



Introducing Competition in the European Rail Sector

Insights for a Holistic
Regulatory Assessment
Discussion Paper



Yves Crozet
University of Lyon

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Table of contents

Introduction	4
Evaluating rail regulation: what indicators?.....	5
European railway programme.....	6
Overview of rail performance indicators.....	7
From company efficiency to cost benefit analysis.....	8
Productive efficiency and commercial efficiency: the crucial role of organisations.....	8
The economic calculation: cost-benefit and cost-efficiency analyses	11
Multi-criteria assessment of rail freight liberalisation.....	13
Rail freight: structurally imperfect competition	14
Rail Liberalisation Index: can we evaluate the effects of competition?	16
Conclusions	18
References	20
Annex A. Net Present Value and taking risk into account.....	22
Annex B. Rail Liberalisation Index	24
Annex C. Regulatory background for rail transport.....	26
The diversity of railway regulation within EU28 countries.....	26
What room for manoeuvre do regulators have?.....	27

Introduction

In July 1991, after lengthy negotiations between European countries, EU Directive 91-440 was published, setting in motion the process of deregulating rail transport. As with other networked industries (power, telecommunications), the European Union (EU28) was embarking on a new approach, separating infrastructure and operation, at least from an accounting perspective. Once again, the clear objective was to allow third parties access to the network and to make competition a key lever in the revitalisation of the sector.*

This initial ambition had been pursued for 25 years, as demonstrated by the successive “Railway Packages” or the creation of the European Railway Agency (ERA), which plays an important role in questions of security and interoperability. Development of the role of the ERA is at the heart of the “technical” pillar of the Fourth Railway Package approved at the end of 2015. This fourth package contains a “market” pillar, which seeks to open up national passenger services to competition, from 2020 for on-track competition and 2023 for public service, off-track contracts.

The European Commission underlines the fact that the earlier rail packages have already substantially transformed the European rail transport sector. With this fourth package, the generalisation of competition should lead to a single European railway area, which needed if this mode of transport is to achieve the objectives set out in the 2011 White Paper. Given the success of the reforms of the last 25 years, this direction should be pursued. Presented in this way, the matter seems simple, but is it really? What has been the impact of introducing competition and notably on-track competition into rail transport?

There is not an easy answer to this question; there are various evaluation methods in response to the diverse objectives of the rail reforms. Thus, in the first instance this paper presents an overview of the new railway regulation and its objectives, relating them to the available evaluation methodologies. On this basis it then examines the strengths and weaknesses of the Cost Benefit Analysis (CBA) and the need to conduct Cost Efficiency Analyses, which are essential for benchmarking. These methods give summarised and numerical results but they are limited by the fact that they have only local value, centred on one aspect or one company. Therefore it is also necessary to develop a more general evaluation, making use of a multi-criteria approach (MCA) that seeks to make a more holistic (systemic) evaluation of the still largely imperfect competition we find when we examine freight transport, the only rail service where there is real on-track competition. The conclusion presents some recommendations about regulatory impact assessments within the rail sector.

Box 1. Infrastructure manager and rail access charges: what is at stake?

The concept of a separate infrastructure manager did not exist in the European railway sector before Directive 91-440. In almost all countries, an integrated historical operator dominated. Train paths were allocated without any being charged. The separation between the rail and the wheel, even if it is only at the accounting level, was firstly designed to contain the monopoly, on the recommendations of economists (Katz and Shapiro, 1985). But the aim was also to introduce a fee for use of the railway, in order to reflect the relative scarcities, notably in cases of congestion, as well as rail companies’

* Author affiliation on the cover was provided at the time of drafting.

readiness to pay. This commercial logic has played a large part in modifying how networks are managed, but it also has its downside. Isn't a monopoly, even one that is contained, likely to abuse the situation by imposing excessive rail access charges to the rail operators?

The question of the level of track access charges is delicate. Infrastructure charges did not exist before the rail reforms. They have now become more or less generalised, even when rail companies have remained integrated. Whether or not they are independent, the infrastructure manager provides rail companies with a service whose cost is reflected in the charges. But does the level of the track access charges really reflect the costs? This is not apparent when we look at the notable differences between passenger trains and freight trains, but also from one country to another. The differences in the operating costs and track maintenance costs do not play a great role in comparison with national strategic choices taking into account the users' willingness to pay. That is why the charges for freight trains are for instance very high in Estonia and in contrast very low in Sweden. In this country, like in many others, track access charges have been deliberately reduced to encourage this mode of transport.

Rail access charges for freight are also relatively low in France. In contrast they are relatively high for high-speed trains. It is the same in Germany. The high charges are therefore not always an unbearable cost for rail operators, but they can be. This is what work on "double marginalisation" has shown. When, like in France, the infrastructure manager, who is seeking to completely cover the costs of the high-speed lines, operates a differential price structure relating to the ability to pay of the rail operator, the risk is that the level of the traffic will end up being sub-optimal (Sanchez-Boras et al., 2010). This is even more true if the rail operator is in a monopoly position and able to practice yield management. This is the case of the SNCF on French high-speed lines. There is therefore a high risk of seeing a classic monopoly position being created by the combined actions of the infrastructure manager and the rail operator (Messulam and Finger, 2015), deliberately reducing demand in order to increase income to the detriment of users.

In reality, the risk is limited as the SNCF does not have a monopoly on transport services. In addition to the high-speed lines, there are air routes, coaches, car-sharing services and, of course, private cars. But there is a risk of seeing a growing proportion of the rail operator's turnover absorbed by the charges and it is clearly a barrier to entry for potential competitors. This is why the presence of an independent regulator is essential to control the infrastructure manager not only to avoid discriminatory access, but also to check its productivity gains.

Evaluating rail regulation: what indicators?

In its successive transport white papers (European Commission, 2001; 2011), the European Commission was seeking to rebalance transport flows in favour of rail transport. This initiative was based on the idea that rail transport has real advantages in terms of sustainable development. The negative externalities of rail transport are generally lower than those of road or air transport, notably in terms of greenhouse gas emissions. Rail transport is also primordial in densely populated areas where the road network is saturated in rush hour. The geography of Europe and the population density of certain countries are strong arguments in favour of this. In the Netherlands, but also in Belgium, the United Kingdom, large

