. they are less sensitive to cyclical fluctuations.

become the dominant players and thus be able to impose their will upon other parties, including port authorities and terminal operators?

Each of these essential issues is shrouded in uncertainty. Moreover, the market in which they present themselves is an extremely dynamic environment. One may reasonably assume all parties involved in it to proceed proactively and to anticipate on moves by other players.

Quite enlightening in this respect is the work of Heaver et al.. (2001), in which the various forms of cooperation and concentration in the maritime sector are examined. The observed configuration still exists today, with some parties engaging more actively than others in the search for partnerships. Table 2.1 provides an overview of the various forms of cooperation that characterise the sector. We restrict ourselves to shipping companies, terminal operators and port authorities.

Table 2.1. Types of strategic partnerships in the maritime sector

Market players	Shipping companies	Terminal operators	Port authorities
Shipping companies	• Vessel sharing agreements • Joint-ventures • Consortia • Alliances • Mergers and take-overs • Conferences		
Terminal operators	• Joint-ventures • Dedicated terminals • Capital share • Consortia	• Mergers and take-overs • Joint-ventures	
Port authorities	• Concessions for dedicated terminals	• Concessions • Joint-ventures	• Alliances

Source: own processing of data from various shipping companies, terminal operators and port authorities and Heaver et al. (2001)

2.2 Focal points for the future maritime sector

In order to understand how port competition may evolve further, greater insight is required into the maritime context as a whole. In which direction will the maritime sector move in the foreseeable future? Which position should port authorities adopt? Will players presently acting within the port perimeter, such as terminal operating companies, be able to survive independently? Again, these are questions shrouded in much uncertainty. We shall deal consecutively with the rationalisation trend among shipping companies, land-side developments, and the new role of the port authorities. On this basis, we shall try to outline an emerging framework that is bound to impact on the specific significance of hinterland transport.

2.2.1 Shipping companies: rationalisation, mergers and scale increases

The greatest amount of movement is observed in the container transport business. And it is precisely in this dynamic subsector that we make a peculiar observation: while shipping companies complain about relatively low freight rates as a consequence of overcapacity, they nevertheless continue to invest heavily in even more capacity. Table 2.2 provides an overview of container vessels (existing fleet and orders) in 2007 and 2008.

Table 2.2. Overview of container vessels (existing fleet and orders) in 2007 and 2008

	Existing fleet (number)	TEU x 1 000	Orders (number)	Orders (TEU)
1/1/2007	5,695	10,464	1,310	4,374
1/1/2008	5,915	11,730	1,447	6,885

Source: Dynamar B.V. (2008)

The underlying strategy of these shipping companies is clear to see: in response to already low freight rates, they are attempting to deploy additional capacity at a lower operational cost per slot. Moreover, they consider a mixed fleet as a means of spreading risks. Additional cost control can be achieved through mergers and takeovers, and the capacity reduction this would entail. Strategic and financial considerations by the holdings that control the shipping companies will keep capacity further in check, through strategic alliances, new partnerships, the rerouting of vessels (cf. Table 2.1). These evolutions may / will give rise to changes in direct port calls, which may in turn have significant implications for hinterland transport projects such as the Iron Rhine between the port of Antwerp and the industrial Ruhr region in Germany. Moreover, rerouting may also imply shifts in freight volumes to be transported to and from the hinterland. On the other hand, it is perfectly conceivable that a port may compensate largely or even wholly for a drop in direct port calls through additional (maritime) feeder services.

There is little doubt what impact the above developments will have on the maritime logistics chain in its entirety. In the short to medium term, these kinds of rationalisations are bound to result in a radical reorganisation of services. We shall witness the emergence of new alliances, within which further mergers and takeovers will occur. On the side of the shipping companies, the market will stabilise, though there will of course be fewer players following the inevitable rationalisation and concentration drive.

A issue of concern to port and public authorities is where the increase in container vessel size will stop. Will we see a further evolution towards 10,000 to 12,000 TEU, or even up to

Malaccamax-sized vessels of 18,000 TEU? The answer no doubt depends on the exact context. However, there is no denying that some of Maersk's more recent fleet additions represent another step in that direction (e.g. Emma Maersk).

On the other hand, this new generation of larger vessels will serve as a laboratory for knowledge acquisition in the technological as well as the economic field. The present state of science suggests that increasing vessel size will lead to a different cost function, among other things because of the necessity of a second engine (for further details, see for example Stopford, 2002). Moreover, shipping companies have had some unpleasant experiences with scale increases in tanker shipping, including the imposition of higher port dues. The expectation is therefore that they will not allow themselves to be manoeuvred into a situation where they have no alternative seaport, i.e. where port authorities are all too aware that ship owners' price elasticity is extremely low. Finally, benefits of scale achieved at sea may be lost through higher terminal and hinterland transportation costs due to the greater freight volumes involved. Let us consider this point in further detail[2].

2.2.2 Land-side developments

It is important to the maritime logistics chain that the economic benefits shipping companies seek through far-reaching scale increases and the corresponding cost reduction should not be wasted through time and cost bottlenecks on the quay, in the terminal or during hinterland transport.

Many Northern European ports intend to further expand in the short to medium term, albeit almost entirely in terms of container throughput capacity. Table 2.3 provides an overview of these expansion plans. The result is again quite predictable: any substantial growth in capacity will further aggravate the existing problem of overcapacity in the world market and at certain European ports. Examples that come to mind are Amsterdam, Cagliari, Zeebruges and Sines.

