

***Development of rail freight in Europe:
What regulation can and cannot do***

CERRE Policy Paper

Professor Yves Crozet (University of Lyon)

With contributions from:

Professor Justus Haucap & Dr Beatrice Pagel (University of Düsseldorf)

Professor Antonio Musso & Dr Cristiana Piccioni (University La Sapienza, Rome)

Professor Eddy Van de Voorde & Professor Thierry Vanellander (University of Antwerp)

Dr Allan Woodburn (University of Westminster)

The authors thank Serafino Abate, CERRE Director of Operations & Projects, for his advice throughout the project and accurate reviewing of the final document

Brussels, 11 December 2014



Table of Contents

About CERRE	3
About the authors	4
Policy Paper.....	6
1. Introduction.....	6
2. Rail freight in Europe: questioning the EU’s goals.....	7
2.1 Rail freight in Europe: ambitions thwarted	7
2.2 Determining the relevant perimeter for rail freight in the context of intermodal competition.....	13
2.3 The competitive "solution" and the challenges of imperfect competition	17
3. Regulation issues: beyond the liberalisation process, what are possible policy options?.....	21
3.1 Liberalisation and deregulation of rail freight in Europe: state of play	22
3.2 Critical issues of imperfect competition in the railway sector	27
3.3 Regulatory issues in the rail freight sector: the next steps	32
4. Implications for rail freight regulation	39
References	42

About CERRE

Providing top quality studies, training and dissemination activities, the Centre on Regulation in Europe (CERRE) promotes robust and consistent regulation in Europe's network industries. CERRE's members are regulatory authorities and operators in those industries as well as universities.

CERRE's added value is based on:

- its original, multidisciplinary and cross-sector approach;
- the widely acknowledged academic credentials and policy experience of its team and associated staff members;
- its scientific independence and impartiality;
- the relevance of its contributions to the policy and regulatory development process applicable to network industries and the markets for their services.

CERRE's activities include contributions to the development of norms, standards and policy recommendations related to the regulation of service providers, to the specification of market rules and to improvements in the management of infrastructure in a changing political, economic, technological and social environment. CERRE's work also aims at clarifying the respective roles of market operators, governments and regulatory authorities, as well as at strengthening the expertise of the latter, since in many member states, regulators are part of a relatively recent profession.

This study within the framework of which this discussion paper has been prepared has received the financial support of a number of CERRE members. It has been completed under the supervision of Professor Chris Nash, Professor at the University of Leeds. As provided for in the association's by-laws, it has, however, been prepared in complete academic independence. The contents and opinions expressed in this discussion paper reflect only the authors' views and in no way bind CERRE, the sponsors or any other members of CERRE (www.cerre.eu).

About the authors

Professor Yves Crozet is professor of economics at Lyon University (*Institute of Political Studies*) and member of the *Laboratoire d’Economie des Transports* (LET), which he headed from 1997 to 2007. In 2008, he became the head of the newly created *Energy, Environment and Transport Observatory* set up by the French government to assess the carbon content of different transport modes. He is also chairing the transport policy group of the French research and innovation programme in ground transport (PREDIT). Since 2010, he is also the Secretary General of the World Conference of the Transport Research Society.

Professor Justus Haucap is a member and former Chairman of the German Monopolies Commission. He is also professor of Economics at the Heinrich Heine University of Düsseldorf and founding director of the Düsseldorf Institute for Competition Economics (DICE). He is also a member of the Board of Directors of CERRE. He holds degrees from the University of Saarland and the University of Michigan.

Professor Antonio Musso is Professor of Transportation Systems Theory and Freight Transport Terminals and Plants Design at the Department of Hydraulics, Transportation and Roads (DITS) of the University of Rome “La Sapienza” (Italy). He is also the Head of the “Transportation Engineering” Program of the university. Furthermore, he is a member of the International Scientific Committee of the World Conference on Transport Research Society (WCTRS) and an independent Expert for the European Commission’s Evaluation of the 4th, 5th, 6th and 7th Framework Programme of Research and Development.

Professor Eddy Van de Voorde is Professor at the Faculty of Applied Economics of the University of Antwerp. His work deals with research in the field of modelling in the sector of freight transport. He is also a Visiting Professor at several Belgian and foreign universities. In July 1998, he acted as Vice-President of the 8th World Conference on Transport Research (8th WCTR). From 1995 to 2001, he was Vice-Chairman of the international scientific committee of the WCTRS. Next to this, he acted as Vice-Chairman of the International Association of Maritime Economists (IAME) and Chairman of the Benelux Interuniversity Group of Transport Economists (BIVEC/GIBET).

Professor Thierry Vanellander is the holder of the BNP Paribas Fortis chair on Transport, Logistics and Ports at the University of Antwerp. Until 2009, he was Director of the Research Centre on Commodity Flows hosted by the Department of Transport and Regional Economics. His research interests are in the field of maritime, land and air transport and logistics.

Dr Allan Woodburn is Professor of Freight and Logistics in the Planning and Transport Department at the University of Westminster, and has been the Course Leader for the MSc Logistics and Supply Chain Management course since 2005. He was previously a Lecturer in the School of the Built Environment at Napier University, Edinburgh. He holds a PhD in Freight Transport and Logistics from Napier University in Edinburgh and a Master in Transport Studies from Cranfield University.

Policy Paper

1. Introduction

The development of rail freight is central to the European Union's transportation policy.¹ The EU objective regarding rail freight development is mainly driven by energy-related and environmental concerns (e.g. improving road safety and reducing pollution, greenhouse gas emissions and other adverse environmental impacts of road freight transport). As it has been the case for road and air transport and for other network industries (e.g. energy and telecommunications), deregulation and market opening have been the main policy options chosen by the European Union to promote sustainable development in rail freight. The European Union's focus on competition and market opening is paramount, as it is a pre-condition for enhanced efficiency in the rail sector in general, and in the freight sector in particular. However, progress in the area of competition and market opening has been uneven across member states. This might be seen as an explanation of the remaining low modal share of rail freight in Europe.

The issue of how to develop rail freight is not usually addressed from the angle of regulation. CERRE has chosen to do so, not solely because regulation is one of its key concerns but also because identifying what regulation can or cannot do amounts to assessing both the objectives of the EU (developing rail freight) and the means to achieve them (market opening).

Based on national case studies from Belgium, France, Germany, Italy and the United Kingdom, this paper shows that measures to establish competition are slowly but profoundly transforming the landscape of European rail freight operators. The “competitive solution” proposed by the EU, already tried and tested in many network industries, leads to significant changes.

But intramodal competition in itself is not sufficient. What matters is the organisational changes within railway companies and the state of intermodal competition with road transport. A general observation stands out, which will be the academic “red thread” of this work: rail freight is still facing a doubly-imperfect competition. On one hand, the intermodal competition is off balance between road and rail. On the other hand, intramodal competition between railway operators is imperfect. Railway operators are not all alike, major companies exist and they play a structuring role that regulation must take into account.

This is what the first part of this report sets out to demonstrate. It first looks at the rail freight sector, presenting demand evolution and supply responses. Although rail transport is faced with a demand that is not very dynamic, it has managed, despite strong and unbalanced intermodal competition, to stabilise and in some cases even expand its market share. Market opening and intermodal competition have played a key role in changing trends, made possible by considerable

¹ EC White Papers on Rail Freight, 2001 and 2011.

organisational changes within companies. But the market structure is still characterised by a strong concentration. Now that the liberalisation process has been developed quite extensively, what are the next steps for the regulation of rail freight?

The second part of this discussion paper comes forward with some possible options, developed on the basis of, among others, an assessment of how competition takes place in practice in this very capital-intensive industry, characterised by numerous barriers to entry. The key role played by the major companies as well as the role of the state are being explicitly addressed, since both of them represent some of the key features of imperfect competition in the rail freight sector.

2. Rail freight in Europe: questioning the EU's goals

The objectives of the European Union in terms of rail freight are clearly expressed in successive White Papers, particularly the one published in 2011. Objective 3 states: “30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050” (European Commission, White Paper, 2011). This expected modal shift, mainly in favour of rail transport, reflects a desire to reverse past trends, in which road transport has traditionally been very dominant (see Section 2.1). In order for this ambition to amount to more than wishful thinking, the EU has sought to develop intramodal competition to revitalise this sector² (see Section 2.2). However, in light of the unrelenting strong intermodal competition, mainly from road transport, one cannot help but question the European Union's objectives (see Section 2.3). Considering the evolution of shippers' demand and the nature of transported goods, to what extent can rail freight transport expand its area of relevancy?

2.1 Rail freight in Europe: ambitions thwarted

In terms of land freight transport, there has been a steady decline in rail's share of freight throughout the twentieth century, giving the impression that road transport had finally, definitely won. Recent data, however, point towards a more complex picture. Traffic flows in several European countries indicate a revival of rail freight, at least to a certain degree. What is the extent of this phenomenon? How can competition help strengthen this new situation?

Intra-European freight

At the end of the nineteenth century, rail was without question the dominant mode for transporting goods. In France, as well as in Germany and Great Britain, the railway system was the only one that could transport goods and passengers at “modern” speeds. Consequently, over 80% of all goods were moved by rail. One century later, the landscape had changed dramatically. In

² Competition is just one component of EU policy in this sector. It is also worth mentioning, among other things, the necessity to develop networks (TEN-T) and pursue common technical standards (ERTMS, ETCS) to ensure interoperability of equipment.

2000, across the European Union (15 countries), rail freight accounted for a mere 12.5% of all land traffic, as it is shown in the table below.

Table 1: Modal share of freight transport in Europe

	Road	Rail	Waterborne	Pipeline
1970	48.6	31.7	12.3	7.4
1980	57.4	24.9	9.8	7.9
1990	67.5	18.9	8.3	5.3
1994	71.7	14.9	7.7	5.6
2000	75.1	12.5	7.0	5.4

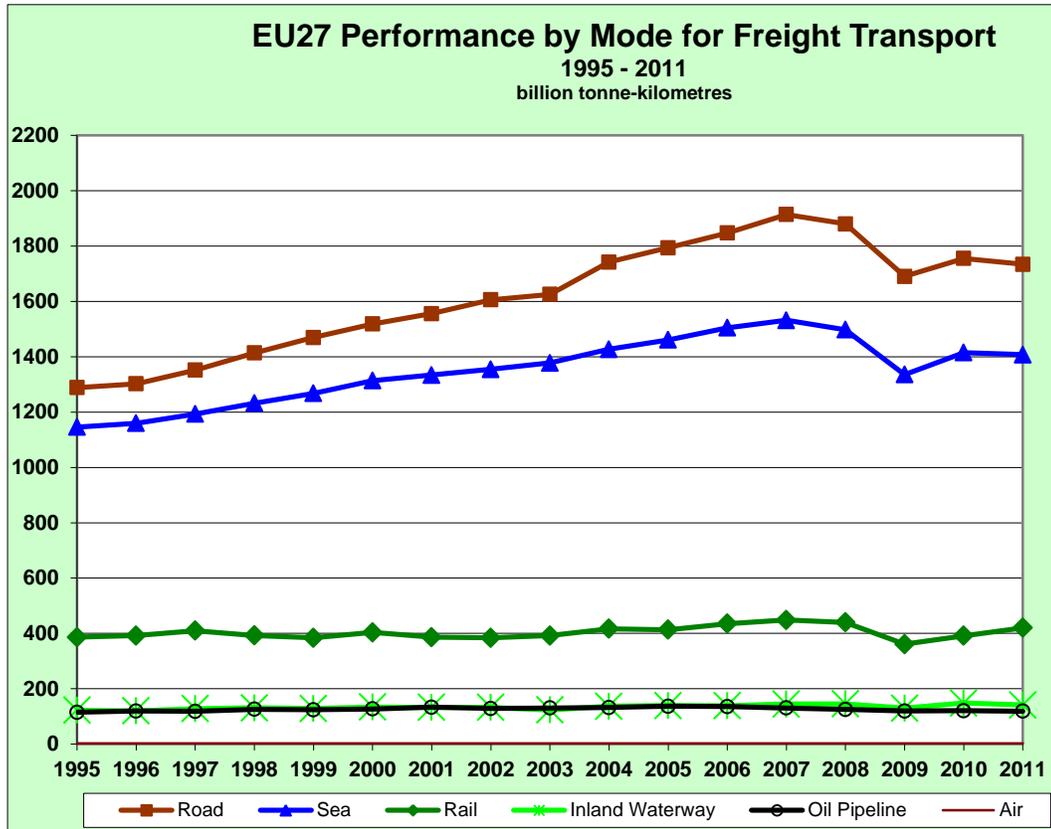
Source: Eurostat

The last decades of the twentieth century were marked by an increasingly steep decline. In addition, after the fall of the Berlin Wall, rail freight’s market share also plummeted in the countries of Central Europe.³ It seemed a given that rail freight was outmoded — a remnant of a bygone era, that of the first industrial revolution, or even that of socialism.⁴ Road haulage was clearly poised to dominate the scene, as is shown in the figure below. Over the past 20 years, road haulage has captured all of the growth in goods traffic, while rail freight has stagnated or even regressed. Everything happened as if road haulage had definitely outclassed rail freight, particularly because of its flexibility and its ability to generate productivity gains and to respond to the changing nature of goods. By contrast, rail freight seemed confined to a few niche activities that were based on production processes with a limited ability to generate productivity gains through either technological innovation or organisational change.