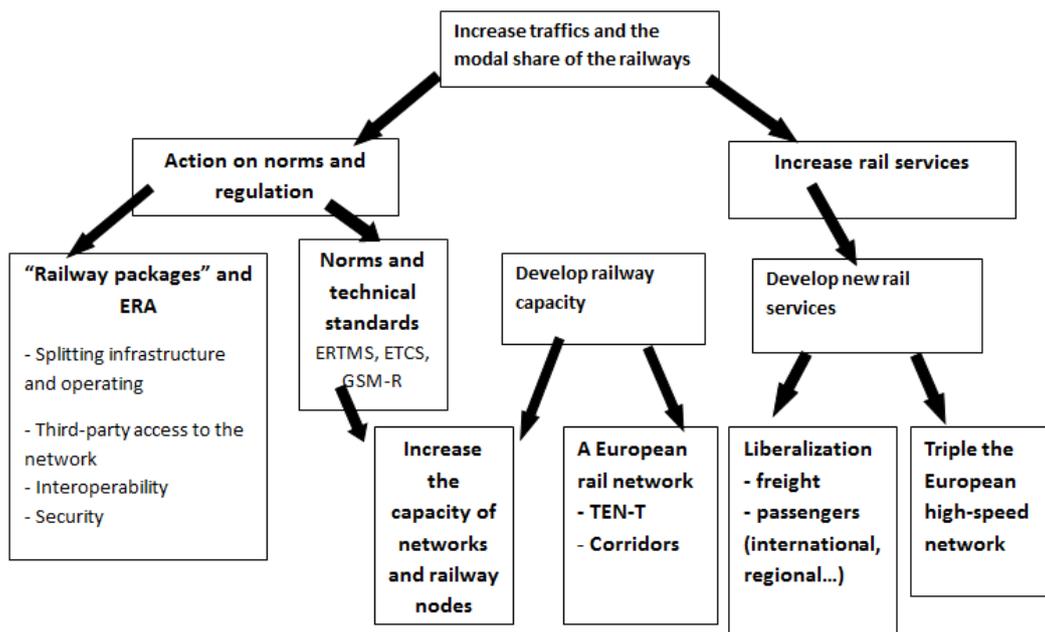
parts of Germany and in many of the large French, Italian and Spanish agglomerations, daily journeys would not be possible without the use of trains and tramways. Their mass transit capacity is essential to allow the mobility of people in large agglomerations.

In addition, high-speed rail has experienced real commercial success, such as on the Paris-Lyon route and to a lesser extent between Paris, London and Brussels. The specific features of European geography and history also tend to favour rail transport. Although it is clear that rail transport is not suitable for the very long distances between some European cities (such as Berlin–Lisbon or Paris–Athens), high-speed rail has demonstrated its usefulness for linking cities such as Paris, London, Brussels, Amsterdam and Cologne. At the national level, the French, German and Italian examples show that high-speed rail routes can be very successful. It is not surprising that in 2011 (the White Paper) the Commission set itself the target of trebling the European high-speed rail network by 2030. Targets for rail freight are equally as ambitious: 30% of inland freight transport over distances of more than 300 km should travel by water or rail by 2030 and by 2050 this proportion should have reached 50%.

European railway programme

To achieve these objectives, the EU28 has not only considered competition as a lever for modernisation, as Figure 1 shows, it has intervened in a number of areas (Crozet Y. et al., 2015).

Figure 1. From objectives to resources: The EU28’s rail programme



Assuming that the EU28’s ultimate objective is an increase in traffic and modal share by the railways, intermediate objectives were set, in the area of standards and regulation, as well as in the railway product offer.

- The first category includes the major decisions represented by successive directives and rail packages, but also the promotion of new standards for train control and command systems

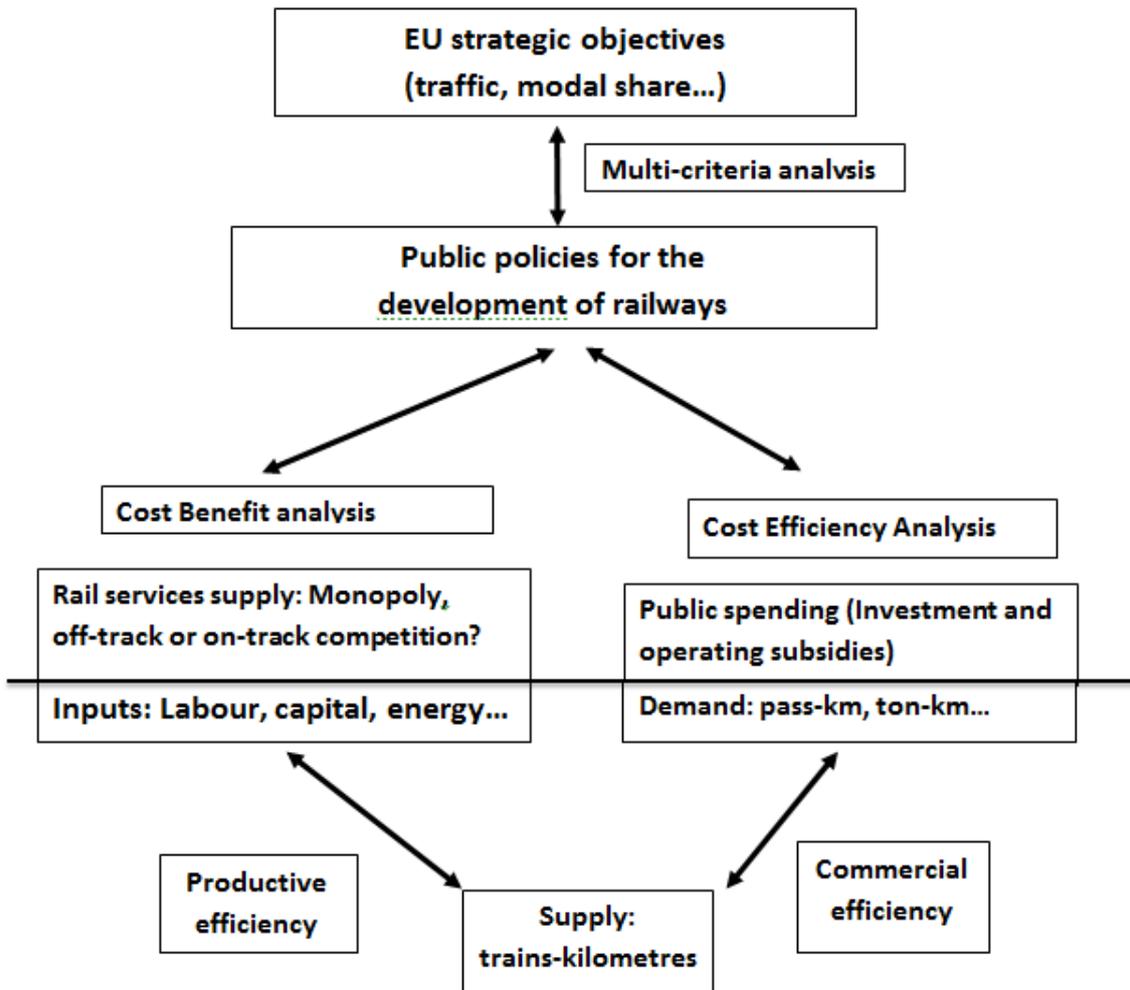
(ERTMS), and safety issues, with the creation of the ERA, which develops procedures for railway safety and interoperability.

- In the second category, we find measures designed to promote a trans-European rail network setting out the main corridors (TEN-T). In certain cases, the EU28 has provided funding, notably in order to build international relationships. On these new or upgraded infrastructures, competition is a way of developing the service offer.

Overview of rail performance indicators.

Thus, liberalisation is a means of achieving the strategic objectives of increasing traffic and the modal share of railways. As Figure 2 shows, from an evaluation perspective, these objectives can be related to a certain number of performance indicators.

Figure 2. Performance indicators and evaluation of public rail policies.