Besides these plans for additional capacity, there is also the issue of the manner in which freight handling at terminals is organised. Here too, we notice a concentration movement, inspired in part by the growing need for investment capital, which the original owners are often no longer able to supply themselves. This concentration movement, coupled with the market entries of such players as PSA, Hutchison Whampoa and DP World have also created a buffer against any attempt at vertical integration on the initiative of the shipping companies.

[2] The question arises how far one can / should go in order to achieve economies of scale and scope. Consider the following example: in the deployment of 8,000-plus TEU vessels, the number of calls is restricted to ports handling large volumes (in the order of 1,000 to 2,000 movements). However, the system still relies on 'hubs', implying additional handling costs. One may reasonably assume that it will then become interesting for non-mainports to attract smaller ships (e.g. in the order of 1,500 to 2,000 TEU) offering direct origin-to-destination services, without hubbing and associated additional handling and storage costs.

Table 2.3. Planned expansion of container capacity in a number of Northern European ports

Port	Terminal	Unused capacity / Planned introduction
Amsterdam	CERES Paragon Containerterminal	2006: 1,000,000 TEU extra
Antwerp	Deurganckdock terminals	2005: 7,000,000 TEU extra
Bremen	CT 4	4 new berths between 2006 and 2008
Vlissingen	Westerschelde Container Terminal	2,000,000 TEU, no date specified
Hamburg	Eurogate Container Terminal Hamburg CTH HHLA Container Terminal Burchardkai CTB HHLA Container Terminal Altenwerder CTA HHLA Container Terminal Tollerort GmbH CTT	2010: 1,900,000 TEU extra 2010: 2,400,000 TEU extra 2010: 600,000 TEU extra 2010: 1,050,000 TEU extra
Le Havre	Port 2000	Phase 1: 4 quayside berths (2005-2006) Phase 2: 2 quayside berths (2008-2009) Phase 3: 6 quayside berths
Rotterdam	EUROMAX terminal Maasvlakte 2	2008: 3,000,000 TEU 2013: 17,000,000 TEU
Zeebrugge	Albert II dock	1,000,000 TEU, no date specified

Source: own processing of data from various port authorities

Obviously, the prospect of even further concentration among terminal operators poses an economic threat to shipping companies, as reduced competition may lead to lower productivity growth, longer vessel-handling times and, perhaps most importantly of all, higher rates. The latter evolution is primarily a consequence of the fact that shipping companies no longer have a choice between any number of rival terminal operators, but are increasingly dependent upon large players who operate in different locations and are therefore able to negotiate longer-term package deals for services in those different ports. This way, the focus of port competition will gradually shift from the level of individual port authorities to that of terminal operators, i.e. large groups that are able to offer regional networks of services.

We may assume with a high degree of certainty that shipping companies will not be prepared to (continue to) undergo this evolution. As their relative market power is at stake, it seems logical that they should put greater effort into acquiring so-called dedicated terminals, be it under joint ventures with local terminal operators or otherwise. This need not be detrimental to the port authorities' cause, as it will at least make shipping companies less footloose, in the sense that a long-term relationship is thus forged that makes them less likely to relocate (Heaver et al., 2001). In the short term, such dedicated terminals may however lead to lower utilisation rates of available capacity.

2.2.3 Port authorities in a new role

Based on the foregoing, we conclude that the involvement of port authorities in commercial activities within the logistics chain is declining. Consequently, the market power of those port authorities and, as the case may be, the public authorities that control them is also decreasing. In the debate on port competition, the aspect of a port's competitive strength is, for that matter, no longer regarded separately, in comparison with that of other, rival ports. Henceforth, ports are considered to perform well insofar as they are part of competitively strong logistics chains. Control over those logistics chains, however, lies only in part with the port authorities and the undertakings located in that port.

The question of where market power actually resides cannot be answered unequivocally, as the situation varies from port to port. In the case of such mainports as Rotterdam and Antwerp, it is already the case that terminals are given in concession, albeit mostly under a

joint venture between a shipping company and a terminal operator. From this, we draw the following conclusions:

1) The shipping companies and terminal operators involved appear to adhere to the saying 'If you can't beat them, join them'. Rather than engaging in an all-consuming competitive struggle, they prefer to collaborate. The immediate effect is, however, a new decline in the relative power of port and public authorities;
2) Revenues from a dedicated terminal may be higher, but now they need to be divided. In the case of a 50/50 terminal, the operator must, unlike in the past, give up 50% of profits to the shipping company. On the other hand, terminal operators thus acquire greater certainty that freight flows will be retained or may even increase in the future.

The strategy proposed is, in any case, more pure than that previously pursued by some port authorities in trying to gain influence in the port debate. A typical example is the port authority of Rotterdam, which in 1999 acquired a 35% stake in the capital of terminal operator ECT. Such moves, be they temporary or not, raise concerns over possible conflicts of interest, especially as the port authority will subsequently have to decide on whether or not to grant concessions to what are, to all intents and purposes, its competitors.

In the current negotiation game between shipping companies and terminal operators, the port authorities hold one strong trump card: they have the power to grant concessions and to determine their duration. Once a long-term concession has been awarded, they lose much of their market power, though. It has, for example, hitherto proven very hard to penalise concession holders who fail to achieve the objectives of their business plan. Consequently, there is an economic incentive for port authorities to award long-term concessions (e.g. 30 years), but in conjunction with mandatory interim objectives agreed upon beforehand with the concession holder.

2.3 The relationship between port competition and hinterland transport

So what does the above analysis, whereby port competition was approached from the perspective of maritime logistics chains, tell us about the aspect of hinterland transport?