³ From 2002 to 2011, rail freight’s market share dropped from 40.5 to 20.5% in Slovakia, from 37 to 20.5% in Poland, from 69.5 to 50.7% in Estonia. (Eurostat).

⁴ Such a view glosses over the success of rail freight in North America, a region that can hardly be suspected of strong socialism.

Figure 1: European freight transport growth (EU27 per mode in billion tonne-kilometres)



Source: European Commission 2011

Towards stabilisation, or even an increase in rail freight’s market share?

Over the past twenty years, road haulage has increased significantly. However, looking at the past five or even ten years, the situation is not as clear-cut:

- The 2008 crisis caused a sharp drop in traffic in the weeks following the bankruptcy of Lehman Brothers. All modes of transport were affected, and especially road haulage. Traffic has since picked up, but in most European countries (for example France, Germany, Italy and Great Britain), road freight traffic in 2013 was still below 2008 levels;
- Rail freight also experienced a decline in traffic after the 2008-2009 crisis, but as demonstrated in the table below, this was not enough to invert a trend of recovery in rail freight’s market share.

Table 2: Rail freight’s market share

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	10.7	11	12	13.4	14.2	15.3	15.9	12.8	14.5	15.2
Austria	29.3	28.7	31.4	32.8	33.8	34.8	37.4	36.4	39	39.9
France	19.1	18.1	17	16	15.7	15.7	15.9	15	13.5	14.9
Germany	18.8	18.4	19	20.3	21.4	21.9	22.2	20.9	22.2	23
Italy	9.6	10.4	10.1	9.7	11.4	12.3	11.7	9.6	9.6	12.2
Netherlands	3.3	3.8	4.2	4.4	4.8	5.5	5.4	4.9	4.9	5.1
Switzerland	42.5	41.4	42.2	42.5	43.3	44	46.9	44.5	45.6	45.9
Sweden	34.4	35.5	36.1	36	35.8	36.4	35.1	36.8	39.3	38.2
UK	10.2	10.1	12.2	11.7	11.7	11.1	11.6	12.1	11.2	12.6

Source: Eurostat

What this table shows is a general increase between 2002 and 2011 in all countries — both those that already had a high level of rail freight to begin with (Austria, Sweden, Switzerland) and those that started off at low levels, such as Great Britain and Italy. France is an exception, as rail freight’s market share continued to dwindle there until 2010. However, since then it has started to recover, as was confirmed in 2012 and 2013. Rail freight in France climbed back up to a market share of 15% by 2013.

At first sight, these results are encouraging, but we must point out immediately that they are biased, because only domestic road haulage has been taken into account in the calculation of these rail freight market shares. Indeed, in most European countries, precisely through the stimulation of international competition in road haulage, including in the form of cabotage, the share of goods transported by foreign lorries is on the rise. In order for our analysis not to be biased, it is preferable to compare the evolution of all rail freight to all road haulage, as in Table 3 and 4 below.

Table 3: Modal split in Europe (28 Countries)

	Road	Rail	Waterborne	Pipeline
1995	67,3	20,3	6,4	6,0
2000	69,5	18,5	6,1	5,8
2005	72,2	16,7	5,6	5,5
2008	72,6	17,0	5,6	4,9
2009	73,4	15,7	5,6	4,9
2010	72,4	16,2	6,4	5,0
2011	71,9	17,4	5,8	4,9
2012	71,6	17,2	6,3	4,9

Source: EU Transport in figures, statistical pocket book 2014

We observe that the rail modal share was at the minimum in 2009 and experienced then a modest upturn while road modal share was slightly declining. The same movement has been observed in Germany, a key country responsible for 25% of European rail tonne-kilometres.

Table 4: Road and rail freight in Germany, in billion tonne-kilometres

Year	1999	2000	2001	2002	2003	2004	2005	2006
Rail freight	76.8	82.7	81.0	81.1	85.1	91.9	95.4	107.0
Road Freight	349.6	354.9	362.2	364.3	381.9	398.3	402.7	439.0
Rail freight (%)	15.2%	15.9%	15.5%	15.5%	15.7%	16.1%	16.5%	17.1%
Year	2007	2008	2009	2010	2011	2012	2013	
Rail freight	114.6	115.7	95.8	107.3	113.3	110.1	112.6	
Road Freight	454.1	460.1	415.6	440.6	457.8	445.9	453.0	
Rail freight (%)	17.6%	17.7%	16.4%	17.1%	17.7%	17.5%	17.5%	

Source: Statistisches Bundesamt

In view of these results, the recovery of rail freight is a reality, albeit a fragile one. After a low point in the late 1990s, rail freight has since grown slightly faster than road traffic. However, the crisis of 2008 caused a bigger drop in rail freight than in road haulage. Since the early 2010s, both modes of transport are on the rise again, with rail’s share now a quarter of that of road traffic, which amounts to 20% of the total market for both modes. How will these numbers progress when the economy regains its trend of about 2% growth per year? Can rail freight gain market share when faced with steadily increasing road traffic, or will the latter reach a plateau and level out?

Traffic elasticity and economic growth

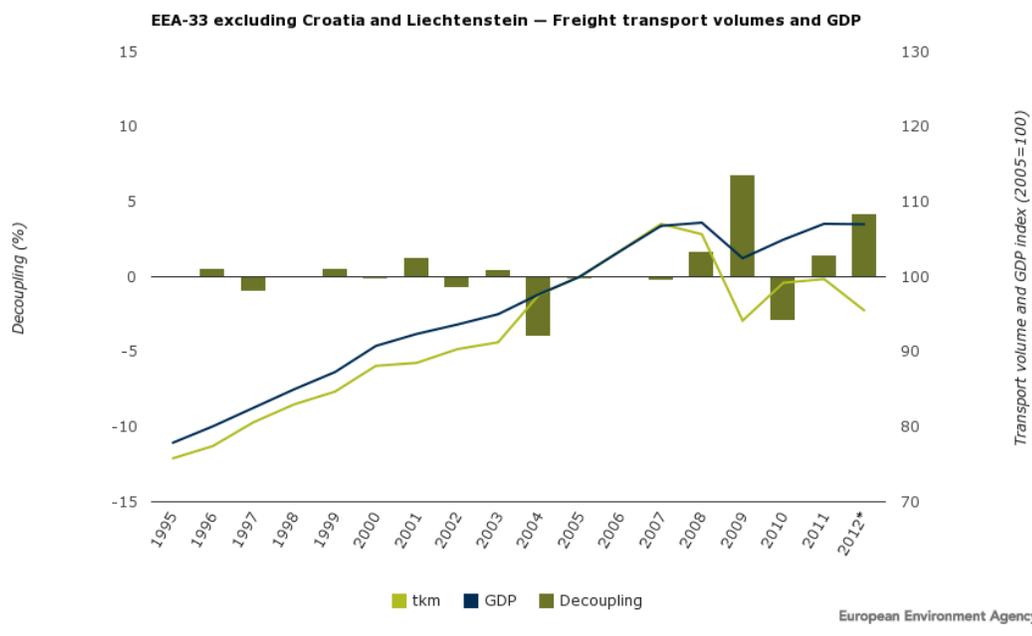
The relationship between freight traffic and economic growth is what economists call income elasticity. For goods, the distance/GDP elasticity has been higher than 1 in the last decades: when the GDP increases by 1%, the amount of tonne-kilometres increases by more than 1%. This explains why, even though there is little increase —or even some decrease— in tonnages loaded in Europe, the amount of tonne-kilometres keeps increasing steadily. Even though services share represents an increasing part of the GDP, demand for goods transport is still more correlated to an increase of GDP than of industrial production.

This correlation works both upwards and downwards. When there is a fall in GDP and industrial production, as was the case in 2009, freight traffic drops too. It can even be said that it overreacts, since elasticities are variable (Bonnafous 2005). As is shown in Figure 2, the link between freight traffic and economic growth is not a linear relationship. When economic growth accelerates, traffic increases more than proportionally, and in an economic slowdown, traffic decreases more than proportionally.

Indeed, during the economic downturns of 2001 and 2003 there was a decoupling to some extent. Freight traffic grew less rapidly than the GDP. However, in the following period (2004–2006), growth accelerated and traffic grew faster than the GDP — mainly in road haulage, as we have seen

in Figure 1. The whole issue therefore comes down to whether this phenomenon will reoccur in the context of the ongoing economic recovery in Europe. If said economic recovery continues, then what we have pointed out about the distance/GDP elasticity of goods leads us to consider that there will neither be “peak travel” for goods, nor for passengers⁵. Overall traffic will continue to grow in Europe⁶ (even if we can expect decreasing transport elasticity to economic growth). Will rail freight be able to seize this opportunity to increase its market share?

Figure 2: Economic growth and freight traffic in Europe before and after the 2008 crisis



In order to assess rail transport’s chances, it is necessary to consider the position it occupies in the context of intermodal competition. We will not discuss here the potential competition of long-distance (deep sea) shipping, for instance between China and Europe. We will focus on competition with road transport for intra-European traffic.

⁵ In the case of passenger transport, a certain "peak car use" has been observed. As of the early 2000s, automobile traffic has levelled out or even declined in all major industrialized nations (Goodwin 2012). However, when taking into account the distances travelled by air passengers, there is no "peak travel". The distance/GDP elasticity remains positive. This is even more clear-cut in freight transport, where the amount of tonne-kilometres increases with economic activity.

⁶ In Great Britain, there has been a disconnect between economic growth, based mainly on services, and changes in freight traffic. However, this trend is not observed everywhere.

2.2 Determining the relevant perimeter for rail freight in the context of intermodal competition

The unrelenting decline of rail freight observed throughout the twentieth century was grounded in objective mechanisms linking demand and supply of goods transportation. The interface between supply and demand can be summed up in the concept of generalised cost: comparing the generalised costs of different modes of transport the shippers' demand moves towards a particular type of transport. The compared generalised costs are therefore the key variable of intermodal competition. However, these costs vary with the unit value of products shipped and with what can be described, by analogy with passengers (Crozet 2005), as their "value of time" (VOT). In light of all this, it is easier to explore how rail freight could better position itself in the context of intermodal competition.

Generalised cost: a key variable in intermodal competition

For shippers, transportation costs can be broken down into monetary costs on the one hand, and temporal costs on the other. These are the two domains in which competition between modes of transport plays out. Road haulage has taken up such an important place in recent decades because it has managed not only to gradually reduce its monetary costs (on a constant currency basis, and in certain periods even in nominal terms), but also to benefit from gains in speed, obtained by the improvement of road infrastructures and significant technical advances incorporated into lorries. Adding to this the fact that lorries are able to go door to door without transshipment, it becomes clear that road haulage tends to offer more cost-efficient and speed-efficient solutions to shippers for door-to-door delivery.