In the lower section of Figure 2, we find the traditional indicators of production efficiency and commercial efficiency. These are generally established for one company, notably in order to compare its performance with that of other companies (benchmarking). In the upper section of the diagram, along

with the cost-benefit analysis and the cost-efficiency analysis, we find traditional indicators that are not seeking to establish the performance of companies, but the costs and benefits for the community of such rail services. This latter feature depends directly on public policies, given that a large proportion of rail services are subsidised. However, public policies are also directly implicated when there is competition in the market between companies who do not receive subsidies, because public policies are also affected by the national forms of regulation of the rail sector and transport in general. That is why based on diverse performance indicators that are presented in the second part of this paper, it is also necessary to develop multi-criteria approaches that are more qualitative and which seek to evaluate the impacts of competition and rail regulation, notably regarding the role of the infrastructure manager.

From company efficiency to cost benefit analysis

To evaluate the impact of competition on rail transport, it is important to firstly refer to traditional indicators. This section reviews some of the classic methods for measuring the productive efficiency of companies and then looks at the cost-benefit and cost-efficiency analyses, which are a first step towards a more global evaluation that seeks to measure impacts on the community.

Productive efficiency and commercial efficiency: the crucial role of organisations

Measuring the efficiency of a company, and particularly a railway company, is not an easy task, as many different types of indicators exist. To make matters clearer, it is important to distinguish between productive efficiency and commercial efficiency.

- With the former, this would involve comparing physical outputs, such as train-km with significant inputs such as the quantity of capital or labour (Bougna and Crozet, 2016).
- Commercial efficiency is measured by comparing supply indicators (train-km) with demand indicators such as passengers-km or tons-km. It is possible for a company to have high productive efficiency but low commercial efficiency, if the load factor of the trains is insufficient.

It is also possible to combine productive efficiency and commercial efficiency in a single composite indicator by bringing together traffic (Pass-km and Tonne-km) and the workforce employed. Although it is only a rough measure, this indicator of what it is known as “apparent labour productivity” is very instructive. Firstly, let us take a look at what has happened in France, to understand how this indicator is constructed (Table 1).

Table 1. France, apparent labour productivity

	1996	2008	2015
Pass-kilometres (millions)	59 700	82 400	94 234
Tonne-kilometres (millions)	48 600	37 300	205 80
Kilometric units (millions)	108 300	119 700	114 814
Workforce	180 500	163 000	151 000
Millions of KU per capita	0.60	0.73	0.76

Source: National transport accounts

The last line of the table shows that labour productivity has increased in France by 26.6%. It has improved from 0.60 to 0.76 million kilometric units (Pass-km + Tonne-km) per employee. This result cannot be explained by the rise in the numerator. Due to the sharp drop in freight traffic, the kilometric units fell between 2008 and 2015. The increase in passenger traffic is not enough to compensate for the drop in freight, as can be seen by the figures for 1996 to 2008. It is only the decrease in the workforce, i.e. the denominator that can explain the productivity gains. The situation is different in two neighbouring countries, Germany and Switzerland, which like France have maintained an integrated historical operator. Table 2 demonstrates that like France, Germany and Switzerland have experienced the impact of the financial crisis on freight traffic from 2008 onwards, and even for passenger traffic in Germany. Nevertheless, between 1996 and 2015, apparent labour productivity increased by 103% in Switzerland and 96% in Germany.

Table 2. Apparent labour productivity in Germany and Switzerland

Germany	1996	2008	2015	Switzerland	1996	2008	2015
Vkm (millions)	59 300	113 634	98 445	Vkm (millions)	11 600	16 150	18 560
TKm (millions)	67 400	77 791	79 561	Tkm (millions)	7 300	12 530	15 065
KUm (millions)	126 700	191 425	178 006	KUm (millions)	18 900	28 680	33 625
Workforce	260 000	178 168	184 391	Workforce	32 000	28 000	28 000
Millions of KU per capita	0.49	1.07	0.96	Millions of KU per capita	0.59	1.02	1.20

Source: DB (Facts and Figures 2015) and CFF (Faits et chiffres 2015)

In other words, given the modest increase in traffic in France, much larger cuts to the workforce would have been needed in order to maintain productivity levels in line with those of its Swiss and German neighbours. Despite a context that favours commercial efficiency, (230 passengers per train on average in France compared to 120 in Germany) the efficiency of the French rail system is low when we compare outputs, namely passengers and tonne-kilometres with inputs, namely the workforce. Another way of formulating the same observation is to look at the number of trains-kilometre (output) per employee (input) in 2015, which stood at 3 510 train-km/employee in France and 5 070 in Germany, some 24% more per employee!

France, unlike Germany, is a country where rail competition is almost non-existent. We could therefore be tempted to look for a relationship between low productivity gains and monopoly position. But things are not so simple: in Switzerland, the Federal Railway (CFF) does not have any competitors for passenger traffic, whether on-track or off-track. Therefore, the efficiency of rail transport companies does not depend on competition. Organisational questions also play a key role. In Switzerland, a specific productivity agreement was signed between the Confederation and the CFF in the early 1990s. In

exchange for generous public subsidies for the modernisation and development of the rail network, the integrated Railway Undertaking (the CFF) agreed to reduce its workforce by more than 30% although traffic increased by more than 60%.

Organisational change is therefore at the heart of railway revitalisation. It can be, as in Switzerland, the result of a contract between the public authority and the historical operator. It can also come from the constraint represented by competition, like in Italy. Since the beginning of the 2000s, rail transport in Italy has shown real vitality, the first demonstration of which was the development of high-speed trains. Covering an area between Naples and Turin, these trains now connect the largest Italian cities, with numerous services offering day return trips between them, to such an extent that it can be considered an inter-urban metro system. High-speed train traffic is increasing, and this trend should continue in years to come because of the extensions that are underway or scheduled towards Venice, Bari, etc.

Extension of the network, competition for the high-speed train market, entrance of private capital – the Italian railway is on track for real renewal. Public policies have been largely inspired by the measures recommended in the EC white papers: development of high-speed trains, implementation of the European Railway Traffic Management System (ERTMS), deregulation in the form of opening-up to competition and private capital.

Competition has played a key role in encouraging traffic development, taking the form of on-track competition rather than a system of franchises or competitive tendering. This is very rare, if not unique in Europe¹: since 2012 alongside the historical operator Trenitalia, there has been a new player on the market, NTV (Nuovo Trasporto Viaggiatori), operating under the trade name of “Italo” and offering services on the same routes. NTV is a private company owned by Italian investors (MDP Holding, IMI investimenti, Generali, etc.). Its entry on the market received strong support from the transport ministry who saw it as a stimulus for reforming the historical operator. Everything has been done to ensure NTV has attractive track access, as well as access to the main stations, which recently included Termini, the main station in Rome. It should be noted that NTV is not the only new player in the peninsula. Another company, Thello, whose shareholders are Trenitalia and Transdev, operates trains from Milan to Paris and Marseille.

