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**Regulating Europe's single railway market: Integrating performance and governance**

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*Abstract*

Regulation of the European railway sector remains a central issue in the framework of the current liberalization process. From a regulatory perspective, the patchwork of national legislations and the delays in transposing and implementing the European Directives bears witness to the difficulty of creating a single European railway market. The paper argues that, as a result of failing to consider the importance of the technical nature of railways, the notions of coordination and regulation are too often looked at from a single perspective – mostly economic performance. In fact the type, the scope, the timing and the required institutional setting of regulation will differ largely depending on the kind of performances one desires to achieve – these can be, among others, financial, social, technical or operational. Policy-makers should therefore ask the question “what to regulate for”. The answer to this question not only has important implications on the regulation of national rail sectors but also on achieving the creation of a single European railway market.

*Keywords*

Railway, regulation, governance, performance

## **1. Introduction**

Regulation of the European railway sector remains a central issue in the framework of the current liberalization process. From a regulatory perspective, the patchwork of national legislations and the delays in transposing and implementing the European Directives bears witness to the difficulty of creating a single European railway market. As noted by Künneke & Finger (2009) notwithstanding unbundling, in a technical sense the railway system remains a network with a strong degree of complementarity and consequently fundamental coordination needs. For instance, achieving an integrated market rests on ensuring technical interoperability across the network (e.g. cross-acceptance of rolling stock, unified signalling). In general, the technical aspect of conceiving and running a railway network is left to engineers and only remotely included in the system's overall governance.

The paper argues that, as a result of failing to consider the importance of the technical nature of railways, the notions of coordination and regulation are too often looked at from a single perspective – mostly economic performance. Policy-makers should ask the question “what to regulate for”? Indeed, the type, the scope, the timing and the required institutional setting of regulation will differ largely depending on the kind of performances one desires to achieve – these can be, among others, financial, social, technical or operational. The answer to this question not only has important implications on the regulation of national rail sectors but also on achieving the creation of a single European railway market.

The paper is divided into five sections. The first section briefly traces back the history of European rail and shows that the European railway network is quite specific in international comparison. The second section describes the salient points of the European railway liberalization program. It highlights the heterogeneous nature of the sector. The next section identifies a number of challenges which arise from the confrontation of Europe's historical railways and the current policy objective and liberalization process. It uses as an example of governance issue the development and implementation of a new pan-European signalling technology – the European Rail Traffic Management System (ERTMS). The fourth section describes regulatory objectives (including regulating for economic, operational, social or technical performance). The last section asks whether the current regulatory framework answers the challenges posed by the fragmentation resulting from the historical and political evolution of the sector and how the objective of a European single railway market can be achieved in the current institutional setting. It proposed to develop a regulatory governance specific to the European railway sector based on a broad notion of performance.

## **2. History of European railways**

For the largest part of their history, European rail networks have been conceived, managed and regulated at the national level. Gauge, electrification or signaling differed widely across

European countries leading to a patchwork of poorly interoperable networks. Little attention was paid to [limited] international traffic and at a high cost: special rolling stock had to be conceived to circulate on different networks (or altogether changed at the border) while border crossings were dealt with via bilateral agreement. For military and industrial reasons some form of public control was envisaged in most countries and many imposed their control by legal mandate (Campos & Cantos, 2000). Until recently, the most common structure of the rail sector in many European countries was the existence of a single publicly-owned firm, in charge of managing both the infrastructure and the rail services.

## 2.1. Some specificities of the European rail sector

When compared to other countries (e.g. USA or Japan), European rail appears quite specific. First, there is a wide variation in the **mix of passenger and freight traffic** on the same network which influences heavily the practical capacity of railway lines (OECD, 2005)<sup>1</sup>. As noted by Waters (2007) passenger service often involves complex operations with high costs<sup>2</sup>. Systems with a higher percentage of passenger traffic (especially dense, urban traffic or high speed passengers) are likely to be more sensitive to limits on infrastructure capacity at peak times and to service quality than systems based predominantly on freight. The **length and complexity** of national networks varies enormously, ranging from under 3'000KM (e.g., Estonia, Latvia, Lithuania, the Netherlands or Denmark) to above 15'000KM (Italy, France, Poland, the United Kingdom or Germany)<sup>34</sup>. In addition, the more "fragmented" the rail network, i.e. the larger the number of railway companies for a given railway infrastructure, the less likely it is that any one rail company can provide any given end-to-end service. For much of its history the European railway sector developed in a very rigid monopolistic structure under tight State control (Stehmann & Zellhofer, 2004). Instead of being managed as commercial enterprises, railway firms were assimilated as **state authorities**. As such they were used for political objectives (e.g. investment and employment), came under public service obligations without adequate compensation. A high proportion of passenger transport services became unprofitable, but had to be maintained for political decisions (public service obligations). The process of debt

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<sup>1</sup> As freight trains are slower than express passenger trains, a good level of service for passengers may well mean that the use of a line for freight trains may be restricted to night hours when no passenger services are running.