Logistics in general, and the maritime and port industry in particular, are evolving very rapidly. Port authorities and enterprises are always confronted with new technologies. From a business economics perspective, strategies are constantly adapted with a view to increasing market share and, more importantly still, profits. All of this translates into an altered market structure. For hinterland transport services, which depend entirely on volumes of freight to be carried to and from ports, this is extremely important.

The short-, medium- and long-term future of the seaports in the Hamburg-Le Havre range is fraught with uncertainty too. However, the previously outlined trends point at certain elements that can help us reduce this uncertainty to some extent. We summarise them as follows:

- We may reasonably assume that the economy and international trade will continue to grow substantially in the future. This trend will also manifest itself in maritime trade. Throughput in the Hamburg-Le Havre may be expected to grow proportionately, and so too may demand for hinterland transport services. Any shifts in the competitive balance between ports may however result in relative shifts in freight flows between

those ports. Hence, an improvement of hinterland transport services has direct relevance, not only to ports' capacity for growth, but also to shifts in the competitive balance.

- There are no indications of increasing profit margins in maritime transport. This is in itself rather surprising, as ocean carriage involves a risk for which investors may reasonably expect a premium. Consequently, at the level of individual shipping companies, shareholders will exert constant pressure on management to improve business results. Management will in turn continue to pressurise other links in the logistics chain, including hinterland transport services, thereby occasioning further vertical integration.

- Some shipping companies have, in recent years, taken a number of important long-term decisions, including in relation to fleet expansion. At aggregate level, this holds a real danger of overcapacity, which would inevitably lead to further rationalisation and cost reduction through partnerships, takeovers and mergers. Such movements may, or will, result in changes in terms of shipping companies' ports of call, loops and frequency of service. Obviously this will have a knock-on effect for hinterland transport services.

- In the short to medium term, overcapacity will result in lower freight rates and lower ROI, putting additional pressure on market players elsewhere along the logistics chain. Over a slightly longer time horizon, a lack of working capital may give rise to cooperation agreements that go beyond the level of dedicated terminals. Hinterland transport services will then become potential participants in an integrated logistics chain.

So how do the above insights translate into recommendations regarding the forecasting of future freight flows to ports and, subsequently, taking into account the modal distribution, regarding potential hinterland freight flows?

1. In the first instance, one could make aggregate forecasts of future maritime transport. Preferably, one should distinguish between the general goods categories (coupled with the type of transport and vessel, e.g. containers versus break bulk) and the different shipping areas. By applying growth figures to current flows and modal shares, one obtains an initial indication of future demand.

2. Much will depend on the behaviour of the shipping companies, who are, after all, ports' largest and most influential customers. They may determine their behaviour individually or under so-called strategic alliances. Carriers may even go so far as to reduce or end their footloose behaviour if they are allocated a dedicated terminal in a particular port. In order to gain insight into such strategies, a detailed analysis is required at the level of individual shipping companies.

3. A decisive factor in individual shipping companies' behaviour is their aversion to any potential time loss. They will opt first and foremost for seaports and terminals that are free of bottlenecks. Hence the importance of having enough free and directly available capacity. Available (theoretical) container capacity, multiplied by a realistic capacity utilisation factor, is therefore a useful indicator of future throughput.

We have thus far focused primarily on container traffic and throughput. However, the ports of Antwerp and Rotterdam attract not only containers, but just about any unit load, liquid as well dry bulk, and virtually any goods category on virtually any geographical relation. And each of these submarkets is characterised by different degrees of freedom.

Moreover, a detailed analysis ought also to take account of all actors present within a particular port. Major shipping companies are approached differently than minor ones, if only because they possess different market power; terminal operators are approached differently than shipping companies, etc. In the once much praised port cluster analysis, very divergent subsectors are combined into a single measure. However, while an adequate policy does require an awareness of cluster effects, one should not neglect the singularity of individual enterprises and sectors. It would therefore appear to make sense also to look within the port perimeter at the production capacity and capacity utilisation of industrial companies and sectors (e.g. the petrochemical industry), in conjunction with existing investment plans.

The most likely scenarios, which therefore deserve to be studied in depth, are more or less known. However, the speed at which the various market players within the maritime logistics chain will take specific initiatives shall depend on a battery of exogenous and endogenous variables. As is the case with pricing in the maritime sector, and with successfully covering oneself against price fluctuations and other risks, timing is what ultimately determines who will emerge a winner. In this sense, it should be very clear that hinterland transport is largely dependent upon the strategic decisions and the success of other market players, but that it can also contribute to the success of specific maritime logistics chains.

3. ANALYSIS OF MARITIME FREIGHT FLOWS FROM ANTWERP AND ROTTERDAM

The potential of the Iron Rhine and the Betuweroute lies in the substantial volumes of (container) traffic between the Ruhr region in Germany and the ports of Antwerp and Rotterdam respectively. In the present chapter, we provide a brief analysis of incoming and outgoing maritime freight in the two ports, i.e. the loading and unloading of ships. In the next chapter, we focus more closely on the hinterland freight flows. Evolutions in these flows shall serve as a backdrop in the interpretation of simulation results regarding future traffic in the context of the Iron Rhine and the Betuweroute.