For NTV, the first years of operation were difficult. Despite a wide range of fares and very varied selection of services (including a “super premium” class with Pullman seats, its own staff and a meeting room), the load factor barely exceeded 50% and losses were accumulating. High-yield passengers were the hardest to attract. The results for 2015 are much more encouraging. The load factor now exceeds 70% and the annual number of passengers has leaped from a little over 6 million to more than 9 million passengers. What is more, in 2015, NTV generated a gross operating surplus for the first time, and the company is planning to develop its activity, including in coach transport. But it should not be forgotten that to achieve these results, the Italian infrastructure manager had to substantially reduce the track access charges. The improved profitability of NTV and Trenitalia is mirrored by a reduced profitability of the infrastructure manager.

In addition, an interrelation has been observed between the traffic on classic lines and that on the high-speed lines. The latter has grown rapidly: 8.6 billion pkm in 2011 (23.4 million passengers) compared with 11.09 billion pkm in 2015 (31.2 million passengers), an increase of some 29%. At the same time, traffic on classic lines has dropped sharply, to such an extent that total rail traffic in Italy barely exceeds 50 billion pkm, the same value as in the early 2000s. The question has to be asked about the cost for the community of this substitution between customer bases. Users of high-speed rail lines have obviously increased their well-being, particularly as competition has seen prices come down on lines where it

exists. However, the public cost is high and it is necessary to compare the costs and benefits at the level of the community. That is the role of the economic calculation.

The economic calculation: cost-benefit and cost-efficiency analyses

The role of the economic calculation, the most commonly used tool being the Cost-Benefit Analysis (CBA), is to compare different possible choices of investment in terms of their costs and their various estimated benefits. The economic calculation makes it possible to assess the usefulness and the profitability of a project compared to other projects with the same objectives. The two main indicators of the economic calculation are the Net Present Value (NPV) and the Internal Rate of Return (IRR).

The NPV takes into account the investment made by the operator and the financial costs of the project. This is always a value that is actualised to a base year. It is a notion that seeks to estimate the global financial surplus of the project (Annex A). However, it should not only take into account monetary flows. It is therefore necessary and possible to calculate a “socio-economic” NPV and IRR which take into account non-sales costs and benefits. Factors that are accounted for include time savings but also the variations in the usual transport-related pollution, safety and noise levels. The monetary estimation of these various benefits is by definition uncertain, due to the non-tangible nature of these effects. Yet, in a socio-economic assessment, they are often preponderant in the results. The values used to calculate these benefits in value terms are therefore chosen by the public authority and can be assessed with sensitivity analyses.

The economic calculation has been used for many years in the transport sector. Thus, in France it is possible to establish ex-post IRR for the country’s high-speed lines, which can be compared with the forecast ex-ante IRR. As Table 3 shows, the profitability falls as the network expands (Crozet, 2014).

Table 3. Ex-ante and ex-post socio-economic Internal Rate of Return values

	Ex-ante internal rate of return	Ex-post internal rate of return
LN1 (South East)	28%	?
LN2 (South West)	23.6%	12%
LN 3 (North)	20.3%	5%
By Pass Paris	18.5%	15%
LN4 By Pass Lyon	15.4%	10.6%
LN5 (Mediterranean)	12.2%	8.1%

Source: J.P. Taroux (2013).

The high-speed lines offered the community good levels of socio-economic IRR, thanks to the time savings and reduction in polluting emissions. The figure is not known for the first high-speed line, but it is very probably in excess of 20%. For the line #3 (North), the low IRR comes from the fact that the traffic, notably towards London, took a very long time to grow. Today, 20 years after the Channel Tunnel opened, traffic has finally reached levels that have allowed Eurostar to become a profit-making company. However, there was a long wait for the new line to be opened on the British side and access given to St Pancras station. The ex post evaluations of the first 25 years of high-speed trains (TGV) in France showed that the net surplus gain for the community stood at EUR 45.9 billion for line 1 (South-East), EUR 23.8 billion for the Atlantic line (South-West) and EUR 4.9 billion for the Nord line. This gives a total of EUR 74.6 billion (in constant 2005 euros), the vast majority of which comes from time savings for passengers. This progressive reduction in profitability suggests that caution should be exercised with regards to the many network extension projects.

It is particularly important to keep in mind that, often, public authorities overestimate the potential major benefits of new transport infrastructures. The entire economic literature indicates that these effects are largely illusory (Flyvbjerg et al., 2003), but all the public decision makers believe in them in exactly the same way as national lottery players believe in their luck. When a project has strong political backing, the individuals who perform the studies are encouraged to come up with traffic flow forecasts that justify the project. In a manner of speaking, because the public decision maker wants the project to go ahead “at any price” it places itself in a position of weakness with respect to its private sector partners.

The result is that negotiations between the public authorities and potential concessionaires are asymmetrical. Rail projects are very political and are characterised by three types of pressure: the line must be built, the trains must run and price/quality must be acceptable. Finally, the concessionaire has an extraordinary bargaining power due to the strong desire of the public sector to make the project happen. Public entities are therefore ready to accept greater risks, give more guarantees than initially planned or intended to provide loan guarantees, especially when they accept to introduce in CBA some potential new gains.

Partly, but not only, for reasons of caution, the economic calculation has recently undergone a number of changes which have resulted in new elements being included in the NPV.

- In recent years, inspired by the work of T. Venables and D. Graham, it has been suggested to include “wider economic benefits”, taking into account the possible impact of new transport infrastructures on productivity and ultimately on economic growth. But the results are still uncertain and generally poorer than the project promoters expected. Thus, D. Graham has evaluated potential gains from the British high-speed train project known as “High Speed 2” in a much less optimistic manner, which could be described as more realistic, than the report from the consultants (KPMG, 2013) because there are high risks that the traffic levels will not live up to expectations.
- The question of risks is therefore on the table and it is now possible to take this into account in various ways, notably by increasing the discount rate (Annex A). Despite this, it is not unusual to find the public authority remains the insurer of last resort. Even when concession contracts have been signed with private partners, for example for the launch of new high-speed lines, it is public funds that have been used to save the project.
- For this reason, and given the growth in public deficits and debt, the recommendation has been to take into account the scarcity of public funding. This is logical in the railway sector, which requires heavy subsidising.

When looking at the cost to the community of rail services, we should not only take into account a simple cost-benefit calculation. A cost-efficiency analysis is also required. This is a good way of comparing various options, but also, from a benchmarking perspective, a way of comparing the cost to the community of various choices. That is why in the fourth railway package, the “markets” pillar clearly mentioned the objective of reducing the costs of the railway for the community. It is a question of improving the cost-efficiency ratio and value for money for taxpayers. If competitive tendering is to become the norm for awarding public service contracts from 2023, this is in order to provide the best price for subsidised passenger rail services, which represent the majority of rail services. It is therefore important to measure how much a train-km costs in absolute value terms and what it costs in subsidies. Once again, the comparison between France and Germany is instructive.

In Germany, from 1996 to 2009 (Guihéry, 2011), regional rail traffic increased by 55% (to 47 million pass-km) but train-km only increased by 26% (to 630 million train-km). Therefore, demand grew much more than supply. Thanks to on-track competition for this type of service, contract prices fell by 26%, to the benefit of the organising authorities. This allowed federal subsidies to be reduced by 6% in constant euros from 1996 to 2009. For a constant euro, the Länder offer 37% more services (2010/1996). Another comparison places train-kilometre subsidies in the area of public service obligations. In 2012, the subsidy per train-kilometre stood at EUR 17 in France against EUR 9 in Germany².