Such criticalities can be briefly traced to low commercial speeds⁷, unreliable travel times also due to time spent in logistic activities (i.e. cargo handling) and lack of homogeneity in railway lines performances, with particular reference to module⁸ (that limits the maximum train length), maximum axle load⁹ (that influences the wagon weight) and gabarit¹⁰ (containers, swap-bodies and semi-trailers must be consistent with values allowed on the rail lines). In this sense, the creation of six European Rail Freight Corridors¹¹ by November 2013 and further 3 by November 2015 (of which Corridors I, III, V and VI cover a strategic role for Italy) can significantly enhance the competitiveness of rail market through improvements of networks performances in terms of

⁷ As an example, in Europe the average value is 18 km/h, mainly due to operational aspects, i.e.: changes in locomotives and/or personnel, train formation, technical and customs inspections (source: EU, White Paper).

⁸ In Italy block trains generally are 500-550 m length.

⁹ Between 20 and 22,5 tonne/axle.

¹⁰ According to the map of the Italian Railway Network (see PIR – Network Information Statement no. 3 - Coding for Combined Traffic, Network Operation FSI), most of the rail lines have profile categories of PC22 (3,840 mm height) and PC32 (3,940 mm height) which are quite restricted values. Only the North-East rail lines belong to the PC80 profile category (4,700 mm height) that correspond to the "Gabarit C".

¹¹ EU Regulation N. 913/2010 of the European Parliament and of the Council, concerning a European rail network for a competitive freight transport.

interconnectivity, interoperability and intermodality as a whole. Indeed rail transport, in virtue of its endogenous characteristics, is not a self-sustaining mode if compared to all-road. This means that also improvement of accessibility to freight terminals/node and optimisation of connections among production sites and/or freight nodes is essential in order to exploit synergies coming with intermodality, including a more effective utilisation of the ports (Musso & alii 2013).

For these reasons, rail freight has all but disappeared when it comes to transport over short distances, which encompasses a majority of all flows of goods. In France, for instance, the average distance over which goods are transported is less than 100 km, with an average of 90 km for road freight and 350 km for rail freight. The relevant perimeter for the latter is therefore, barring some exceptions (some urban supply chains, some short-haul traffic between joined-up industrial sites and traffic between ports), structurally focused on long distances. Globalisation, too, keeps this type of traffic from declining, although road haulage largely dominates the scene. For instance, still in France, road haulage over stretches of more than 150 km only accounts for some 20% of all tonnes loaded, but it represents more than 70% of all tonne-kilometres in road transport. So there are opportunities for a modal shift towards rail, where transports over distances greater than 150 km account for 75% of tonnes and 95% of tonne-kilometres.

Besides, one structural feature strongly unbalances intermodal competition between rail and road, namely the latter's extensive deregulation. This is because of the opening to competition in road transport, which happened far earlier than in the railway sector. More precisely, because the deregulation led both modes to very different situations regarding generalised costs:

- Differences in social rules: working hours and driving hours of truck drivers are much greater than locomotives drivers;
- Differences in wages and social welfare, truck drivers can work in a rich EU Member State while being paid on a poor Member State's conditions. Recent generalisation of cabotage emphasises this phenomenon;
- Remember that road transport has benefited from numerous investments, notably for highways, and deregulations that have progressively increased the authorised total load (40 then 44 tons and yet more in Northern Europe), even vehicles length ("megatrucks" being 25.25 metres long);
- The failure in most countries to charge road haulage adequately for its use of the roads and the external costs it imposes (which are much higher than for rail).

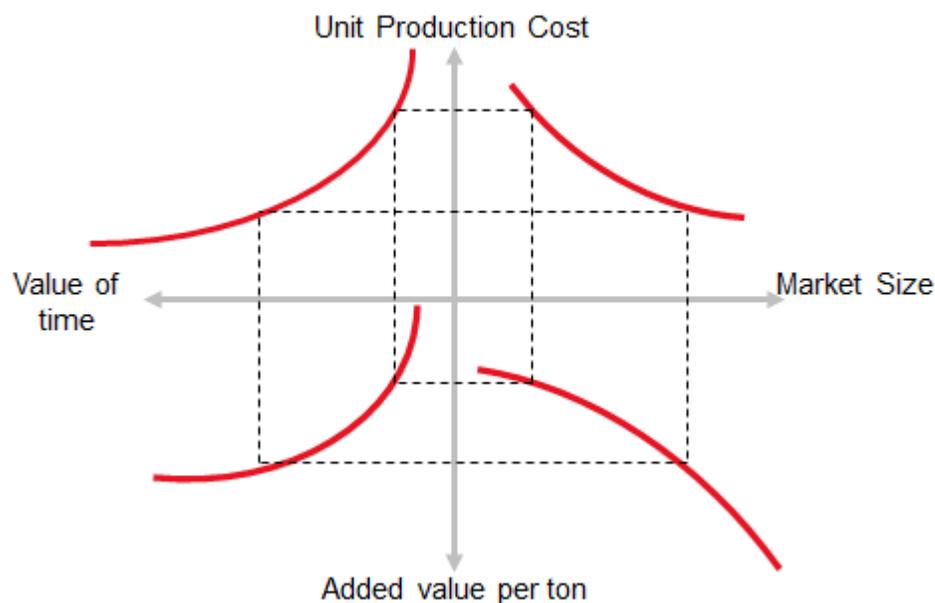
As it has been demonstrated in the "Secular Model" of the modal split in freight transport (Bonnafous & Garcia 2005), relative evolutions in generalised cost explain nearly all of the success

of road haulage to the detriment of rail transport¹². In order for the upturn observed in rail freight's market share to hold out, it is therefore necessary to continue implementing improvements such as those that in many countries have led to a relative decline in the generalised cost of rail transport. This improvement can be explained in part by the rising costs of road haulage (fuel prices, infrastructure fees ...), but the main factor lies in productivity gains, as they lead to lower costs and prices, as well as in improved reliability. After all, shippers are met with increasingly high requirements in this area, due to the increase in the time value of the goods.

The increasing role of the “value of time” (VOT) of goods

Just as the VOT of passengers increases with the income gained from them, the VOT of many goods increases with the added value per tonne. As Figure 3 shows, this is also a consequence of increasing market sizes and mass production. Two factors that might just encourage rail freight.

Figure 3: Market size and value of the goods



Source: Yves Crozet, CERRE, 2014

Considering a sustainable upturn for rail freight in the context of intermodal competition means taking into account the evolution of demand from shippers and the type of goods transported. Figure 3 summarises these developments, and is to be interpreted clockwise, starting from the top right quadrant of the figure:

¹² The generalised cost of rail is increasing relative to that of road haulage, because of the speed gains the latter can offer. At the same time, the nature of the products has evolved, all of which has added up and triggered the protracted decline of rail freight.

- In order to obtain lower production costs per unit, industrial businesses extend the size of their markets. This allows them to take full advantage of the economies of scale that mass production offers;
- Lower unit costs do not mean lower added value per tonne (bottom right quadrant). On the contrary, along with increased production volumes and a larger market, many industrial products are moving upmarket. The result is that the transport cost becomes a relatively insignificant variable in the total product cost;
- But as the products increase in value, they should not be stored for too long (bottom left quadrant). Their VOT increases. They are looking for a higher moving rate, or at least a highly reliable supply chain (just-in-time);
- Finally, arriving in the top left quadrant of the figure, we arrive at the central paradox for many manufactured products in the industrial sector, which is the fact that the downward trend in unit costs is linked to an increase in the VOT of the goods.

The result of this phenomenon is that the balance between the four variables gradually moves to the edge of the figure. The centre of the figure is the old industrial world, where products are manufactured in small quantities for a small market, with a low VOT due to their low value per tonne — especially since these are often bulky products (products for quarrying, for the metal industry, for the chemical industry ...). Near the edges of the figure are the modern forms of mass industrial production where transport plays a key role, albeit as a dominated player. Carriers must keep improving their productivity and quality of service constantly, but they are in a position of weakness, in part because transport costs are relatively insignificant compared to the value of the product, and also because there is fierce competition in this sector. By taking into account all these elements, rail transport can define and possibly extend its relevant perimeter.

What is the relevant perimeter for rail transport?

Rail freight has traditionally been subject to a double penalty, which explains its protracted decline. In a competitive world where the role of the carriers is subordinate to that of the generally more dominant shippers, rail transport has also been confined to commodity-type products, with a low added value per tonne and with little volume growth. A striking example of this situation is the transport of coal, which has plummeted since the advent of oil and, in particular in France, alternative energy sources such as nuclear power.

This is why it is necessary to determine the range of products transported by rail, and which ones offer real prospects for development. This is what the UK Department for Transport (DfT) set out to do in a study, which has been summarised in the table below. It lists the main products transported (markets), linked to their degree of maturity. Coal, aggregates and metals, for instance, represent mature markets that are potentially stable or in decline. It would be unwise to rely on this type of markets when trying to bring about a significant development in rail transport. What are then the

products that have a higher added value per tonne, requiring transport over large distances, which might be of interest to rail freight?

Table 5: Strategic analysis of products transported by rail

Market	Degree of market maturity	Current rail position	Potential for growth in rail share
Coal	Mature and stable	Dominant	Limited
Aggregates	Mature and stable	Strong for longer distance flows	Moderate
Metals	Mature and stable/declining	Strong for certain sub-markets	Moderate
Petroleum	Mature and stable (until 2008)	Strong for high volume flows where no pipelines exists	Limited
Automotive	Mature and stable (until 2008)	Low	Considerable
Waste	Mature and stable/declining	Low	Limited
Intermodal	Dynamic and growing (until 2008)	Significant share of deep sea; low share of other unitised	Very considerable
Channel tunnel	Dynamic and growing (until 2008)	Very limited	Very considerable
Other general freight	Variable – generally mature for “other bulk”, but growing for parcels and pallets	Variable but generally limited	Variable – greatest potential where volumes can be aggregated

Source: DfT, 2010

The transport of cars and parts for the automotive industry is a potential target, since there are relatively few production plants in Europe, each specialising in certain models. However, car manufacturers have high demands in terms of regularity and quality of service. The same goes for intermodal traffic and container transport in particular. Growth prospects are strong in this area, but this presupposes that the provision of rail services is tailored to demand. This is precisely what is at stake in Europe’s strong focus on competition. Opening rail freight to intramodal competition has been regarded as the source of organisational innovations that could revitalise rail freight, even when faced with intermodal competition from road haulage.

2.3 The competitive "solution" and the challenges of imperfect competition

Given rail freight’s protracted decline, one option would have been to consider it as an obsolete mode of transportation, definitely and permanently surpassed by road, sea and air freight. This is more or less what has happened in many Western European countries. After World War II, public

policy simply followed this activity's decline. As has been mentioned in the introduction to this first part, the objective of the European Union is to reverse this trend.

With Directive 91/440 and the subsequent "Railway Packages", the EU has sought to extend rail freight's relevant perimeter by using the same logic as in other network industries. The goal was to put an end to traditional monopolies by what is called the "competitive solution". In what follows we shall describe, from a supply perspective, the logic of this intramodal competition, which is clearly part of what economists call "imperfect competition". It is crucial for sector regulators to know the limitations and key issues of this type of competition.

Network industries: an analytical framework

In light of its strong commitment to bringing about an upturn in rail freight, the European Commission has implemented recommendations in line with those already in force in other network industries and in other transport activities in order to foster competition. However, merely establishing competition is not enough to transform an industry dominated by increasing returns and the logic of natural monopolies. Competition —more specifically, imperfect competition— can only be applied to network industries if the natural monopoly can be abolished or at least contained, so as to remove certain barriers to entry.

This was proposed by economists who suggested differentiating the components of the "system good", which are the network industries in general, and rail in particular (Katz and Shapiro 1985). These authors pointed out that the services provided by a rail or telephone network are the culmination of a "system good", which is an amalgam of several components. For rail, it is possible to distinguish infrastructure from operations. The dissociation between the two is not at all that obvious, as evidenced by recent debates about projects for the 4th Railway Package and multiple exposés on whether or not infrastructure and operations ought to be regarded separately (EVES-Rail 2012). The recent tug-of-war between the European Commission and several Member States regarding the "bundling vs. unbundling" dichotomy reminds us that there are probably several ways to constrain the natural monopoly.

Nevertheless, regardless of how exactly the railway sector is to be segmented, what ultimately matters is whether competition between operators will arise or not. One way or another the stakeholders in the railway sector will have to let go of the natural monopoly, because only through the arrival of new competitors will the impasse of old habits gradually be broken. These new entrants, at different stages of the production process of rail transport, are the source of innovations capable of changing the cost and content of rail freight's offer. Innovations can emerge in rolling stock (wagons with larger capacity and better suited to the goods being transported), in signalling and the relationship between infrastructure and trains (ERTMS, ETCS ...), in the operation of trains (human resources, equipment rotation ...) and, above all, in the quality of service provided to shippers. In order for the latter to improve, the playing field must be levelled, even within railway companies, and opened up to new production processes combining various innovations to better meet market demands.