3.1. Port of Antwerp

The port of Antwerp is an inland seaport spread out over a surface area of 13,057 ha. At the moment, tide-independent shipping is guaranteed to a draught of 11.85 metres. Further deepening works will increase the permissible draught to 13.10 metres. The port extends over both riverbanks, with the Left Bank, or *Linkeroever*, presently undergoing a phased expansion (cf. Deurganck Dock). The port's total usable quay length, before and behind the locks, amounts to 150 km. (Gemeentelijk Havenbedrijf Antwerpen, 2008 and Kabinet van Kris Peeters, 2007)

Table 3.1 provides an overview of the general trend in Antwerp's tonnage throughput in the period 1998-2007. Over the past 10 years, an average annual growth of 4.91% has been realised in terms of tonnage unloaded. The corresponding annual average for tonnage loaded

is 5.54%. In 2007, total maritime cargo handled amounted to 183 million tonnes, comprised of 100 million tonnes unloaded and 83 millions tonnes loaded.

Table 3.1. Maritime cargo in the port of Antwerp: tonnage loaded and unloaded (percentage changes), 1998-2007

Year	Unloaded	Loaded	Total
1998	13.84	-1.70	7.05
1999	-7.86	3.14	-3.45
2000	13.70	11.75	12.86
2001	-1.31	0.91	-0.37
2002	-2.20	5.75	1.21
2003	6.89	10.58	8.54
2004	7.10	6.03	6.62
2005	4.77	5.43	5.07
2006	5.62	3.32	4.57
2007	8.54	10.17	9.28
Minimum	-7.86	-1.70	-3.45
Maximum	13.84	11.75	12.86
Average	4.91	5.54	5.14
Standard deviation	6.92	4.35	4.88

Source: Gemeentelijk Havenbedrijf Antwerpen (2008)

Container traffic has grown more rapidly than overall traffic in the port, with a recorded annual increase of approximately 11% in both loading and unloading of vessels (see table 3.2). The year 2005 saw the inauguration of Deurganck Dock, whose terminals represent an additional annual capacity of approximately 7 million TEU (Gemeentelijk Havenbedrijf Antwerpen, 2006d). If the growth rates presented in table 3.2 are indicative of future trends, then total TEU in Antwerp is set to increase from 6.482 million in 2005 to 14.938 million by 2013. In other words, supposing that all of this additional future container traffic is accommodated at Deurganck Dock, the new goods-handling facility will have reached full capacity by 2013. A further expansion of the port's capacity, with the addition of Saeftinghe Dock, is therefore under consideration.

Table 3.2. Container traffic in the port of Antwerp: freight loaded and unloaded, in TEU (percentage changes), 1998-2007

Year	Unloaded	Loaded	Total
1998	11.60	8.43	9.99
1999	9.96	11.38	10.67
2000	11.82	14.06	12.95
2001	3.95	2.73	3.33
2002	12.44	14.04	13.25
2003	12.74	15.19	13.99
2004	11.50	11.21	11.35
2005	6.93	6.87	6.90
2006	9.05	7.55	8.28
2007	16.13	16.85	16.50
Minimum	3.95	2.73	3.33
Maximum	16.13	16.85	16.50
Average	10.61	10.83	10.72
Standard deviation	3.37	4.40	3.82

Source: Gemeentelijk Havenbedrijf Antwerpen (2008)

One may reasonably assume that, in the short to medium term, maritime throughput at Antwerp will continue to increase. Without additional investment in port throughput capacity (i.e. terminals), the port is in danger of reaching its upper throughput limit.

3.2. Port of Rotterdam

The port of Rotterdam is accessed directly from the North Sea. The permissible draught is 24 metres. Unlike in Antwerp, there are no locks. The port area extends over 10 000 ha, and total quay length adds up to 74 km. Preparations are underway for the construction of Maasvlakte 2, a new port area that will include 1 000 ha of industrial terrain with direct deep water access. (Haven van Rotterdam, 2008)

In absolute terms, Rotterdam handles a greater volume of cargo than Antwerp does. In 2007, total volume handled amounted to 407 million tonnes, comprised of 299 million tonnes unloaded and 107 million loaded. Rotterdam's and Antwerp's unloaded-to-loaded ratios amount to 2.79 and 1.20 respectively. Rotterdam records an average annual growth of 2.93%, which is lower than the figure reported for Antwerp.

Table 3.3. Maritime cargo in the port of Rotterdam: tonnage unloaded and loaded (percentage changes), 1998-2007

Year	Unloaded	Loaded	Total
1998	2.14	-2.72	1.10
1999	-5.84	6.61	-3.28
2000	7.56	7.53	7.56
2001	-0.88	-7.57	-2.40
2002	0.52	8.67	2.27
2003	2.96	-1.42	1.96
2004	6.01	12.53	7.45
2005	3.78	9.08	5.00
2006	2.18	6.06	3.11
2007	4.14	13.97	6.56
Minimum	-5.84	-7.57	-3.28
Maximum	7.56	13.97	7.56
Average	2.26	5.27	2.93
Standard deviation	3.76	6.95	3.82

Source: Nationale Havenraad (2008)

Table 3.4. Container traffic in the port of Rotterdam: TEU loaded and unload (percentage changes), 1998-2007

Year	Unloaded	Loaded	Total
1998	9.35	8.87	9.11
1999	5.39	6.58	5.98
2000	-2.01	0.01	-1.01
2001	-0.89	-4.52	-2.70
2002	5.63	7.95	6.77
2003	10.60	8.06	9.34
2004	16.88	15.23	16.07
2005	12.78	11.22	12.02
2006	3.40	4.50	3.93
2007	11.39	12.20	11.78
Minimum	-2.01	-4.52	-2.70
Maximum	16.88	15.23	16.07
Average	7.25	7.01	7.13
Standard deviation	6.05	5.83	5.86

Source: Haven van Rotterdam (2008)

As in the port of Antwerp, growth in container traffic outpaces overall growth in the port. It amounts to approximately 7%, compared to Antwerp's 11%. As in the case of Antwerp, growth in maritime throughput may be assumed to continue. So Rotterdam, too, requires additional capacity, which is to be achieved first and foremost through the construction of Maasvlakte 2.