In contrast, in France, not only has public support increased substantially (+80% between 2002 and 2011), but the same applies for the subsidy per train-kilometre, as the cost of the train-kilometre has increased by 60%, some 5.3% per year, which is three times faster than inflation! This has all occurred as if the organising authorities, for a variety of institutional and political reasons, were incapable of stopping costs getting out of control. As a comparison, in Switzerland over the same period, total public contributions increased slightly then stabilised. As a result of the reduction in costs per train-km, the corresponding subsidy dropped sharply (-22%).

We can observe that, in terms of labour costs; competition in the rail sector is not leading to the same results as in other network industries. Usually, competition increases the pressure on companies and thus on employees. In sectors such as air or road freight transport, competition has led to a kind of "social downsizing". But it was not the case for rail. In Germany, like Britain, drivers found themselves in a strong position because their skills were in high demand. Sometimes, because of strikes, they have obtained significant wage increases in exchange for more flexible work organisation.

This atypical development is not a hindrance to a win-win game. Higher wages for drivers are, subject to organisational changes and productivity gains, concealable with declining public subsidies for the same service. Therefore, there is possible room for manoeuvre, especially since the introduction of competition will be gradual. In Germany, the market share of new competitors rose from 10% to 27% of regional traffic from 2003 to 2014.

A potential avenue of research is put forward in recent work by the ITF (Casullo, 2016). The work suggests that the impact of open access is evaluated through comparative econometric techniques such as difference-in-differences estimators. The first step of this analysis requires matching rail networks with similar characteristics to control for exogenous factors. Next, a meaningful dependent variable is selected (such as operating cost per train-km) and the evolution of this variable before and after market opening is observed. Initial findings suggest that there is no evidence of cost reductions at the system level in the immediate years after market opening.

Multi-criteria assessment of rail freight liberalisation

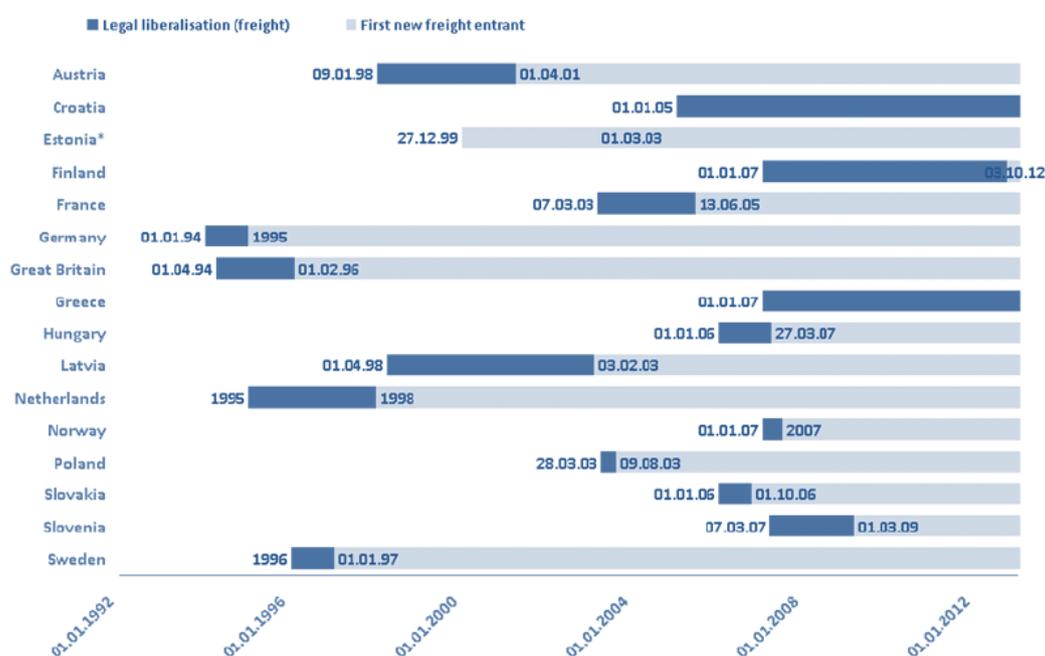
The indicators shown in the previous sections are characterised by their one-dimensional nature. In one way or another, they seek to capture the relative efficiency of a company or a transport project in a single value. But is it possible to do the same when assessing an entire public policy, such as on-track

competition in rail transport? We are going to attempt to answer this question by focusing on rail freight, an area which was liberalised a relatively long time ago and where competition is now quite widespread throughout Europe. However, before attempting an assessment using the Rail Liberalisation Index (RLI), it is important to bear in mind that we are in the presence of imperfect competition.

Rail freight: structurally imperfect competition

Since the first and second railway packages liberalised rail freight, in 2001 and 2004 respectively, important changes have been seen in most European countries. In general, markets are more open and competition is increasingly a reality. The first phase of deregulation took some time, but it has now been accepted throughout Europe, although the extent of liberalisation is not the same from one country to another, as shown in Figure 3.

Figure 3. Rail freight liberalisation in 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).

In terms of liberalisation, EU28 countries are in very variable situations. Some, like the Netherlands, Sweden, Germany or the United Kingdom, legally liberalised the market in the mid-1990s and new market players moved in. In other countries, legal liberalisation only occurred after the publication of the European railway packages, in the first half of the 2000s. The first competitor only emerged much later, often many years later, and in some cases even later still, in Finland, or never as in Greece. Liberalisation of rail freight is therefore not a tidal wave; it is a slow movement that is gradually taking place throughout Europe.

Even when competition exists, the sector remains heavily concentrated, which leads to the persistence of strong market powers. In traditional competition analyses, economists closely examine the market structure, i.e. the number of competitors. They consider that this largely determines the behaviour of companies in terms of innovation and ultimately their overall efficiency. To evaluate the market structure within a sector of activity, the most frequently used reference is the Hirschman-Herfindahl Index (HHI) which is defined as the sum of the square of market shares (Shepherd 1984). The value of the index increases when the number of companies decreases. Thus, in the United States the number of rail freight companies fell from 36 to 7 between 1978 and 2004, which resulted in the HHI increasing from 589 to 2 263, well above the value of 1 000 which is considered to be the critical value beyond which there is a risk of powerful market powers emerging. (McCullough, 2005).

At first glance, the EU28 is in the opposite situation. The liberalisation of the market is currently producing a reduction in the HHI. When there is a single operator, the HHI reaches its maximum level, of 10 000³. In the case of the United Kingdom, the growth in market share of the competitors of the principal operator HWS, gradually brought the HHI down, to around 4 250 in 2012 compared with 7 450 in 1997. The tendency is going in the right direction, but these are still the same very high levels of concentration that can be found in most European countries. In Germany, the HHI is greater than 6 300; it is more than 5 000 in France⁴.