<sup>2</sup> Both economic and social considerations influence policies and operations and result in sizeable subsidies. There can be several public policy concerns to be reconciled with a desire for efficient management of rail operations.

<sup>3</sup> Complex networks with intense usage normally require more complex systems of access charges if the cost response of the system to changes in use is to be accurately represented – due to congestion and scarcity, as well as likely diversity of types of trains, rolling stock.

<sup>4</sup> Furthermore, environmental characteristics such as topography and climate can influence the operating costs. In many cases, the information is not available for all output and environmental characteristics. Many of these characteristics are therefore omitted from the cost function specifications. Moreover, there exist other omitted variables such as differences across companies in accounting procedures that are generally not taken into account (Farsi, Filippini, & Greene, 2005).

accumulation entered a "vicious circle"<sup>5</sup>. The massive indebtedness that ensued was hard to overcome since rail entities repeatedly suffered from political interference, both in the short and long-term. According to the OECD (1999), the poor performance of railways can, in many countries, be attributed to a "soft budget constraint" – partly a result of a lack of transparency in the costs of public service obligations<sup>6</sup>. While virtually all national networks were interconnected, the network remained **highly inefficient** and **un-coordinated** at the European level – the national organization of railways acting as a formidable barrier to integration. In the 1950s the European Conference of Ministers of Transport (ECMT) diagnosed the "dominance of un-coordinated national railway policies as the key problem" (van der Vleuten, Anastasiadou, Lagendijk, & Schipper, 2007)<sup>7</sup>. In fact, the Treaty of Rome signed in 1957 considered the development of a Common Transport Policy (CTP) pivotal to the European integration process (Schot, 2007) – the CTP failed to achieve its objective lead to a ruling of the European Court of Justice, the so-called inactivity verdict.

### 3. European railway liberalization

As noted above for much of the 20<sup>th</sup> century European railways suffered from financial losses (usually covered via public subsidies), management inefficiency and an insufficient commercial outlook. During the past two decades, European Member States have progressively reformed their rail sectors with the goals of reducing state subsidies, enhancing productivity and increasing the sovereignty of the market. The resistance to reform from some major stakeholders – national operators, trade unions, etc. – was not universal. For instance equipment manufacturers interested in expanding their markets, railways interested in alternative ways of exploiting their network together with industrial groups interested in operating their own trains welcomed the reforming trend.

In fact, pressures to reform the European railway sector emanated from several levels: national, European and world-wide (Puffert, 1995). At the national level, rail traffic was losing ground to road haulage due to the technical incompatibilities, nationally-oriented infrastructure planning and time-tabling, poor international cooperation, dominance of political influence impeding responses to changing market conditions as well as the increased degree of motorization and the

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<sup>5</sup> Dramatic debt levels relative to the national public budget was attained in most European states at the end of the 1980s.

<sup>6</sup> At the time, the OECD encouraged countries to improve the performance of railways and to introduce competition by improving commercial incentives and addressing public service obligations.

<sup>7</sup> The Treaty of Rome signed in 1957 considered the development of a Common Transport Policy (CTP) pivotal to the European integration process. Railways, together with roads and inland waterways were considered as a core competence of the newly established European Economic Community (Treaty articles 74-84). Initial measures were directed to modernizing the existing railway system, stimulating cross-border traffic and improving the financial situation of railway administration.

expansion of the road infrastructure. National rail companies were generally financially burdensome due to over-manning in order to fight unemployment, obligation to maintain routes for political reasons (public service), innovation and procurement policies in the hands of national suppliers, infrastructure planning and construction following general political considerations without tackling profitability or industrial policy aims (high-speed rail). At the European level, budgetary pressure and the introduction of single market-principles into the transport sector further deteriorated the situation of rail companies. At the global level, significant efficiency improvement following railway reforms and re-organization (Staggers Act in the USA or restructuring in Japan) together with the broader trend of liberalization added to the pressure to reform railways.

Like in other countries the aim of the European reforms has been the improvement of efficiency and competitiveness of the railway system (Nash, 2008)<sup>8</sup>. Reforms were concentrated on the introduction of competition into the rail transport market via separation of infrastructure from operations (at least in an accounting sense), by the progressive opening up of entry to the market for new operators and by rules regarding the allocation of slots and the pricing of infrastructure use, administered by an independent regulator. Deregulation in Europe has meant both changes in the regulatory structure and a gradual (or complete privatization in the case of the United Kingdom) of the former vertically integrated state monopolies. This is all in marked contrast to the US, where concentration has been on parallel competition between vertically integrated railroads (Nash & Rivera-Trujillo, 2004).