4. ANALYSIS OF HINTERLAND FREIGHT FLOWS IN THE CONTEXT OF THE IRON RHINE AND BETUWEROUTE

The significance of the Iron Rhine and Betuweroute rail links extends beyond the ports of Antwerp and Rotterdam. In this section, we provide a general overview of which other freight flows may experience an impact from a shift in traffic to the Iron Rhine and the Betuweroute (i.e. which freight on these rail links may free capacity on other connections). Domestic traffic, as well as import, export and transit freight may all be affected. So, in the case of the Iron Rhine, it can be argued that the competitive advantages for the port of Antwerp will also lead to advantages for other (Belgian) ports. However, we ought to point out straight away that routing choices are ultimately operational decisions.

In order to be able to arrive at a number of (quantitative) assertions, we must first acquire insight into the modal split in the Belgian and Dutch infrastructure networks on the basis of relevant available material.

We shall first consider evolutions in hinterland transport to and from the ports of Antwerp and Rotterdam. After all, it is here that the main potential of the Iron Rhine and the Betuweroute lies. Hinterland traffic to and from other ports and regions may nevertheless benefit from any capacity that may subsequently become available on other connections.

In the first instance, we provide a general analysis of land-based transport in Belgium and the Netherlands (i.e. road, rail and inland navigation) and indicate the relative importance of rail transport (sections 4.1. and 4.2.). Subsequently, we consider the implications as far as the ports of Antwerp and Rotterdam are concerned (sections 4.3. and 4.4.).

4.1 General analysis of land-based transport (road, rail and inland waterways) in Belgium

In 2006, the modal split in freight transport (by tonnage) on the Belgian infrastructure network was as follows: 68% by road, 23% by inland waterways and 9% by rail. These general shares have remained more or less unchanged in recent years. Obviously there are substantial differences to be observed if one breaks the figures down further. In imported freight, for example, the three modes' respective shares are 46%, 45% and 9%, while in exports they are estimated at 56%, 31% and 13%. (FOD Economie, 2008)

Also in 2006, total rail freight in Belgium, by operator B-Cargo, amounted to 62,189 tonnes (x 1 000). About 40% of this was domestic transport, 23% consisted in imports, 33% in exports and 4% was transit without reloading. (FOD Economie, 2008)

Table 4.1 provides an overview of goods categories transported by rail in 2006, broken down into domestic, export, import and transit freight. The most important freight categories are "Products from the metal industry" and "Machinery, transport equipment, manufactured articles and miscellaneous articles".

Table 4.1. Belgian rail freight by goods category, in %, 2006 (broken down into domestic, export, import and transit freight)

Type of transport	0	1	2	3	4	5	6	7	8	9
Domestic	0.95	0.57	2.09	0.67	14.51	37.49	6.33	0.00	2.71	34.68
Imports	3.45	8.42	0.00	0.34	4.80	41.25	0.51	0.00	4.97	36.28
Exports	1.35	0.35	10.74	9.04	1.35	25.47	10.33	0.94	8.10	32.34
Transit	6.85	2.74	0.00	6.85	0.00	36.53	1.37	4.57	27.40	13.70
Total	1.90	2.38	4.35	3.59	7.39	34.38	6.10	0.50	6.02	33.40

Source: Own processing of data from FOD Economie (2007), with 0=Agricultural products and live animals, 1=Foodstuffs and animal fodder, 2=Solid mineral fuels, 3=Petroleum products, 4=Ores and metal waste, 5=Metal products, 6=Crude and manufactured minerals, building materials, 7= Fertilizers, 8=Chemicals, 9=Machinery, transport equipment, manufactured articles and miscellaneous articles

We have selected a number of import and export countries whose transport infrastructure may be affected by the reactivation of the Iron Rhine, be it directly or indirectly. In the former case, certain goods flows may be transported along the Iron Rhine itself. In the latter, the reactivation of the rail link will free capacity on other relations. The data we have at our disposal is country-level data. We repeat that, ultimately though, the choice of rail route is an operational decision.[3] Tables 4.2 and 4.3 provide an overview of respectively imports to and exports from Germany, the Netherlands, Luxembourg, Denmark, Sweden, Poland and the Czech Republic (for the period 2003-2006), as well as a ranking in declining order of volume. One notices immediately how very important the relationship with Germany is.

Table 4.2. Belgian imports by rail: absolute figures in tonnes (x 1 000) and ranking, 2003-2006

Country	Absolute figures per year				Rankings per year			
	2003	2004	2005	2006	2003	2004	2005	2006
Germany	2,273	2,165	1,968	2,324	1	1	1	1
The Netherlands	1,295	1,260	942	791	2	2	2	3
Luxembourg	705	792	792	1,171	3	3	3	2
Denmark	1	2	1	0	7	7	7	7
Sweden	199	257	239	250	4	4	5	4
Poland	141	153	139	122	5	5	6	5
Czech Republic	112	80	314	85	6	6	4	6

Source: own processing of data from the Federal Public Service for Economics, Small and Medium-size Firms and Energy, Statistics and Economic Information, Transport Statistics

Table 4.3. Belgian exports by rail: absolute figures in tonnes (x 1 000) and ranking, 2003-2006

Country	Absolute figures per year				Rankings per year			
	2003	2004	2005	2006	2003	2004	2005	2006
Germany	3,407	3,948	4,198	4,573	1	1	1	1
The Netherlands	2,381	2,222	1,498	1,415	2	2	3	3
Luxembourg	1,968	1,890	1,659	1,839	3	3	2	2
Denmark	25	35	33	22	7	7	6	7
Sweden	189	228	242	261	4	4	4	4
Poland	114	138	159	147	5	5	5	5
Czech Republic	51	41	33	95	6	6	7	6

Source: own processing of data from the Federal Public Service for Economics, Small and Medium-size Firms and Energy, Statistics and Economic Information, Transport Statistics

[3] The countries selected all belong to the top right quadrant from Belgium's perspective.