Although the implementation of this “competitive solution” has been slow, this is what has happened as a result of the various Railway Packages. Since the 2001-12, 13 and 14 Directives rail freight market entry is possible, and this has had certain effects. It should be noted that freight was the part of the railway sector in which competition began to assert itself. This shows that it was possible, but about a dozen years later; we now know that this is, in fact, imperfect competition.

How to deal with imperfect competition?

A great achievement of the “Railway Packages” is that they have shown that competition is indeed possible in this sector and that it has managed to shake up the situation of inertia. In and of itself this is a significant achievement, and over a relatively short period of time at that. Nevertheless, compared to road haulage, where deregulation started almost 30 years ago, it appears that intramodal competition does not manifest itself in the same form in both sectors. The major differences between the two are network access on the one hand, and the costs of market entry on the other:

- In terms of network access, road and rail are in radically different positions. Even in a scenario where each freight wagon were independently motorised and could come and go freely on the rail network, general open access remains a pipe dream for now. Rail traffic has to be planned, often several months in advance, by means of graphic timetables. Furthermore, it should be noted that the length of the rail network is relatively modest compared to that of the road network: the ratio is 10/100 in Germany, and 3/100 in France¹³. This means that rail needs to undergo extensive massification, as its relevance lies in its ability to transport large volumes over long distances. Transporting smaller quantities over short or medium distances is also possible, albeit still in a global scheme of massification;
- This massification turns rail freight into a capital-intensive activity, which effectively precludes small businesses. By contrast, deregulation in road haulage has led to the emergence of a myriad of small businesses operating just one or two lorries. This is a powerful factor of competition among hugely fragmented actors. The same does not apply to rail transport. In many countries the market is concentrated relative to road transport, given the low number of active rail freight operators. Regulators should definitely take this market structure into account, all the more because there is usually one major player who used to be the national monopoly provider (the incumbent).

Therefore, competition in rail freight can clearly be classified as imperfect competition. Competition is not a steady state, but rather a horizon that one aims to reach, yet obviously recedes as one approaches it. Another tell-tale sign of this situation, besides the limited number of players, is that new market entrants often fail to sustain their business and end up backing out. For

¹³ 60,000 to 600,000 km in Germany; 30,000 km to 1 million kilometres in France.

instance, after the market was opened up in Sweden, one of the pioneering countries in this area, there were no less than eight market exits between 2000 and 2004, including “Ikea Rail”. After 2004, only 10 operators remained (B. Hylén 2005). We can notice that intermodal competition played here an important role. In Sweden, road transport has experienced high productivity gains due to the allowance of “megalorries” (60 tons).

From competition to efficiency

Competition is not a *panacea*. It has a cost for new entrants who fail to make a profit on their investments. It often leads firms to restructure after a few years of operation. Because of a lack of interoperability, there are many sunk costs. It is not possible to go for a “hit and run entry”, a concept dear to the theory of contestable markets (Baumol 1982). Unlike aircraft in air transportation, rail equipment purchased for use in one country cannot easily be transferred to another country due to the many differences in technical standards. Furthermore, such railway equipment is not easy to acquire. Delivery of new equipment is often counted in years, and the second-hand market is not very active. Incumbent operators have no interest in selling their available equipment, as it would likely only serve as a springboard for potential competitors. The same goes for human resources, such as train drivers, who have to undergo extensive training.

This means that the industry is characterised by multiple barriers to entry, including both market entry costs and market exit costs. Competition is therefore only legitimate if it ultimately leads to an overall improvement in efficiency in the sector. The latter is measured using various indicators such as rail freight’s market share, changes in industry costs, productivity, and so on. The ultimate purpose of intramodal competition is to increase the efficiency of individual companies and of the industry as a whole, so that intermodal competition can also lead to a collective gain.

Sectorial regulation presupposes that compliance with competition rules is taken into account, as well as the effects of said rules on the efficiency of individual companies and the sector as a whole. Besides short-term impacts, medium-term and long-term effects need to be addressed as well, keeping in mind that this is —much like the energy sector— a capital-intensive sector subject to high sunk costs. The main upshot of this type of situation is that the market participants are not similar. There is no “representative company” as in the case of pure and perfect competition. Each company will adopt a strategy and will target markets suited to its specific assets (Williamson 1986). Since the latter are not of the same nature, nor of the same importance, market powers should be taken into account with a view to ensuring both companies’ and the entire sector’s long-term efficiency — a difficult task, as we shall see.

3. Regulation issues: beyond the liberalisation process, what are possible policy options?

The very title of this discussion paper suggests that regulation cannot fix everything. Regulation is, however, not powerless. In order to grasp the extent of its scope, we propose a distinction between regulation in the strict meaning of the word and regulation in a broader sense:

- The former essentially aims to avoid any discriminatory behaviour on the part of the natural monopoly, curtailed in principle (Crozet 2012), of the infrastructure manager (IM). First and foremost, all operators need to have equal network access, including when it comes to the allocation of train paths in the planning phase (drafting of graphic timetables); equal treatment of trains in the operating phase; non-discrimination in charges and tolls for infrastructure; access to essential facilities such as fuel delivery points, depots or train storage tracks; and so on. The very list of such essential facilities can be up for debate. For example, should it include rail marshalling yards or maintenance centres? To what extent should the incumbent operator be forced to share its specific assets? The objective here is to lower the barriers to entry so as to facilitate market entry;
- Regulation in the broad sense also considers the mechanisms that will allow not only the survival, but also an acceptable level of profitability for a sufficient number of operators, ensuring the overall efficiency of the sector. This refers to technical issues such as the harmonisation of operating standards, which ultimately have to converge at the European level, but also economic and social issues pertaining to the management of companies in the sector. The issue of state intervention is crucial here. Having been for a long time and very often still being the main or sole shareholder of the incumbent operator, each national state will tend to interfere in the competitive game, albeit in an indirect or hidden way. This is a delicate issue that regulators cannot always deal with head-on, yet it needs to be addressed, taking into account the independence typical of the academic world.

Considering these various dimensions of regulation, the following points will be discussed in this second part. We will begin by making an inventory of the liberalisation of rail freight in Europe. We will see that the process is underway in many countries where competition is actually no longer a goal to be attained, but a reality (see Section 3.1). However, national situations are still quite diverse and competition remains imperfect for many historical, technical, political or social reasons — and even the sector-regulating bodies and procedures vary from one country to the next (see Section 3.2). For this reason, any possible options considered in this document with a view to contribute to better regulation must take into account these national differences on the one hand and the specificities of the sector on the other; it should not do so to encourage a *status quo*, but, on the contrary, to show what could be possible next steps in regulation, once the initial phase of achieving liberalisation and establishing competition is completed.

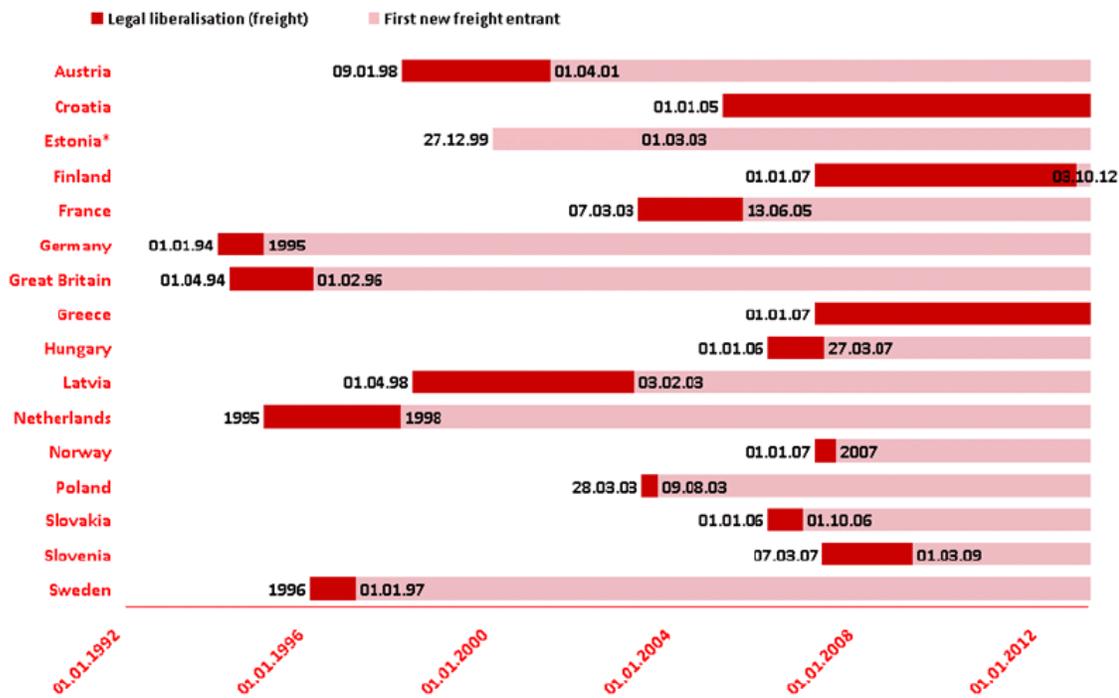
3.1 Liberalisation and deregulation of rail freight in Europe: state of play

Since the first (2001) and second (2004) "Railway Package" established competition for rail freight, significant changes have been observed in most European countries. In general, markets are more open and competition is increasingly becoming a reality. The first phase of deregulation took time, but it is now in evidence in Europe, although the degrees of liberalisation differ from one country to another. We will highlight that even though no obvious direct causality relation can be noted between opening to competition and rail freight market share, liberalisation has led to a deep transformation of the sector; and that such process is not yet over.

General overview

There is no European-level regulator for the rail sector. The European Rail Agency (ERA) could eventually take on this role in the future. For now it is mainly involved upstream, in the field of standardisation and harmonisation of standards. So there are only national regulators, and they are not always independent, but there is a network of independent regulators (IRG-Rail) which has provided a general overview of the process of liberalisation in rail freight (see Figure 4).

Figure 4: Liberalisation progress in selected European Countries



* Estonia had a new freight entrant before legal liberalisation on 1st March 2003.

Where exact dates are not available, they have been set to the appropriate year.

Source: Independent Regulators Group - Rail, 2013

Figure 4 shows that different countries are in very different situations. Some, like The Netherlands, Sweden, Germany and Great Britain, legally established competition in the mid-1990s and shortly afterwards saw several new entrants gaining a foothold in the market. In other countries, the legal introduction of competition only came about as a result of the European Railway Packages in the early 2000s. The actual market entry of the first competitor then followed, often only after a few years, or after many years as in the case of Finland, or even never, as in Greece. This indicates that the liberalisation of rail freight does not necessarily bring about a tidal wave of competition: it is a slow movement that manifests itself in stages across Europe. Nevertheless, even after the liberalisation, the sector remains highly concentrated, which raises questions about the different stages of the liberalisation process and its impacts on rail freight performance.

The Rail Liberalisation Index (IBM 2011)

Varying degrees of liberalisation can be tracked in detail thanks to the Rail Liberalisation Index (IBM 2011). Before we get into the results, it is important to outline its evolving structure. In 2011, the general index took two broad categories of indicators into account, called LEX and ACCESS:

- Indicators grouped in the LEX category, representing 20% of the overall index, take into account the organisation of the sector and in particular the vertical separation between IMs and RUs, as seen below. However, the most weight is given to the regulation of market access and the power of market authorities;
- The ACCESS indicators comprise the bulk of the weight of the RLI (80%). They assess the different barriers to entry (information/administrative/operational barriers), but also the share of the domestic market that is accessible, and to a lesser extent also ticketing/sales services to passengers.