By comparing the development in North America and Europe, we can therefore ask ourselves whether there is not a specific feature in rail freight that structurally maintains the HHI, and thus the market powers at a high level. To understand this, we must bear in mind that an HHI of 1 000 represents a situation where ten operators each hold 10% of market share. Is this a reasonable objective for rail freight? Are we not in a sector where in order to develop certain activities such as the transport of wagon load traffic, or powerful corridors for container transport, it is necessary to hold a much higher market share than 10%?

Competition in the rail freight transport sector is clearly a situation of imperfect competition. Entering the market has a cost for the new participants. If they do not succeed in obtaining a return on their investment, they have to restructure or leave the market after a few years of operation. As there are many sunk costs, it is not possible to practice the “hit and run entry” so dear to the theory of competitive markets (Baumol, Panzar and Willig, 1982). A clear indication of this is that, in addition to the low number of players, there is a high number of new participants leaving the market after failing to sustain their activity. Thus in Sweden, after liberalisation of the market in one of the pioneer countries in this approach, between 2000 and 2004, eight companies left the market, including Ikea Rail.

We are therefore in a sector characterised by multiple barriers to entry, which manifest themselves either in the entrance costs or the exit costs. As a result, competition is only legitimate if it leads to an overall improvement in sector efficiency. This is measured by a number of indicators such as the share of the rail freight market, the development of costs of the sector, productivity, etc. An assessment of market liberalisation must therefore take into account medium and long-term effects. The players in the market are all different. There is no “representative company” as there is in pure and perfect competition. Each company will adopt a strategy and target markets adapted to its specific assets. As these are neither of the same nature nor of the same importance, the market powers must be closely monitored in order to find out whether competition has really changed the situation.

Rail Liberalisation Index: can we evaluate the effects of competition?

To evaluate the effects of competition, the competition has to be measured, in order to establish a degree of intensity. That is what IBM attempted to do, at the request of Deutsche Bahn. On the basis of a multi-criteria method, a synthetic index was constructed to monitor the degrees of liberalisation. This is the Rail Liberalisation Index (RLI), (IBM, 2011). Before we look at the results, it is important to describe the evolving structure (Annex B). In 2011, the general index took into account two large categories of indicators known as LEX and ACCESS.

- The indicators contained in LEX represent 20% of the total. As shown below, they take into account how the sector is organised and notably the vertical separation between the infrastructure manager and the Railway Undertaking (RU). However, the main weight is given to the regulation of access to the market and the power of the market authorities.
- The ACCESS indicators are those that have the most weight in the indicator (80%). They assess the various barriers to entering the market (information-related, administrative, and operational) but also the proportion of the domestic market that is accessible, and in a more marginal manner, the question of passengers ticketing.

The scores obtained for each indicator are then added together, taking into account the weightings shown in Annex B. Thus, the higher the score of the RLI, the more open the rail market of the country can be considered to be. When the index is above 800 points, liberalisation is considered as “advanced” (Austria, Germany, Denmark, the Netherlands, Sweden, and the United Kingdom). At between 600 and 800 the country is considered to be “on schedule” (13 EU28 countries including Italy, France and Belgium). While countries are considered to be behind schedule if they score between 300 and 600 points (six EU28 countries including Spain and Luxembourg). The annex includes the scores obtained for the various years and their overall development for all of EU28 countries plus Norway and Switzerland.

The score for each country is interesting but we should avoid according too much importance to detailed results, insofar as they depending on changing weighting and measuring tools that can still be perfected. However, three things are worthy of mention.

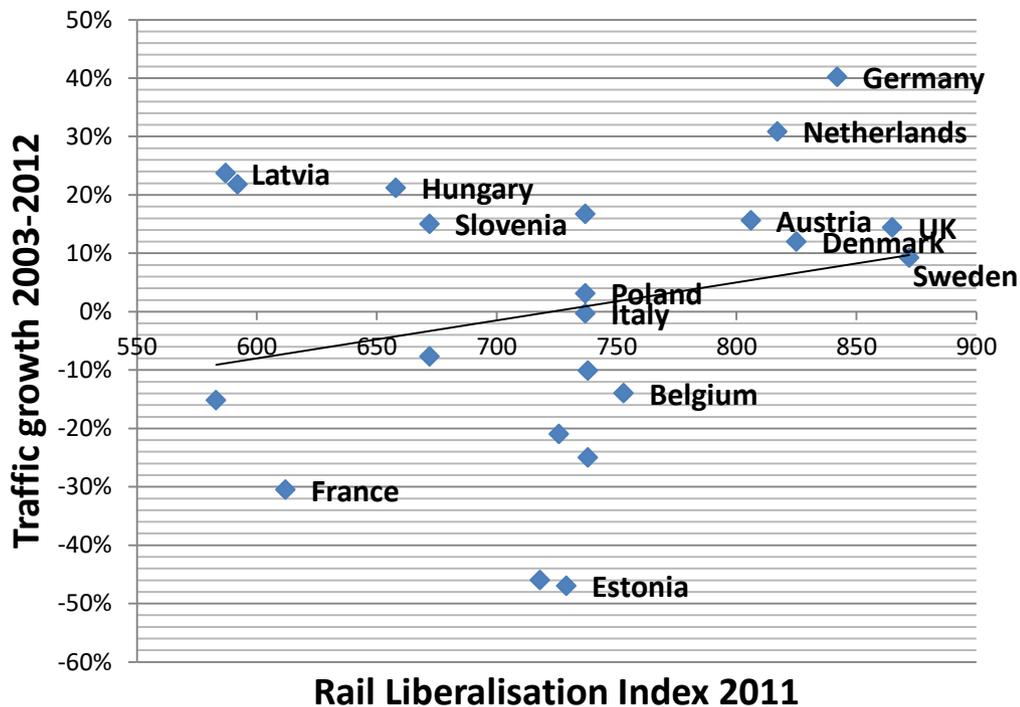
- The first is that the tendency is for all countries to see a gradual improvement in their RLI. In less than a decade, this is a major result that tells us that the “competitive solution” is at work.
- The second is that the very fact of changing the weightings reveals that liberalisation is a complex process which adapts its ambitions to the changes observed. Thus, the ACCESS indicators (evaluating barriers to entry) went from representing 50% to 80% of the total RLI between 2002 and 2011.
- The third, which is an extension of the previous point, is that the growing importance of the ACCESS indicators is primarily linked to the fact that other indicators have been removed from the general index, gathered under the name of COM (Annex B). Yet, these last indicators illustrate the effects of liberalisation in relation to the EU28’s general objectives, notably the evolution of modal share for railways and the proportion of new entrants.

The question of the market share of new entrants takes centre stage once again here because a longitudinal approach is required. What happens to new entrants? In a number of sectors of activity, such as air transport, it has been seen that competition, after a phase of multiplication of operators, results in a period of consolidation and finally, increased concentration. This is very similar to what is

happening in rail freight, as the HHI shows us. However, can we consider that, despite the low number of operators, greater liberalisation goes hand in hand with a larger growth in traffic? Figure 4 partially answers that question.