4.2 General analysis of land-based transport (road, rail and inland waterways) in the Netherlands[4]

On the basis of data from NEA (2007), we calculate that, in 2005, the modal split in Dutch land-based transport infrastructure was as follows: 67% by road, 30% by inland waterways and 4% by rail. The main difference with Belgium lies in the share of rail transport (9% in Belgium). In imports, the shares of the respective modes are 59%, 36% and 5% in the year 2003. In exports, they amounted to 38%, 54% and 8%. (CBS, 2008) Inland navigation is more strongly represented in exports than is the case in Belgium (31% in Belgium compared to 54% in the Netherlands).

Total Dutch rail freight in 2005 is estimated to have amounted to 38,000 tonnes (x 1 000) in 2005. (NEA, 2007a) The respective shares of domestic freight, imports and exports[5] were 19%, 21% and 61%. (Eurostat, 2008) Exports by rail are proportionally more substantial in the Netherlands than in Belgium.

If we break down rail freight by goods category (see Table 4.4), we notice that, as in Belgium, category 9 (which includes containers) is the most important. The second most important category is "products from the metal industry".

Table 4.4. Total rail freight in the Netherlands by goods category, in %, 2005

	0	1	2	3	4	5	6	7	8	9
Total	2.38	1.68	15.48	1.86	18.83	8.37	6.49	0.52	11.02	33.37

Source: own processing of data from Eurostat (2008), with 0=Agricultural products and live animals, 1=Foodstuffs and animal fodder, 2=Solid mineral fuels, 3=Petroleum products, 4=Ores and metal waste, 5=Metal products, 6=Crude and manufactured minerals, building materials, 7= Fertilizers, 8=Chemicals, 9=Machinery, transport equipment, manufactured articles and miscellaneous articles

The same import and export countries were considered as in the analysis of Belgian rail freight. Again, the relation with Germany emerges as the most significant, especially in exports. Exports to Germany (14,614 tonnes x 1 000) represented 75% of total Dutch exports by rail.

Table 4.5. Dutch imports from selected countries (freight transport), 2003-2006

Country	Absolute figures per year				Rankings per year			
	2003	2004	2005	2006	2003	2004	2005	2006
Germany	2,244	2,257	1,977	2,115	1	1	1	1
Belgium	2,188	1,764	1,429	1,301	2	2	2	2
Luxembourg	70	31	30	n.a.	5	6	6	n.a.
Denmark	7	4	2	n.a.	7	7	7	n.a.
Sweden	63	58	32	11	6	5	5	3
Poland	83	106	102	n.a.	4	4	4	n.a.
Czech Republic	236	229	459	n.a.	3	3	3	n.a.

Source: Eurostat (2008) and CBS (2008)

[4] For the purpose of our analysis, we set out in search of readily comparable Belgian and Dutch data. As it turns out, however, Dutch public rail data are far less detailed than the corresponding Belgian data.
[5] No data available with regard to transit freight.

Table 4.6. Dutch exports to selected countries (freight transport), 2003-2006

Country	Absolute figures per year				Rankings per year			
	2003	2004	2005	2006	2003	2004	2005	2006
Germany	11,323	13,345	12,863	14,614	1	1	1	1
Belgium	1,285	1,265	912	766	2	2	2	2
Luxembourg	23	0	n.a.	n.a.	7	7	n.a.	n.a.
Denmark	26	23	18	n.a.	6	6	6	n.a.
Sweden	71	68	63	53	5	5	5	3
Poland	190	212	217	n.a.	4	4	4	n.a.
Czech Republic	261	316	226	n.a.	3	3	3	n.a.

Source: Eurostat (2008) and CBS (2008)

4.3. Analysis of the port of Antwerp in relation to the Iron Rhine

In the previous two paragraphs, we have provided a general picture of rail transport in Belgium and the Netherlands, in order to offer an initial insight into freight flows that may be influenced. The figures show how very important the two countries' relation with Germany is. In the present section, we take a closer look at data relating to the port of Antwerp. Our analysis focuses specifically on traffic to and from Germany. It is our purpose to gain insight into the modal split in relation to the port of Antwerp and to put forward a number of possible evolutions.

Rail transport in the port of Antwerp is operating close to maximum capacity. The reactivation of the Iron Rhine is one of three railway projects that are crucial to the port's future, the other two being a new railway tunnel under the river Scheldt and an improved rail access to the port on the Right Bank. The Iron Rhine is a disused railway line of 160 km connecting the port of Antwerp with Germany. The main stumbling block for its reactivation was a stretch of railway across Dutch territory. However, an international legal ruling gives Belgium the right also to reactivate that part of the rail link. Belgium, the Netherlands and Germany are presently engaged in negotiations over the issue. (Gemeentelijk Havenbedrijf Antwerpen, 2008) Traffic forecasts predict that, by 2020, between 9.4 million and 12.3 million tonnes will be transported annually along the Iron Rhine. Depending on which scenario pans out, the number of freight trains on the line would amount to between 62 and 82 per day by that same year. (Duijnisveld et al., 2007)

Total rail freight to and from the port of Antwerp amounted to 24,854 tonnes (x 1 000) in 2006. This represented 40% of the total volume of freight transported by rail in Belgium.