The scores for each indicator are then added up, taking into account the weightings shown in Table 6. The higher the RLI score, the more we can consider that the country has opened up its rail market. Countries scoring over 800 points are said to be in a state of “Advanced” liberalisation (Austria, Denmark, Germany, Netherlands, Sweden, and United Kingdom). Countries scoring between 600 and 800 points are said to be “On Schedule” (13 EU countries including Italy, France, and Belgium). The status of countries scoring between 300 and 600 points is called “Delayed” (6 EU countries including Spain and Luxemburg). Though the score for each country is interesting, it is best not to attach too much importance to the detailed results, insofar as they depend on changing weightings and measurement tools that are still open to improvement.

Table 6: The Makeup of the Liberalisation Indices in 2011

LEX (20% of overall index)	
(25% in 2002, 30% in 2004, 20% in 2007)	
Organisational Structure	25
Incumbents' independent status with respect to the state	5
Degree of vertical separation - network/operations	80
Degree of horizontal separation - freight/passenger transport	15
Regulation of Market Access	45
Market access regime for foreign RUs	40
Market access regime for domestic RUs	40
Legal controlled access to operational facilities	20
Regulatory Authority Powers	30
General aspects of the regulatory authority	30
Scope of regulation	30
Powers of the regulatory authority	40
ACCESS (80% of overall index)	
(50% in 2002, 70% in 2004, 80% in 2007)	
Information barriers	5
Duration for obtaining information	40
Quality of non-personal information provided	30
Quality of personal information provided	30
Administrative barriers	20
Licence	35
Safety certificate	25
Homologation of rolling stock	40
Operational Barriers	45
Track access conditions	25
Infrastructure charging system	50
Other service facilities	25
Share of domestic market accessible 2009	25
Method of awarding transport contracts	20
Compliance with transparency provisions	10
Percentage of the accessible market for RUs	70
Sales services in passenger transport	5
Rental of space ticket sales offices	50
Access to sales services	50

Source: Author's own work

Nevertheless, three points are worth being mentioned at this stage:

- Firstly, all countries are seeing a gradually improving trend in their RLI. In less than a decade, this is a major achievement, indicating that the “competitive solution” is at play;

- Secondly, the very act of changing the weightings reveals that liberalisation is a complex process, the ambitions of which adapt to observed developments. Indeed, the weight of the ACCESS indicators (assessment of barriers to entry) increased from 50% to 80% of the total weight of the RLI between 2002 and 2011;
- Thirdly, as an extension of the previous observation, the increasing weight of the ACCESS indicators is primarily due to the fact that other indicators, grouped under the name “COM”, have since been left out of the general index. These COM indicators consider the effects of liberalisation from the perspective of regulation in the broad sense, particularly taking into account the evolution of rail’s modal share and new entrants’ relative share.

Table 7: Content of the COM indicators (RLI - IBM 2011)

COM (not included in overall index)	
(25% in 2002, not included in 2004, 2007 and 2011)	
Modal split changes	20
Change in the modal split for rail freight transport (2001 - 2008)	40
Change in the modal split for rail passenger transport (2001 - 2008)	40
Share of modal split for rail freight transport 2008	10
Share of modal split for rail passenger transport 2008	10
Number of external RUs 2009	20
Certified RUs (excl. incumbent) in relation to network length	40
Ratio of active RUs to certified RUs	50
Number of active RUs providing passenger services on a regular basis	10
Market share external RUs 2009	60
Market share ext. RUs in terms of transport performance in %	75
Increase in market share of ext. RUs between 2006 and 2009 in %	25

Source: Author’s own work

The issue of new entrants’ market share therefore takes centre stage once more, as it is necessary to have a longitudinal approach. What becomes of these new entrants? In many industries, such as air transport, it has been found that after an initial phase in which the number of operators multiplies competition eventually leads to a period of consolidation, ultimately followed by increased concentration. Does this hold true for rail freight? Beyond the issue of the number of operators, the question of performance of the whole branch is addressed. Is it possible to link the RLI on one hand and the degree of concentration on the other hand?

Indicators of concentration and market powers

In traditional analyses of competition, economists pay close attention to the structure of the market, i.e. the number of competitors, since they consider that structure largely determines the behaviour of companies in terms of innovation, and ultimately their overall efficiency. Completely monopolistic companies are known to lead a “quiet life”, as J. Hicks (1935) puts it.

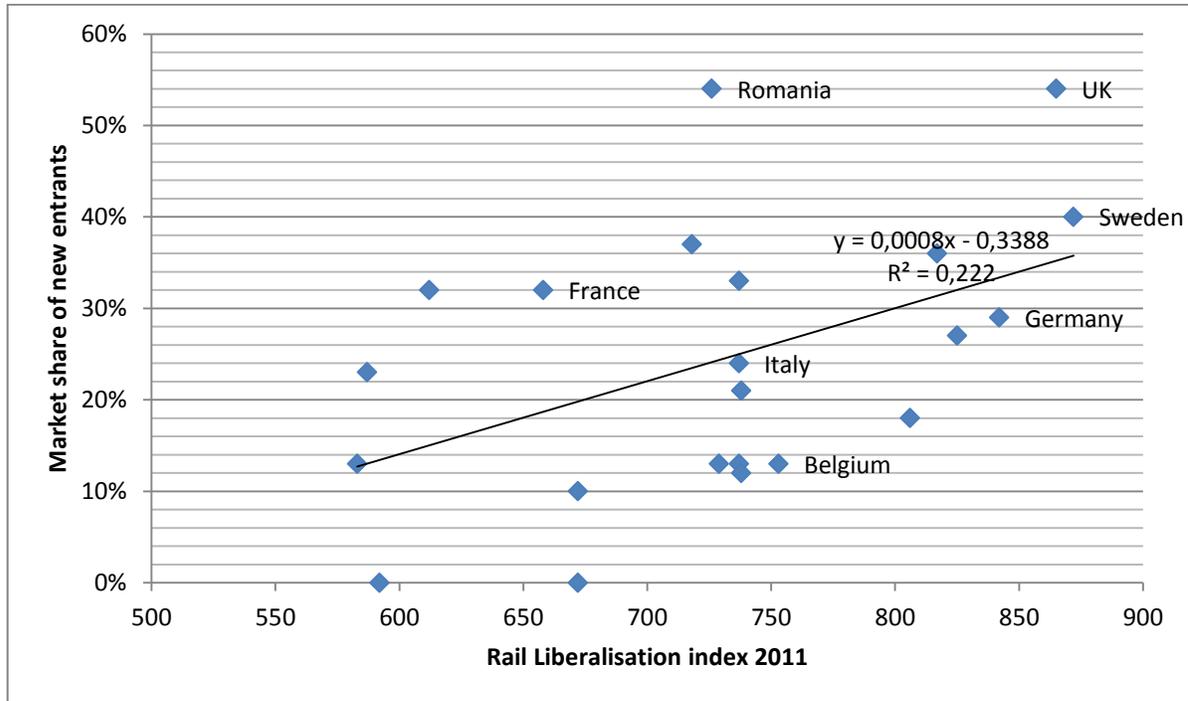
For these reasons, in the United States the issue of market structure within an industry is closely monitored by the authorities. They refer in particular to the Herfindahl-Hirschman Index (HHI), which is defined as the sum of the squared market shares (Shepherd 1984). The value of the index increases when the number of companies decreases. Thus, as the number of companies active in rail freight in the United States dropped from 36 to 7 between 1978 and 2004, the HHI rose from 589 to 2263 — well above 1000, which is considered to be the critical value above which strong market powers are likely to occur (Mac Cullough 2005). Is this the situation in Europe as well?

Compared to the United States in the late twentieth century, the European Union is in the opposite situation. The opening of the market currently leads to a lower HHI value. When there is only one operator, the HHI peaks out at its maximum value of 10,000¹⁴. In the case of Great Britain, for example, the growing market share of competitors of the main operator (EWS) gradually brought down the HHI value from 7450 in 1997 to approximately 3000 in 2012 (see Table 7 below). So there is clearly a downward trend, but we are still at extremely high levels of concentration found in most European countries. Germany has an HHI value of well over 6300, while that of France exceeds 5000.

If we now cross RLI and the market share of the new operators, we obtain the results presented below (Figure 5). The linear regression shows that there is a direct link between the two variables, but the R^2 value is quite low. However, some new operators in countries with a low RLI, reach 20 to 30% of market share. The RLI explains then just a small proportion of the variance. As well as there is no “representative firm”, national specificities, historical, geographical, socio-political...make it impossible to have a “representative country” that could stand for model to other countries. Nonetheless a background trend stands out being the large market share of a major company that plays a key role on the market.

¹⁴ 10,000 if market shares are valued between 0 and 100, but 1 if market shares are expressed as a number between 0 and 1.

Figure 5: Rail Liberalisation Index and market share of new entrants in 2013



Source: EU, RMMS, working documents, 2014

Despite major differences between the US and Europe, we end up with the same observation. Therefore one might question whether there is some specificity to rail freight keeping the HHI value structurally high, thereby maintaining high levels of market powers. In order to understand this, one should keep in mind that an HHI value of 1000 corresponds to a situation where 10 operators each hold 10% market share. Is this a reasonable goal for rail freight? Are we not in a business where, in order to develop certain activities such as single-wagonload transport or powerful corridors for container transport, it is necessary to hold a market share well above 10%?

If the answer to this question is yes, then that means that a certain level of concentration is inevitable, and even desirable for the community to benefit from increasing returns specific to certain activities. In terms of competition analysis, and therefore regulation, this entails that we should not go out of our way to keep increasing the number of operators. Nevertheless, market entry must remain possible for new competitors. The issue of barriers to entry has become pivotal, because such barriers risk sterilising the beneficial effects of competition, imperfect though it may be. In order to do this, we could look a little further than the HHI, to the Rail Liberalisation Index.

3.2 Critical issues of imperfect competition in the railway sector

In the rail sector, effective competition takes on specific forms, requiring context-specific analyses. For instance, for rail passenger transport, we have shown (Crozet, Nash and Preston 2012) that competition *for* the market (off-track) is easier to establish than competition *in* the market (on-

track). In rail freight, there is definitely on-track competition, but there are many obstacles limiting the beneficial effects that are generally attributed to increasing competition. This has to do with the particular context of the rail sector, where there is still a strong presence of public authorities, when it comes to questions on optimal market structure and the role of major companies.

From the rail context to organisational issues

The issue of network access is crucial in order to understand why rail freight has such difficulty growing and developing. As we have indicated, the rail network is much less dense than the road network and it is not, except locally, being extended. Furthermore, freight trains compete with passenger trains for the allocation of train paths. Generally speaking, in Europe —unlike in the United States— priority is systematically given to passenger trains:

- To begin with, this is evident in the allocation of train paths where regular passenger-train schedules predominate, leaving freight trains to have to slip into leftover slots between passenger trains;
- Giving priority to passenger trains most often occurs in the operational phase. In case of a disturbance, it is usually the passenger trains that get to leave first. This often results in significant delays for freight trains, which can accumulate, as they travel long distances and may encounter several disturbances.