The countries with the greatest liberalisation (Sweden, United Kingdom) are those where the growth in traffic has been the most pronounced. However, for all the countries represented, this relationship is not obvious, as is shown by the wide dispersion of points around the regression line, which also reveals a very weak correlation between the variables. It is therefore clear that competition may be a necessary condition but it is not an adequate condition. Aspects such as the level of intermodal competition should also be taken account, but not only from road transport. It is not widely known that the strong rise in rail freight in Germany (+40% since 2003) was entirely offset by a fall in waterway traffic. The market share of road freight transport has remained almost unchanged over recent years.

Figure 4. Degree of liberalisation and growth of rail freight traffic



In general, competition has not had a particularly significant impact on rail freight traffic. Across the EU28, freight traffic grew once again after the sharp fall experienced in 2008 due to the financial crisis. In 2014, total rail freight in the EU28 reached 422 billion tons-kilometre. But if we look at modal share, rail freight has taken almost nothing away from road freight, which represents over four times more traffic than rail. Thus, in 2014, road freight transport represented 74.9% of land traffic in the EU28, against 18.4% for rail. In 2009, the figures were 77.1 and 16.9 % respectively. There has been an improvement but it is modest. Can change be expected?

Probably not, because rail freight has to accept that it has only a niche market.

- This firstly comes from a problem of relative cost. For a shipper, transport is a cost that can be broken down into monetary cost and time cost. Competition between modes of transport depends on both components. Road transport has taken such a predominant position in recent

decades because it has succeeded in reducing the trends of its monetary costs (in constant money terms, sometimes in nominal terms at certain periods) and also in making the most of time savings made possible by improved road infrastructures and major technical progress included in the vehicles.

- Changes in the nature of products being transported is also a key factor in this relative decline. Which products use the rail mode of transport and which offer real prospects for development? This is what the British Department for Transport has sought to identify (DfT, 2010). The main products that are transported are assessed in terms of their degree of market maturity. Coal, for example, like aggregates or metals, represents mature and potentially stable or declining markets. It is difficult to build upon such markets to envisage a significant development in rail transport. What then are the products with the highest added value per ton, transiting across long distances, which could interest rail freight? The transportation of automobiles and parts for the automobile industry is a potential target as there are few production plants in Europe, each one specialised in certain models. However, car makers are demanding in terms of regularity and service quality. The same applies to intermodal traffic and notably container transport. Growth perspectives are strong in this area but would require track to be available across the network with track access charges that are not too high. This leads us to evaluate the role of the infrastructure managers (Annex C).

Conclusions

Railway reforms initiated in Europe 25 years ago have sought to revitalise this mode of transport. For this, they have stepped up measures to allow competition, with a view to a single European railway area. The results are today still modest in terms of traffic growth and rail market share. When it was set up, mainly in the area of rail freight, “on track” competition took the form of imperfect competition and even for “off track” competition barriers to entry and market powers remain important, as is the role of major companies in many countries.

In this context, assessing the impact of new regulations for rail transport in Europe involves not just one indicator. Thus, the introduction of competition is a necessary condition to question the inertia of old railways companies. Nevertheless, this is not a sufficient condition for organisations, especially when they feel protected by the state and as a consequence may not significantly increase their efficiency.

- Therefore, the first recommendation we can make is to develop Europe-wide benchmark studies using traditional indicators of productive efficiency and business efficiency, but also cost benefit analysis and cost efficiency analysis especially ex-post CBA. The results of such work may be useful for each country and across the EU28, including the Commission, as monitoring indicators of the 25 years of reform of the railway sector.
- In this perspective, our second recommendation would be to bring together the three layers of analysis presented in the paper in order to inform an MCA of the liberalisation process. As indicated at the beginning of the paper (Figure 1), competition is only one objective of the Commission. It is therefore necessary to promote a comprehensive ex-post evaluation

comparing the goals and the results of EU policy in the rail sector. It will be a way to question the relevance of the goals and the consistency of the content of the EU policy.

- Our third recommendation aims to enrich the toolbox of the RIA (Regulatory Impact Assessment). It is obvious that an RIA is necessary. Whatever the sector, the regulation framework has numerous impacts. Within the railway sector, the objectives of EU policy were, in 1991, to abandon the old regulation, considered as a factor of inertia, and to promote a new regulation. Twenty-five years ago, it was clear that the benefits of the new regulation would be higher than the costs of deregulation. In order to demonstrate that, it is possible to apply to the RIA the classical methodology of CBA. CBA is usually designed for the evaluation of investments. However, this paper demonstrates that CBA also has the ability to ensure that regulation will be welfare-enhancing from the societal viewpoint.

Notes

1 Open access exists in seven other countries (Austria, Czech Republic, Sweden...), just for some routes.

2 In 2012, the net public support to a 140 tons suburban train in France was estimated to amount only to EUR 7.1 train-km, as EUR 10.9 train-km serve to pay track access charges. The net public to a support 140 ton suburban train in Germany is estimated to amount to only to EUR 4.8 train-km (deducting track access charges).

3 10 000 is the market share assessed at between 0 and 100, but 1 if the market share is given as between 0 and 1.

4 The 2013 HHI is over 6 500 in France if we consider VFLI (10% market share), subsidiary of the SNCF, as a stakeholder of the historic operator.

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Annex A. Net Present Value and taking risk into account

The Net Present Value (NPV) is the difference between the updated costs and benefits of all kinds created by the operation, calculated in comparison to a reference situation. The calculation is performed using constant money.

$$NPV = \underbrace{-(I - I_{avoided})}_{\text{Investments undertaken before commission of the}} + \underbrace{\sum_{t=1}^T \frac{A_{(t0+t)}}{(1+a)^t}}_{\text{Net returns earned by the investment over the project lifespan}} - \underbrace{\sum_{t=1}^T \frac{\Delta I_{(t0+t)}}{(1+a)^t}}_{\text{Major maintenance or renewal investment during the lifespan of the project}} + \underbrace{\frac{R}{(1+a)^T}}_{\text{Residual value of the infrastructure}}$$

Where:

- t_0 is the year preceding the commissioning of the project (or its first phase)
- ω is the duration of the project construction
- T is the lifespan of the project from the year of commissioning
- $I = \sum_{t=-\omega}^0 \frac{I_{(t0+t)}}{(1+a)^t}$ is the initial cost of the project (discounted, spread over many years, or over a number of commissioning phases)
- $I_{\text{élués}}$ is the sum of avoided investment
- ΔI_t is the variation in large maintenance investments which are not included in operating costs and are made in year t
- A_t is the economic benefit for the project at year t :

$$A_t = A_{users}(t) + A_{third\ parties}(t) + A_{AOT}(t) + A_{RFF}(t) + A_{other\ IM}(t) \\ + A_{public\ authority}(t) + A_{railway\ operators}(t) \\ + A_{transporters\ using\ other\ modes}(t)$$

- The benefits for each of the players are expressed in constant money. As a large number of outcomes impacting on these benefits do not have an intrinsic value in euros (value of time, carbon, safety, etc.), they have to be given a monetary value in the form of reference values
- a is the discount rate or the “rate of exchange” between the future and the present, in constant money. The higher the chosen discount rate, the more we favour the present or near future over the distant future. In real terms, a discount rate of 10% reflects the idea that there is an equivalence between receiving EUR 100 immediately or EUR 110 the next year. Its value can decrease over time. For example, in France, it could be 4% until 2034, then 3.5% in 2035 to 2054, then 3% beyond 2055.