Tables 4.7 and 4.8 show the evolution of total imports from and exports to Germany by rail and inland waterways. The port of Antwerp accounts for 41% of Belgian imports from Germany by rail (see table 4.2) and 40% of Belgian exports to Germany by rail (see table 4.3). Again, Germany emerges as a very important partner, especially to the port of Antwerp.

Table 4.7. Port of Antwerp: imports and exports (in tonnes x 1 000) by rail and inland waterways, 2002-2007

	Year					
	2002	2003	2004	2005	2006	2007
Imports from Germany						
• Rail	879	1,162	1,051	972	954	n.a.
• Inland navigation	8,912	9,820	10,393	10,661	10,301	11,198
Exports to Germany						
• Rail	1,060	1,332	1,492	1,548	1,838	n.a.
• Inland navigation	9,982	9,752	9,884	10,499	10,531	10,325

Source: Gemeentelijk Havenbedrijf Antwerpen (2006a, 2006b and 2008)

Tabel 4.8. Port of Antwerp: imports and exports (in indices) by rail and inland waterways, 2002-2007

	Year					
	2002	2003	2004	2005	2006	2007
Imports from Germany						
• Rail	100	132.15	119.58	110.54	108.55	n.a.
• Inland navigation	100	110.19	116.61	119.62	115.58	125.65
Exports to Germany						
• Rail	100	125.65	140.74	146.08	173.41	n.a.
• Inland navigation	100	97.69	99.02	105.18	105.50	103.44

Source: own processing of data from Gemeentelijk Havenbedrijf Antwerpen (2006a, 2006b and 2008)

The figures above demonstrate the importance of rail transport to the port of Antwerp and the strong growth that has occurred between 2002 and 2006 in rail traffic between Belgium and Germany. Hence, the need for additional rail capacity.

No official data are available regarding road haulage between Antwerp and Germany. However, the Antwerp Port Authority has calculated the modal split in total freight flows to and from the port. For 2002, the split was found to be 41% for road haulage, 42% for inland navigation, and 17% for rail transport. No distinction was made between incoming and outgoing freight. (Gemeentelijk Havenbedrijf Antwerpen, 2008) The port assumes these proportions still to have been valid in the year 2007.

A distinction can also be made between maritime freight and industrial freight. Maritime freight concerns the loading and unloading of sea ships, while industrial freight refers to the supply and removal of goods (without loading or unloading of a sea ship) before and after processing in the port area. In maritime freight, the respective shares of road, rail and inland waterways are 49%, 21% and 30%. The corresponding proportions in industrial freight are 19%, 7% and 74%. The aforementioned data takes no account of reloading of freight from one vessel onto another, nor of pipeline traffic. Clearly, then, the proportions vary depending on the transport segment under consideration.

On the basis of the 2006 annual report of the Antwerp Port Authority, we conclude that the modal split was virtually unchanged in that year. Approximately 60% of all containers passing through the port were transported by road. Inland navigation accounts for over 31% of containers carried to and from the port. The Antwerp Port Authority's longer-term objective is for the shares of inland navigation and rail haulage in the transportation of containers to be increased to respectively 40 and 20 per cent. (Gemeentelijk Havenbedrijf Antwerpen, 2007)

Figures from NEA (2004) provide an indication of hinterland transport to and from the port of Antwerp. Table 4.9 presents an overview of the shares of the various hinterland modes in

2002. The flows referred to are maritime freight (i.e. goods that are imported or exported without industrial processing in the port area; cf. the concept of transit ports).

Table 4.9. Hinterland transport to and from the port of Antwerp (maritime freight), in millions of tonnes, 2002

	Maritime import	%	Maritime export	%	Total	%
Road	18.48	54	16.38	70	34.86	60
Rail	6.07	18	3.30	14	9.37	16
Inland navigation	9.91	29	3.84	16	13.75	24
Total	34.46	100	23.52	100	57.98	100

Source: own processing of NEA data (2004)

In 2002, the modal split in the hinterland transportation out of the port (i.e. imports by sea) was 54% for road haulage, 18% for rail transport and 29% for inland navigation. In the case of hinterland transportation into the port (i.e. exports by sea), the respective shares are 70%, 14% and 16%. Note that the hinterland flows referred to do not have an origin or destination in the so-called port region.

The above data demonstrate there is still a potential for growth for the various transport modes if economic growth persists. Simulation models can provide a more detailed picture in this respect. Suffice it for now to say that these growth scenarios should always be considered in conjunction with available capacity in road haulage, inland navigation and rail transport. The issue of the reactivation of the Iron Rhine should therefore also be approached from this angle. If one ignores capacity, there is a danger that the port of Antwerp will reach its limits, so that it will become less interesting as an import and export hub.

4.4. Analysis of the port of Rotterdam in relation to the Betuweroute

The Betuweroute is one of thirty transnational priority projects in the European Union (TEN-T). This new 160-km freight rail line connects the port of Rotterdam with the German rail network. Inaugurated in 2007, it was designed for an annual capacity of 74 million tonnes (European Union, 2005). In theory, it can manage ten freight trains per hour. (Betuweroute, 2008) In the first two months of 2008, the rail link was used by 615 trains. (Nieuwsblad Transport, 2008)

Rail freight to and from the port of Rotterdam amounted to 15,553 tonnes (x 1 000) in 2006, which corresponded to approximately 40% of total rail freight in the Netherlands, a similar proportion as in the case of Antwerp and Belgium.