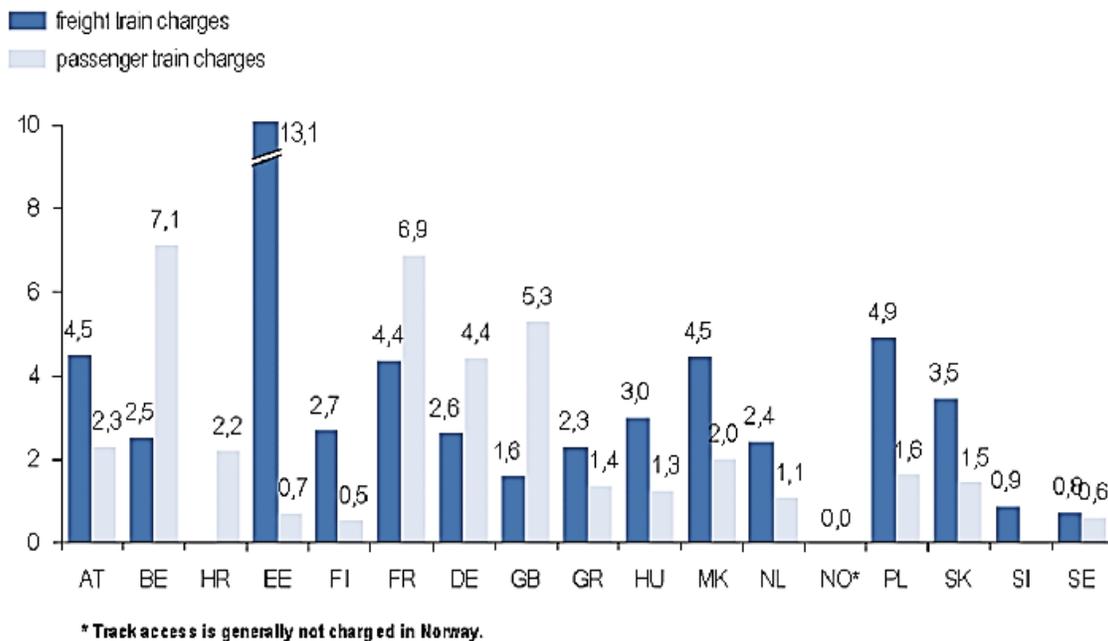
The development of rail freight therefore requires the availability of quality slots at an affordable price:

- Path quality depends primarily on the average allowed speed. This is a major factor in efficiency because the lower the speed of the train, the higher the capital costs (locomotives, wagons) and labour costs. Conversely, a higher average speed allows for more goods to be transported with the same amount of production factors. The reliability of the paths is another factor influencing their quality. In countries such as France where more than 20% of freight trains have substantial delays (see the France Case study), shippers tend to turn their backs on rail;
- The question of railway access charges is a delicate one. Infrastructure fees did not exist prior to the railway reforms. They are now almost universal in Europe, even when railway undertakings have remained integrated. Whether or not independent, the infrastructure manager (IM) provides railway undertakings (RUs) with a service the cost of which is reflected in the access charges. But are the infrastructure charges an accurate reflection of the costs incurred by the IM? This is not all that obvious when looking at Figure 6. Not only are there significant differences between passenger trains and freight trains, but from one country to another, freight trains also pay very different access charges. This can stem from actual differences in operating costs and track maintenance costs, but mostly it reflects strategic choices taking into account each type of user's willingness to pay. This is why access charges for freight trains are very high in Estonia, for example, while they are very

low in Sweden. In the latter country, as in many others, railway access charges are actively lowered in order to promote this mode of transport. Under European legislation, access charges are to be based on direct cost, with non-discriminatory mark ups permitted when needed for financial reasons. In other words the differences in charges largely reflect differences in the degree to which the state is willing to pay the fixed costs of the rail systems opposed to charging them to rail users through mark-ups.

Figure 6: Railway access charges in Europe

Euro per train kilometer, 2011



Source: Independent Regulator's Group – Rail 2013

Note that access charges are relatively low in Great Britain and Germany, while they are apparently relatively high in France¹⁵, where rail traffic has declined significantly since the early 2000s. However, access charges are also high in Poland, where freight rail traffic is now in second place in Europe, after Germany (see Table 8 in Section 3.3). Access charges are therefore not the sole cause of rail freight's problems. In fact, there seems to be an asymmetric sensitivity to these charges. Given rail freight companies' low profitability levels, any increase in access charges is detrimental and reduces rail's relevant perimeter compared to other modes. However, lowering rail access charges does not always lead to significant improvements if the railway companies have not been able to make profound changes to their internal organisation and to the services they offer to shippers.

¹⁵ In France, freight operators do not pay the official tariff. A public subsidy lessens the burden of real access charges.

Organisational reforms and the ongoing presence of the state

Railway undertakings have long been in a monopoly position, and have therefore not been prone to look for productivity gains. The railway reforms promoted by the European Union are intended to rectify this situation. We should also bear in mind that throughout almost the entire twentieth century, as passenger and freight transport increased significantly, governments everywhere responded by trying to curtail road transport. Passenger transport by bus was highly controlled, hauling goods by lorry was strictly regulated (maximum distances, administered prices, required licenses for vehicles ...), and so on. And yet these severe restrictions did not prevent rail transport's protracted decline. Europe's railway reforms, initiated a quarter century ago, have since turned away from this restrictive logic. Instead of trying to save the rail sector by increasing constraints on road transport, the aim is now to push rail transport towards profound transformation. However, since rail freight's relevant perimeter today is structurally reduced due to the changing nature of the goods transported (see § 122), productivity gains in the rail sector can only be obtained, at least in the initial phases of the process, through considerable workforce reductions.

This phenomenon follows from an "iron" law of economics, which states that employment in an industry evolves with the ratio of variation in production to variation in productivity. When production increases less than productivity, employment decreases mechanically per constant amount of hours worked. For this reason, workforce cuts have been an essential part of railway reforms, in Germany and Switzerland for instance. Note that in both cases, unlike in Great Britain, the process did not involve privatising the activity, or even completely separating the IM from the other activities of the company. The important thing, though, was the explicit contract entered into with the unions on downsizing and accepting greater flexibility in the organisation of work in exchange for guaranteed compensation.

The presence of the state in the sector is not in itself a problem, but the state should insist on some necessary organisational redesigns, which is not always the case. In France, for instance, there have been successive railway reforms —one in 1997 (creation of RFF as an independent IM) and one that is set to be passed by the French Parliament in 2014— but neither addresses the issue of productivity head-on. The latter has progressed in France in recent years, but does anyone see that as fortunate? The railway reforms are not presented as an opportunity to reorganise the production processes. Particularly in the freight branch, these lay-offs were felt —both within the SNCF and in France as a nation— as an abandonment, as the inevitable price to be paid for the plummeting activity in this sector. This price is mostly linked to the difficulty in changing social relations and human resource management at SNCF. Any such decision is immediately presented as a social step backwards and relayed as such at the highest state level. The only option left for SNCF's senior management is to downsize and focus on the remaining profitable activities within the organisation as it is. And then there's also the ongoing expansion of the company's private-sector subsidiaries (VFLI...), as they are less hampered by the burden of having very rigid rules for HR management.

Most regrettable though this may be, it is important to emphasise that the state is not so much an actor in this situation as it is totally captured (Laffont & Tirole 1991). The EPIC status (*Établissement Public à Caractère Industriel et Commercial*, a category of public undertaking) is problematic, as the European Court of Justice recently pointed out. This status, which gives a company the equivalent of a state guarantee against any risk of bankruptcy, puts it in a weak position. It has very little room for manoeuvre to change things. This means that SNCF's rail freight branch has been able to accumulate losses for years on end. Despite the frequent workforce cuttings in the business sector, and despite effort made on reorganisation, the company remains above its breakeven point.

The "tyranny of the status quo" (M. & R. Friedman 1985) imposes its law, and successive managers of the freight branch have to operate under constraints prohibiting them from successfully re-launching their activity. Not to mention that at the same time, new competitors entering the market had more flexibility to adapt to demand from shippers. In just a few years, these competitors have taken a third of the market share, yet rail freight traffic in France has still decreased by over 40% since the early 2000s.

The restoring force of increasing returns and "major" companies

Comparing changes in France and in Germany is interesting because it leads to reflection about another issue, just as delicate as the previous one with regard to state involvement, but also just as challenging: the existence, both in rail and in air transport, of "major" companies with a large market share.

Deregulation in air transport has led to fierce competition, many bankruptcies and fragile profitability for many traditional companies. In Europe, those who survived managed to do so by developing hubs at large airports, allowing for a higher seat-occupancy rate per plane, thereby yielding increasing returns. At London Heathrow, Paris CDG and Frankfurt, more than half the traffic comes from British Airways, Air France and Lufthansa respectively. These companies are in a strong position in their domestic markets. Dismantling them would make no sense, neither for their countries of origin, or for the overall efficiency of the sector.

Based on this example, we can draw a parallel with rail freight. In every European country, there is one major company in the rail freight sector. This is not only the result of a former state monopoly, as shown in the example of Britain, where the monopoly was broken 20 years ago. It is a consequence of the increasing returns in the sector, playing the role of restoring force. Not only do these increasing returns stem from the very capital-intensive nature of the sector, they are also linked to the use of large hubs, as in air transport. This applies to single-wagonload transport. At the beginning and at the end of routes, these wagons can be towed by short-haul rail operators. But for the main stretch, when flows need to be consolidated, requiring trains to be assembled in

marshalling yards, the major company is essential. Take the Xrail¹⁶ project, for instance, which aims to restore the relevance of single-wagonload transport at the European level. This type of ambition leads to a need for cooperation between companies across the European TEN-T networks. In a way, this is a move away from competition towards cooperation, or at least “coopetition” (Y. Luo 2007) under the auspices of a major company. This also raises the question whether such cooperation is to be viewed as a cartel to reduce competition, or as the opposite — an alliance meant to improve the overall efficiency of the system, as is the case in air transport.

Major companies also play a role at the international level, as the development of international freight leads to strategic choices having to be made at the European level. Indeed, SNCF has subsidiaries operating in neighbouring countries (Captrain) and DB, through DB Schenker, controls many railway companies throughout Europe. These undertakings sometimes even become the major company in the country in which they are active, such as EWS in Great Britain. This requires a European rather than a national approach to major companies. As we can observe in the different countries’ markets, local new entrants are indeed rarely absolute beginners in the sector. Most often, the new entrant is a subsidiary of a major company, or is already well established in another market. This is not necessarily a bad thing, given that we are in a sector where both learning costs and sunk costs are high. This does, however, raise specific questions regarding the way the sector is to be regulated. Although the liberalisation of rail freight has allowed competition to develop and new players to enter the market, regulation must also take into account companies’ strategic behaviour, and how it affects the overall efficiency of the sector.

3.3 Regulatory issues in the rail freight sector: the next steps

The regulation of rail transport is a recent issue in Europe. The matter is approached very differently in different countries. This is due to the wide diversity of organisational choices made to implement the reforms and the different stages of progress reached through said reforms. Furthermore, the European regulatory framework surrounding these reforms is itself continuously evolving, and nobody knows for certain what will be the exact final content of the fourth Railway Package, which is still under discussion. We must therefore consider the next steps in rail regulation pragmatically, in particular when it comes to transporting goods.

Diversity of national choices in terms of regulation

In recent years, the European Commission has been very active in the railway sector. It has launched infringement proceedings against many countries in order to push them towards more competition. It has placed great emphasis on the need to establish a regulating body capable of enforcing free market entry, access to paths, and equal charges and fees for all. However, just as

¹⁶ Xrail consists of seven European freight operators: NMBS Logistics (Belgium), DB Schenker Rail (Germany), CFL Cargo (Luxembourg), Rail Cargo Austria (Austria), CD Cargo (Czech Republic), Green Cargo (Sweden) and SBB Cargo (Switzerland). It has to be noticed that Xrail is not a closed group; it is an alliance opened to new members.

each country has carried out railway reforms in its own way, sector regulation too takes very different forms in different countries.

In the mid-1990s, Great Britain decided to establish an independent and powerful sector regulator, which made sense in the organisational structure adopted after the disappearance of British Railways. The ORR (Office of rail regulation, formerly Office of the Rail Regulator) has statutory duties towards freight (ORR, 2013a). The ORR performs these duties in three key ways (ORR, 2013b):

- To “regulate Network Rail’s stewardship of the national rail network”;
- To “licence operators of railway assets”;
- To “approve track, station and light maintenance depot access”.

We will not go into a detailed discussion of the many activities of the ORR here. However, one example we do wish to highlight is that the ORR carries out periodic reviews of Network Rail’s financial structure, usually every five years. This process leads to the approval of track access charges for each type of freight locomotive and wagon for different commodity types, together with a range of other charges such as a coal spillage charge and a freight-only line charge (ORR, 2008), based on proposals from Network Rail. The ORR has published a detailed account of the proposed charging principles for 2014-2019 (Control Period 5, ORR, 2013c).

More recently, in December 2009, France introduced an independent industry regulator, but its scope of action is much more limited than that of the ORR. For instance, each year the ARAF (*Autorité de Régulation des Activités Ferroviaires* — authority regulating rail activity) has to approve the list of track access charges proposed by the IM. However, ARAF plays a much less prominent role in establishing the principles upon which such charges are to be based. In terms of freight, it intervenes mainly to verify that there is no discrimination between operators and to make a decision in case of appeal by one of them. This type of intervention by the regulator, usually *ex post*, is also the norm in Germany.