- R is the residual value of the investment at the end of the period in question, which represents the economic value over the useful life of the project. R can be negative if there is a land restoration cost at the end of the project.
- We can also add an Opportunity Cost of Public Capital (COFP) to evaluate the NPV, for example by multiplying all public spending and income (other than tax variations) by a coefficient (0.3 in France or a multiplication by 1.3).

$$- \quad NPV_{with\ COFP} = NPV_{without\ COFP} + [0.3 * (\Delta_{public\ income} + \Delta_{public\ spending})]$$

- In terms of risk, we can identify two categories. Probabilisable risk, which can be described by more or less complex probability laws and can be quantified, and non-probabilisable risks, which are unpredictable or even unimaginable. The first can be included in the economic calculation. The second are more difficult to circumscribe and cannot be taken into account through a calculation and must therefore be assessed qualitatively.
- In France, taking into account systemic risks linked to weak economic growth halved the IRR of high-speed train projects, when their profitability was already low.

Annex B. Rail Liberalisation Index

Table B.1. 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

COM (not included in overall 2011 RLI)	
(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

Annex C. Regulatory background for rail transport

There is not a European railway regulator but the European Commission has been very active in this area. It has launched infringement proceedings against a number of countries to encourage them to develop greater competition. It has also strongly emphasised the need to put in place national regulators capable of ensuring respect free entry to the market, access to train paths and non-discrimination in charges (Crozet Y., Nash C. and Preston J., 2012). This is considered as regulation *stricto sensu*, but there is also a regulation *lato sensu*.

The diversity of railway regulation within EU28 countries

In the same way that each country has applied the rail reforms in their own manner, sector regulation also takes very different form from one country to another.

- In the mid-1990s, the United Kingdom opted for an independent and powerful rail regulator, which was logical for the architecture chosen after the disappearance of British Railways. The ORR (Office of Rail and Road, formerly Office of Rail Regulation) has statutory duties towards freight. The ORR performs these duties in three key ways (ORR, 2013):
 - to “regulate Network Rail’s stewardship of the national rail network”
 - to “license operators of railway assets”
 - to “approve track, station and light maintenance depot access”.

ORR carries out periodic reviews of Network Rail’s financial structure, usually every five years. This process establishes 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. The ORR has published a detailed account of the proposed charging principles for 2014-2019.

- More recently (December 2010), France created an independent sector regulator. Its duties are more limited than those of the ORR but they were extended with the rail reform law of 2014. Thus, each year ARAF (the railway activity regulatory authority, now known as ARAFER since 2016) must approve the track access charges proposed by the infrastructure manager. However, ARAFER does not set the charges. In 2015, it refused the price rises announced for 2017 by putting forward the argument that they did not demonstrate an effort to achieve productivity gains by the infrastructure manager. Germany also has this same form of generally a posteriori intervention from the regulator.
- In the case of Germany, the rail regulator is not a sector regulator. Regulation of the rail sector is the responsibility of an independent regulator covering a number of 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 regulatory remit of the BNetzA does not include an ex-ante approval of infrastructure charges. Rather, it comprises preventive as well as ex-post measures: it examines the network statement and initiates investigations as a reaction to complaints. 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 up to EUR 500 000, 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).

- Although the railway liberalisation process in Italy was one of the earliest in Europe, paradoxically the responsibility for regulation of the railway companies was for a long time retained by the Government (Senn and Cini, 2011). From 11 August 2004 to 14 January 2014, an independent office of the Ministry for Transportation, called Ufficio per la Regolazione dei Servizi Ferroviari (URSF), played the role of the Italian Regulatory Body (Stanta, 2013), established to comply with EU legislation (Directive 14/2001). The Italian rail regulator was only made truly independent from government through the creation of ART (Transport Regulation Authority) on 17 September 2013 by the decree-law 6 December 2011 n. 201. (becoming operational on 15 January 2014). This is very recent compared with other major European countries. However, the regulation of the railway sector was one of the Authority's primary commitments since its entry into operation. Beginning in 2014, a number of measures has been adopted to ensure fair and non-discriminatory access to infrastructures and service facilities, including the setting of access charges and the establishment of a regulatory period (ART Annual Report, 2016).

What room for manoeuvre do regulators have?

In general, rail regulation remains an open question. It is indeed possible to identify two approaches to regulation taking into account the fact that rail regulation can strongly encourage stakeholders, but it cannot do everything (Crozet et al., 2014).

- In the strict sense of the term, regulation is mainly intended to limit any discriminatory behaviour from the natural monopoly which is the infrastructure manager. The first task is to verify that all operators have the same network access: Allocation of track paths in the upstream phase (timetabling); equal treatment of trains in the operating phase; no price discrimination with the track access charges; access to essential facilities such as fuel delivery points, depots, sidings, etc. Just drawing up the list of these essential facilities can cause debate. For example, should marshalling yards or maintenance centres be included? To what extent should the historical operator be required to give up certain specific assets? The aim here is to reduce the barriers to entry, to allow new entrants onto the market.
- Regulation in the broad sense covers the mechanisms that will allow not only survival but also acceptable profitability for an adequate number of operators, to ensure the global efficiency of the sector. This raises technical questions such as the harmonisation of operating standards, which must eventually become similar across the whole of Europe, but also economic and social questions about the management of companies in this sector. The question of state intervention is also crucial. Having been for a long time, and often still being, the main or sole

shareholder in the historical operator, each country has a tendency to interfere in the competitive game, albeit in indirect or hidden ways. This is a delicate question that regulators cannot always address directly, but that we have a duty to examine. The presence of the state in a sector is not a problem per se, but the state should facilitate and not hinder the necessary organisational reforms, and this is not the case everywhere. Thus in France, successive rail reforms, whether it was the reform of 1997 (creation of the independent infrastructure manager, the RFF), or the reform of 2014 have not directly addressed the question of productivity. This is due to the difficulty in adapting social relations and human resource management. The risk is therefore that the government cannot drive the process, but is totally captured (Laffont and Tirole, 1991) by various pressure groups. And thus, it has only very reduced rooms for manoeuvre for changing things. The “tyranny of the status quo” (Friedman, 1988) imposes its law and managers have to work with these constraints which make any real improvements in their activity impossible.

In light of market opening, regulators should also be equipped to assess the impacts of liberalisation, both ex ante and ex post. On the one hand, regulators that collect market data from infrastructure managers and operators will be in a favourable position to carry out ex-ante assessments, or at least to establish a baseline position for the analysis. Ex-post assessments, following the methodologies discussed in this paper and the related literature should be encouraged. This practice will empower regulators to evaluate market opening impacts and to inform future decisions and ex-ante analysis.

Introducing Competition in the European Rail Sector

This paper assesses the impact of European rail transport regulation in the past 25 years. It highlights competition as a necessary condition to overcome the inertia of legacy railway operators, but argues that competition is not sufficient to increase efficiency when they feel protected by the state.

Resources from the Roundtable on Assessing Regulatory Changes in the Transport Sector are available at:
www.itf-oecd.org/assessing-regulatory-changes-roundtable