Table 4.10 provides an overview of total imports from and exports to Germany by rail, inland waterways and road with Dutch trucks. The port of Rotterdam represents 22% of total Dutch imports from Germany by rail (see table 4.5) and 72% of total Dutch exports to Germany by rail (see table 4.6). As was the case for Belgium, these figures show just how important the rail connection with Germany is.

Table 4.10. Port of Rotterdam: imports and exports (in tonnes x 1 000) by rail and inland waterways, 2006

	Year
	2006
Imports from Germany	
• Rail	473
• Inland navigation	11,835
• Dutch trucks	2,559
Exports to Germany	
• Rail	10,575
• Inland navigation	54,893
• Dutch trucks	3,686

Source: Haven van Rotterdam (2008)

On the basis of the data from table 4.10, complemented with data from CBS (2008) regarding the ratio of Dutch to foreign vehicles, we are able to make an estimation of the modal split in hinterland transport in 2006 (table 4.11). On the basis of these data, it is estimated that 7% of freight arrives in the port of Rotterdam by rail and 12% is removed by rail. These figures are slightly higher than the Dutch average, but lower than the corresponding figures for Belgium. The substantial share of inland navigation in the Netherlands is quite striking.

Table 4.11. Hinterland transportation to and from the port of Rotterdam: modal split estimate for 2006

Hinterland transportation	Tonnes x 1 000	%
To port of Rotterdam:		
• Dutch trucks	5,118	14
• Foreign trucks	3,122	9
• Inland waterways	25,359	70
• Rail	2,389	7
• Total	35,988	100
From port of Rotterdam:		
• Dutch trucks	7,816	7
• Foreign trucks	3,752	4
• Inland waterways	81,997	77
• Rail	13,164	12
• Total	106,729	100

Source: Haven van Rotterdam (2008), supplemented with an estimation on the basis of CBS data (2008)

According to calculations by the Port of Rotterdam, the modal split in container transport in 2006 was as follows: 58.6% by road, 30.5% by inland waterways and 10.9% by rail. (Port of Rotterdam, 2008) These proportions are similar to those for container transport to and from the port of Antwerp.

Table 4.12 offers an overview of hinterland transport in the Rhine and Meuse estuary. This region extends beyond the port of Rotterdam, but the figures still provide a good indication. Again, we notice that inland navigation accounts for a much more substantial share than is the case in Antwerp.

Table 4.12. Indication of hinterland transport to and from the port of Rotterdam (maritime freight), in million tonnes, 2002 (based on the Rhine and Meuse estuary)

	Maritime import	%	Maritime export	%	Total	%
Road	33.51	27	20.46	45	53.97	32
Rail	11.08	9	4.19	9	15.27	9
Inland navigation	80.14	64	20.87	46	101.01	59
Total	124.73	100	45.52	100	170.25	100

Source: own processing of NEA data (2004), with Rhine and Meuse estuary referring to Rotterdam, Schiedam, Vlaardingen, Maassluis, Dordrecht, Moerdijk and Scheveningen

What can we conclude now from the figures in the previous parts? It is clear that the Iron Rhine and the Betuweroute provide additional rail capacity to and from Germany. This is an important signal to the users of the ports of Antwerp and Rotterdam. The new lines free also capacity on other routes, so other destinations and origins gain extra capacity. New member states to the European Union will also lead to a further increase in demand for hinterland transport services (East European countries).

5. CONCLUSION

Our analysis of the effects of port competition on hinterland transport services has shown capacity to be the keyword. It is a critical factor that comes into play at different levels.

In port competition (particularly in the context of container traffic), available capacity is an important factor in a port's ability, not only to attract new cargo flows, but also to retain current flows. Shipping companies tend to opt for ports where operations are not hampered by congestion and bottlenecks. They like to think ahead, and are therefore likely to choose for open space and locations offering potential for growth. This means that loading and unloading of goods must proceed smoothly, and that available hinterland transport services (or the modal choice) is also an important factor.

In this instance, rail transport must therefore be regarded in the broader context of (control over) the total logistics chain. Ports must offer adequate (reserve) capacity to maritime traffic, both in terms of goods-handling facilities and hinterland transport options. They must, in other words, be able to guarantee that no bottlenecks will occur in the transportation process.

We observe that, in 2006, some 40% of total rail freight in Belgium was either destined for or originated from the port of Antwerp. Similar figures emerge for the port of Rotterdam and its share in total Dutch rail freight. In other words, these two ports are not only engines of economic growth, but they also hold a considerable potential insofar as rail transport is concerned.

Seen from the perspective of the port of Antwerp, the Iron Rhine is, first and foremost, a valuable addition to available transport capacity, which will allow the port to continue to grow. Container traffic in Antwerp has, over the past ten years, expanded by an average 11% per annum. This would seem to suggest that hinterland connections (road, rail and inland waterways) ought to prepare for further growth. If one ignores this prospect, there is a real longer-term danger of maritime cargo flows shifting to other ports, including Rotterdam.

The inauguration of the Betuweroute represents additional hinterland transport capacity to the port of Rotterdam. The rail link has a potential of 74 million tonnes annually. In this sense, it

is important that the port of Antwerp should also extend available hinterland transport services, particularly in view of its current capacity problems in rail transport.

In the first instance, the Iron Rhine and the Betuweroute provide additional rail capacity to and from Germany. These new lines will also free capacity on other routes. Moreover, the accession of new member states to the European Union may also lead to a further increase in demand for hinterland transport services.

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