In the case of Germany, the rail regulator is not a sector regulator. Regulation of the rail sector is carried out by an independent regulator overseeing several network industries. Since 2006 the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway (Bundesnetzagentur, BNetzA) is the regulator responsible for the regulation of the German railway market. Its responsibilities are based on the General Railway Law (*Allgemeines Eisenbahngesetz*, AEG) and the Regulation on Railway Infrastructure (*Eisenbahninfrastruktur-Benutzerverordnung*, EIBV), which determines its main task as monitoring and controlling the non-discriminatory access of all railway operators to infrastructure, especially the processes granting access to networks and service facilities, time-table schedules as well as non-discrimination of access fees (BNetzA, 2013). The German regulatory authority has *ex-ante* as well as *ex-post* competencies for regulatory control

of access and charges issues¹⁷. It can also initiate investigations as a reaction to complaints and, if necessary, it is able to take action *ex officio* (BNetzA, 2013; LIB-Index, 2013). Decisions by the BNetzA are then immediately effective and an objection has no effect of delay. In addition to its monitoring responsibilities, the BNetzA has the authority to order coercive measures of up to 500,000 euros, without being able to impose fines. Since 2006, the regulatory authority has initiated around 600 investigations and taken about 150 decisions (BNetzA, 2013, LIB-Index, 2013).

In Italy, there was until recently¹⁸ no independent sector regulator. Regulation of the sector was in the hands of a department within the Ministry of Transport, which verified the IM's decisions, including proposed infrastructure charges, in advance. This is the same department that dealt with complaints from operators regarding network access and essential facilities. The situation is the same in Belgium.

Ups and downs of the 4th Railway Package and implications on regulation in the strict sense

As we have seen, the rail transport sector is regulated in many different ways in Europe. This situation is likely to persist. The ambitions of harmonisation in the railway systems that were included in the draft 4th Railway Package were opposed by several countries, and eventually severely limited in February 2014 by the European Parliament. The latter wisely favours considering rail regulation in a more pragmatic way.

Asserting their influence to prevent the 4th Railway Package from making mandatory the separation of ownership between infrastructure and operations, France and Germany — with the support of other European countries such as Italy and Luxemburg — have made the regulator's mission more crucial as well as more complex:

- More crucial, because the existence of a holding company increases the risk of a privileged relationship between the IM and the holding company's other subsidiaries;
- More complex, because extensive investigations may be required to reduce these risks of discrimination. Just as EU directives have left much room for manoeuvre for nations to reform their railway systems, the fourth Railway Package will not impose a complete separation of infrastructure and operations on all countries. This means that the rail regulator will need to carry out regular and thorough assessments of the inner workings of the IM, a (natural) monopoly.

¹⁷ The infrastructure manager has an obligation to submit the list of charges and the network statements (including charging principles) for checking by BNetzA (process: submission, check, hearings, counter checks, decision). BNetzA has the right to object to the submitted proposal. If BNetzA objects, the status quo ante continues, until the infrastructure manager submits a new proposal.

¹⁸ The Italian "Autorità di Regolazione dei Trasporti" (ART) has been officially set up in September 2013. Its first report to the Italian Parliament has been delivered in July 2014 (<http://www.autorita-trasporti.it>)

Of course any form of price discrimination must be avoided, but that is fairly easy to check and verify. The same does not hold true for two other areas where regulators have their work cut out for them:

- The first is the allocation of train paths, and giving access to the network and essential facilities, to competitors of the railway holding company. If the incumbent railway undertaking should somehow obtain information on paths requested by other operators from the IM, then that would constitute a significant information asymmetry. It would then be easier for the incumbent to offer competing services, or it could even request train paths in the same space-time to saturate capacity. This is what SNCF was found guilty of by the French competition authority¹⁹. It is for this reason that the fourth Railway Package requires real compartmentalisation, calling for proverbial "Chinese walls" to be built between the IM and the other entities of the holding company. But how can the absence of any information leaks between the different entities be ensured and monitored? As long as their subsidiaries are not fully separated into independent entities, holding-type companies should expect to undergo regular checks and evaluations. This is the quid pro quo for maintaining vertical integration and avoiding separation of ownership;
- The second area refers to the question of financial transfers between the IM and the rest of the holding. These transfers may be from the IM to the holding company, as it is the case in Germany. In that country, in fact, the railway reform has led to the Federal Government taking over the railway system's long-standing debt. For this reason the IM, DB Netz, has little debt. As it has also obtained significant productivity gains, it makes modest profits on the railway access charges since 2007²⁰, which contribute to better operating results for DB. This type of flow should therefore be monitored closely by the regulator in order to assure that the incumbent operator does not gain undue benefits in terms of cost of capital and financing compared to its competitors. In France, by contrast, the IM is highly indebted (33 billion euros by the end of 2013). It is for this reason that in the current draft of the railway reform, it cannot simply be merged with SNCF into a single entity, because the income statement of such a merged company would be permanently affected by the debt service burden (more than 1 billion euros per year).

Based on these examples, it appears that regulation in the strict sense, which essentially monitors discrimination and other asymmetries between operators, should be carried out with even more vigilance, and should take on forms that are suited to the various national contexts, which are likely to remain very different. However, regulators will also need to take a broader view in order to address more strategic issues regarding the long-term sustainability of rail freight.

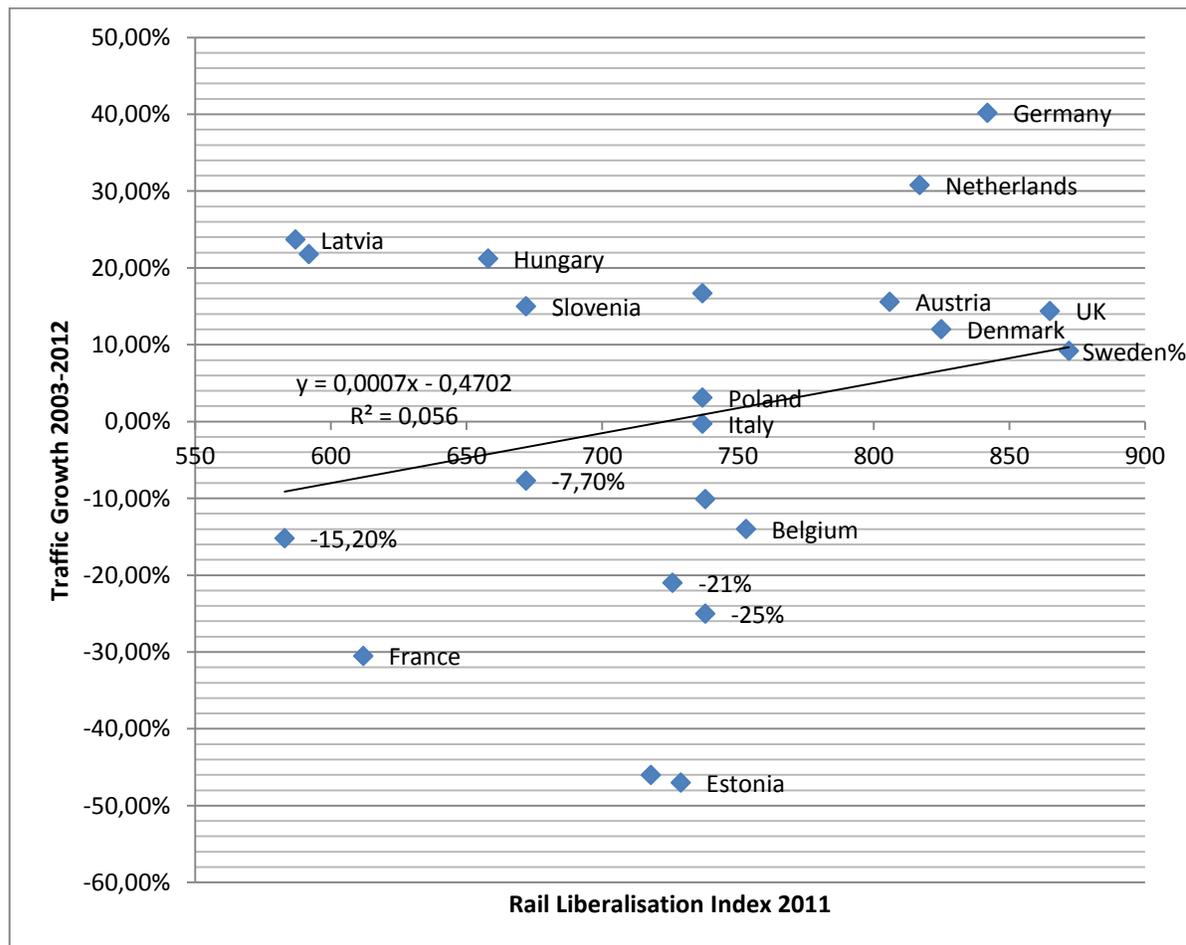
¹⁹ The case is currently challenged in the courts.

²⁰ DB Netz's profits are regulated and can be capped at the level of Capital Cost. However, DB Netz has never reached this ceiling in practice. For example, the ROCE (Return On Capital Employed) was only 3.6% in 2013.

Regulation of the railway sector in the broader sense: efficiency and sustainability of rail freight

Considered in broader terms, regulation of rail freight needs to focus on the latter’s development. Liberalising the sector is not the main goal; it is a mean to get to a higher efficiency and affordable prices, which should result in an increase of traffic. As shown in Figure 7, the relation between liberalisation (RLI) and traffic growth is not easy to establish.

Figure 7: RLI and rail freight traffic growth (2003 – 2012)



Source: RLI (IBM), EU, RMMS, Working documents 2014

Dispersion of the points and the weakness of the R^2 show that liberalisation only is not enough. Traffic decrease in Spain is not only due to the poor opening to competition. One must keep in mind the deep recession the country has been going through for 5 years. For France, as shown above (see also case study on France) several organisational issues have to be taken into consideration. But it is still significant to underline that, countries with a RLI higher than 750 have all encountered increases in traffic, despite 2008-2009 depression, that affected every country. Does that mean that there could be a threshold of liberalisation that should be reached and

overtaken to sustainably inject dynamism into the sector? The issue deserves to be addressed even though it is clear that competition is not a stable state enough for this capital intensive industry.

Therefore, regulators must adopt a strategic approach to medium-term and long-term developments in the sector. The following key points warrant extra emphasis:

- The first aspect to be questioned relates to the relative fragility of rail freight companies. These undertakings are facing stiff competition from other modes, especially from road haulage. Any increase in infrastructure charges or energy costs (especially electricity) is a threat to the sustainability of these activities. It is therefore crucial that the regulator takes these elements into account, especially when it is responsible for determining or approving railway access charges. Public authorities must also see to it that rail freight is not penalised by their lack of investments in infrastructure or by their systematically giving too much priority to passenger trains. In order to reach the EU's rail freight development objectives — even partially — more will need to be done than relying solely on the mechanisms of competition. It is also crucial to consider the context in which it takes place;
- Another element of this context is the strategy followed by the companies. We have already highlighted the key role of some major companies, and we can broaden the subject by pointing out that the liberalisation process is still new. Consolidation mechanisms will arise. Companies will appear and disappear; others will merge or be acquired by those who have the capital resources to do so. It is therefore useful to consider just what an optimal situation in the railway sector would be. Can we expect a market structure with a vast number of operators, as is the case for road haulage? This seems unlikely. Should we then consider as very likely the presence of two or three dominant players, as in air transport? If we are moving towards an oligopolistic structure, and if this situation is considered as rather favourable to the efficiency of the sector, a specific kind of regulation will have to emerge, closely monitoring mergers and acquisitions, market shares, and the necessary survival of smaller operators, as they are important drivers of innovation.

Finally, we have to keep in mind the national specificities of rail freight industry. Table 7 below summarises the situation for eight key European countries. Traffics have not been equally affected by the 2008 economic slowdown. Competition is a reality in all these countries but there are big differences in market shares as well as in traffics growth. In the same vein, it is not possible to make a direct link between rail freight development and concentration index (HHI) or new entrants market shares. But in all these countries, regulators have to face the same challenge: how to foster rail freight traffic both from new entrants and from the increasing returns of the former monopoly?

Table 8: Rail freight national synthetic indicators about rail freight

	Austria	Belgium	France	Germany	Italy	NL	Poland	United Kingdom
Traffic 2012 in tkm	22,1	6,7	32,6	99,8	20,2	6,1	49	22
International traffic	73,5%	69%	32,2%	43,5%	50%	90%	36%	2,50%
Market share of rail	15,2%	39,9%	14,9%	23%	12,2%	5,1%	22%	12,60%
Market share of new entrants	18%	13%	32%	29%	24%	36%	33%	54%
Traffic growth 2003-2012	15,00%	-14,00%	-30%	40%	0%	30%	3%	14%
Traffic growth 2000-2008	4%	2,70%	15,90%	49,20%	6,40%	51,5%	-5,3%	11,50%
Approached HHI	6850	7600	5000	6300	nd	nd	3850	3000

Source: EU, RMMS, Working documents, 2014

4. Implications for rail freight regulation

Given the rail freight development objectives, it is clear that regulation cannot do everything. Whatever form regulation takes, changes in the nature of goods and supply chains will not allow rail freight to regain the dominant position it enjoyed in the early twentieth century. It is here important to underline some hidden hindrance. Apparently the EU objective (“30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050”) is not so difficult to achieve because the majority of road haulage is done for rather short and medium distances: the average distance of road haulage is close to 100km. Therefore, 30% of road freight over 300km would lead to a small decline of the road freight traffic but to an extraordinary change in rail modal split. For instance, at the EU level, shifting 10% of road traffic to rail implies to increase the rail market share from 17 to 24%: a challenge.

However, there is still room for substantial improvement and some studies (McKinnon, 2007) have shown that rail can still gain market share, especially if rail transport services are adapted to certain increasing traffic flows (such as intermodal, long-distance and international traffic). It is by investing in this domain that rail can avoid remaining confined to transporting bulk commodities, whose markets have long since matured or started to decline. Such cooperation with other modes — with sea shipping for container transport, and with road haulage for combined transport — could result in an increase in rail’s long-term market share.

As a result of the analysis carried out in this paper and of discussions during the CERRE seminar of 18 September 2014²¹, some key messages emerge quite clearly which have a direct bearing on how rail freight policy should develop. These are set out below.

1) Message from the rail stakeholders to the Commission and public authorities

Ambitious objectives for rail freight will require firm decisions on the part of public authorities in terms of investments in infrastructure, pricing of competing modes, and opposing “mega-lorries” that could strike a crippling blow to rail freight along many routes.

The stakeholders worry about the risk of an unstable environment. Competition is now a reality for rail freight in Europe and the development of rail freight business needs a stable regulatory horizon. Railway companies have just integrated into their business processes the provisions arising from the recast of the previous directives. It is not obvious at all that further changes to the framework are needed in the near future.

Infrastructure charges should remain low, so as to level the playing field in terms of competition with road haulage. All modes should be subject to the same rules, for example when it comes to covering the social marginal cost (which in many countries implies higher pricing for road haulage).

²¹ <http://cerre.eu/development-rail-freight-europe-what-regulation-can-and-cannot-do>

The quality of train paths is at least as important as their cost for railway undertakings. This is obvious for major international freight corridors, but quality must be ensured throughout the network if rail freight is to be as punctual as road haulage (over 95% of deliveries on time).

2) Message from the Commission

In order to achieve productivity gains and deliver relevant rail freight services, competition remains a powerful driving force and it needs to be leveraged even more widely in order to minimise both the barriers to entry and the risks of discrimination between incumbents and new entrants. It is telling that many of these new entrants are subsidiaries of neighbouring countries' incumbent operators. The Commission knows that this fact portends a certain level of consolidation, leading to a market structure akin to the oligopolistic form. Many aspects of regulating such imperfect competition have therefore yet to be devised. The 4th Railway package is addressing these issues, especially the best way to avoid discrimination (rail access charges, paths allocation...) and other barriers to entry.

3) Message to the rail regulators

In light of this structural imperfect competition, the main challenges regulation will have to address are set out below. At a high level, we note that even if competition seems achievable in the different rail freight segments, regulators have a lot to do.

Intermodal service is a kind of shuttle service for containers and trailers between city pairs – or a port and a city. This service has oligopolistic characteristics since customers value frequency and high frequency increases rolling stock utilization and reduces costs. With rented locomotives and wagons and open access intermodal terminals, the barriers to entry are, however, quite low. And there are some big customers with high bargaining power. What is needed is a “business as usual” regulation (non-discrimination and control of market power).

Industrial solutions are tailor made by traction providers for big shippers, e.g. iron ore, coal, steel, cars and petroleum products. There are probably close to a hundred traction providers of such services in the EU and also many in-house suppliers. The critical mass to start is one customer. The customers have high negotiating power and the entry barriers are typically quite low with rented locomotives and wagons. For this segment, the main regulatory issue is related to the fact that, very often, the incumbent railway undertaking (RU) controls the local infrastructure (sidings). Therefore, access to essential facilities remains a key point to deliver competition.

Single-wagonload is a network service which offers freight wagon transport “from anywhere to anywhere”, nationally and internationally. This supply cannot be provided by a multitude of small operators. There's a strong, natural tendency towards concentration in this domain. It can work through cooperation between a major company and smaller entities. So, in this case, it is cooperation that should be encouraged rather than competition. But it can be an unbalanced cooperation, given that big companies have more market power than the small ones. Hence, regulators or competition authorities should remain vigilant over the terms of cooperative agreements.

Given the very capital-intensive and highly scheduled nature in all segments of rail transport, numerous entry barriers remain and market power manifest itself in many areas of rail freight. This should be given special attention by regulators or competition authorities. Take, for instance, the issue of access to freight terminals, which are often owned by the incumbent operator. Regulators have to ensure that access by third parties to these essential facilities is ensured. Similarly, regulators also have to ensure an equitable access to train paths.

In order for all these points to be fully taken into account by regulators, strengthening the powers of national regulators is crucial. The European directives already provide all the necessary legal basis and guidance for this. However, national regulators should also communicate with one another, as they will be confronted with major companies' market power. The latter is to some extent necessary for the development of rail freight. However, too much market power on behalf of one or two players cannot be a recommended outcome, because the risk of abusing market power would be too high.

References

Baumol W. 1982, Contestable Markets: An Uprising in the Theory of Industry Structure, American Economic Review, Vol. 72, No. 1, (Mar., 1982), pp. 1-15

Bonnafeous A. & Garcia O., 2005. "Modélisation séculaire du marché des transports de marchandises. (Modèle "S.D.FRET")," Economies et Sociétés (Série Histoire Economique Quantitative), Association Française de Cliométrie (AFC), issue 33, pages 1265-1297, July

Bundesnetzagentur (2013), Tätigkeitsbericht Eisenbahnen 2012. Bericht gemäß § 14b Abs. 4 Allgemeines Eisenbahngesetz, Bonn, Juli 2013

Crozet Y., 2005, Time and Passenger Transport, 127th Round Table of ECMT, Time and Transport OECD, Paris, pp. 27-69

Crozet Y., 2012, *Infrastructure management: how to deal with the "quiet life" of a natural monopoly?* Issue paper, Brussels, October, 33 pages, <http://www.cerre.eu/new-policy-paper-regulatory-challenges-ahead-europes-rail-sector>

Crozet Y., Nash C., Preston J., 2012, *Beyond the quiet life of a natural monopoly: Regulatory challenges ahead for Europe's rail sector*, Policy paper, CERRE, Brussels, December, 24 pages, <http://www.cerre.eu/new-policy-paper-regulatory-challenges-ahead-europes-rail-sector>

European Commission (1996), White Paper, A Strategy for revitalising the community's railways, 30.07.1996, COM(96)421 final, (http://europa.eu/documents/comm/white_papers/pdf/com96_421_en.pdf)

European Commission (1997), Intermodality and Intermodal Freight Transport in the European Union, Commission Communication COM(97) 243 final, Brussels, 29.05.1997

European Commission (2001), "White Paper – European Transport Policy for 2010: Time to Decide", COM (2001) 370 (http://ec.europa.eu/transport/themes/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf)

European Commission (2011), White Paper, Roadmap to a Single European Transport Area – Towards a Competitive and Resource Efficient Transport System, COM (2011) 144 (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF>)

European Commission (2012), Technical specification of interoperability relating to 'safety in railway tunnels' in the trans-European conventional and high-speed rail system, 2012/464/EU (amending 2008/163/EC), Publications Office of the European Union, Luxembourg

European Commission (2013), Technical specification for interoperability relating to the subsystem 'rolling stock – freight wagons' of the rail system in the European Union and repealing Decision 2006/861/EC, Publications Office of the European Union, Luxembourg

European Commission (2013), *EU transport in figures*, Statistical pocketbook 2013, Publication Office of the European Union

European Commission (2014), Staff Working document accompanying the document REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT, Fourth report on monitoring development in the rail market, {COM(2014) 353 final}, http://ec.europa.eu/transport/modes/rail/market/doc/swd%282014%29186_final_en.pdf

European Union Committee (2005), Liberalising rail freight movement in the EU, 4th Report of Session 2004-05, House of Lords, The Stationery Office, London

European Union Committee (2011), Tunnel vision? Completing the European rail freight market, European Union Committee, 24th Report of Session 2010-12, House of Lords, The Stationery Office, London

Eurostat *Statistics*, Viewed September 09, 2013, <http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Statistical_themes>

EVES-Rail, 2012, Economic effects of vertical separation in the railway sector, Report to CER (Community of European Railway and Infrastructure companies), CER & innoV, Amsterdam, 188 p.

Friedman M. & R., 1985, *Tyranny of the status quo*, Penguin, 182 p.

Goodwin Ph., 2012, Peak travel, Peak car and the future of Mobility, International transport Forum 2012, <http://www.internationaltransportforum.org/jtrc/DiscussionPapers/DP201213.pdf>

Hicks J., 1935, Annual Survey of Economic Theory: The Theory of Monopoly, *Econometrica*, January

Hylén B. et al. (2013) *Road Haulage Charges and Taxes, Summary analysis and data tables 1998-2012*, Discussion Paper 2013-8 — OECD/ITF

IBM (2011), Rail Liberalisation Index 2011, IBM Global Business Services, Brussels

IBM Global Business Services (2011) *Rail Liberalisation Index 2011 - Market opening: comparison of the rail markets of the Member States of the European Union, Switzerland and Norway*. A study conducted by IBM in collaboration with Prof. C. Kirchner Humboldt-University (Berlin), Brussels

IBM, Global Business Services, Rail Liberalization Index 2011, 2011

Independent Regulators' Group – Rail, 2013, Annual Market Monitoring Report 2013, <http://www.irg-rail.eu/app/download/5798750017/IRG-Rail+%2813%29+2+-+Market+Monitoring+Report.pdf>

Katz M. & Shapiro C, 1985, Network externalities, Competition and Compatibility, American Economic Review, June, 75, 424-40

Laffont J.-J. & Tirole J., 1991, the Politics of Government Decision-Making: A Theory of Regulatory Capture. Quarterly Journal of Economics 106 (4), 1088-1127

Luo Y. 2007, a cooperation perspective of global competition, Journal of World Business, vol. 42, issue 2, pp.129-144

Mc Kinnon A., 2007, Decoupling of Road Freight Transport and Economic Growth Trends in the UK: An Exploratory Analysis, Transport Reviews, Volume 27, Issue 1, pp.37-64

Musso A., Piccioni C., Van de Voorde E. (2013) *Italian seaports' competition policies: Facts and figures*, Transport Policy, Vol. 25, pp. 198-209, Elsevier Ltd

ORR (2008), Track usage price list, Office of Rail Regulation, London, http://www.rail-reg.gov.uk/upload/pdf/cp4-pl-track_usage_181208.pdf

ORR (2013a), National Rail Trends Data Portal, Office of Rail Regulation (ORR), London, <http://dataportal.orr.gov.uk/>

ORR (2013b), GB rail industry financial information 2011-12, Office of Rail Regulation (ORR), London

ORR (2013b), Our functions, Office of Rail Regulation (ORR), London, <http://www.railreg.gov.uk/server/show/nav.95>

ORR (2013c), Opportunities and Challenges for the Railway: ORR's Long-Term Regulatory Statement, Office of Rail Regulation, London

ORR (2013c), Periodic Review 2013: Rail freight – conclusion on the average variable usage charge and a freight specific charge, Office of Rail Regulation, London

Williamson, O. E. 1986, *Economic Organization: Firms, Markets, and Policy Control*, New York University Press, New York, NY