To create and support markets, new regulatory regimes were set up (Coen, Héritier, & Böllhoff, 2002). Reforms were initiated by Directive 91/440. The European Commission has published a White Paper in 2001 (European Commission, 2001) outlining its ambition to revitalize the sector through the introduction of competition – freight was to be fully liberalized by 2007 and passenger service by 2012 – and the reform of institutions<sup>9</sup>. The idea was to increase both the capacity and the safety of the sector. A ‘first package’ was adopted in 2001 with the objective to achieve market opening of rail transport and create a single European railway market. It was designed around 3 axes: splitting the infrastructure from the activity of railway transport<sup>10</sup>, opening to competition the access to the network and achieving a regionalization of passengers regional railway transport. The European Commission then adopted in January 2002 a 'second package' of measures to revitalize the railways by rapidly building an integrated European railway area. In March 2004 the Commission proposed a third railway package containing

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<sup>8</sup> Nash identifies four additional objectives: 1) improve rail's market share in international traffic, 2) clearly differentiate the role of government, train operator and infrastructure manager, 3) put inter modal competition on a level playing field and 4) introduce direct “on-the-track” competition.

<sup>9</sup> The Commission should adopt a Communication on the Future on Transport in June 2009.

<sup>10</sup> Three different models for separation have emerged in Europe: 1) complete separation, 2) holding company and 3) separation of key powers.

measures to move the European railways forward. Adopted in October 2007, it introduced open access rights for international rail passenger services including cabotage by 2010.

Some countries preceded the Commission's effort. In 1988 Sweden, the first country to reform its railway market, demanded complete separation of infrastructure from operations and the empowerment of regional governments for planning and funding of regional services. The UK followed in 1993 with the passing of the Railways Act which led to the franchising of all passenger operations to private operators. Germany followed with the creation of Deutsche Bahn, a government-held holding company grouping freight, passenger and infrastructure services<sup>11</sup>.

While the European Commission has taken the driving seat in reforming the sector, Member States battle hard to retain control on their national networks. In many European countries there are important delays in transposing EU regulation into domestic laws and even more delays in implementing the new legal frameworks<sup>12</sup>. When looking at the EU in general Member States differ in terms of how they have interpreted requirements set by the legislation. As noted by Nash (2007), the extent of actual reform does not match the formal transposition of European Directives. In fact, the majority of the countries only implemented the EU's minimum requirements. The Commission has repeatedly notified Member States for failing to transpose Directives.

There is also a wide diversity in the type of regulatory body adopted: most European countries still have a Ministry in charge or no regulatory body with decision-making powers. A handful of countries have adopted either a "railway authority" model (dealing primarily with licences, safety and other railway-specific administrative tasks) or a special regulatory authority (Austria, Germany, Italy, UK, Latvia and the Netherlands). In fact only 3 countries (Germany, Austria and the UK) have specially trained staff dealing exclusively with regulatory matters and with far-reaching powers to enable them to enforce their decisions (IBM, 2007). Some of the EU's new Member States, in comparison with many old Member States, had already set up better organized regulatory bodies. It is interesting to note that almost all countries that had made relatively good progress in terms of opening up their rail transport services markets had Special Regulatory Authorities but most of the regulatory bodies had not yet been required to make decisions on discrimination cases.

On the ground, there are large variations in the extent to which railway markets are open to potential entrants. Whereas the freight market is open to competition since January 2007 the passenger market remains to be open. For the time being international trains circulating in

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<sup>11</sup> With 280 operators, Germany is the most open market in Europe but Deutsche Bahn retains more than 90% of train kilometers (Nash, 2007).

<sup>12</sup> Countries are routinely sanctioned by the Commission for failing to transpose or implement new laws pertaining to railways.

Europe are operated under joint-venture between national companies (e.g. Cisalpino is a 50-50 joint-venture between Switzerland's SBB and Italy's FS). With the partial opening of the passenger market in 2010, a number of operators have applied for slots outside of their home markets<sup>13</sup>.

Akin to its technical heterogeneity, the deregulation of the railway sector in the EU Member States has been driven by different types of economic, institutional and legal concerns. For instance, in the United Kingdom the pursuit of a market liberal agenda has dominated while in Sweden key concerns have been the need to find new ways to finance investments in the railway sector and to increase efficiency through competition. In countries like France and Portugal the initial most important factor seems to have been the necessity to act in accordance with EU legislation (Alexandersson & Hultén, 2008). While the different Member States are all taking divergent paths of liberalization, one can nonetheless note a number of significant changes that took place in the European railway landscape since the 90s (see Table 1).

**Table 1: European rail era**

	<b>Previous era (till 1990)</b>	<b>Transition era ( 1990-2005)</b>	<b>New era (2010)</b>
<b>Organizational structure</b>	Vertically integrated	Voluntary unbundling	Mandatory unbundling <sup>14</sup>
<b>Regulatory policy and legislation</b>	National	National with supra-national transport policy and directives	National with EU Directives (railway packages)
<b>Drivers</b>	Public service	Public service, productivity and financial sustainability	Public service, productivity, financial sustainability, environmental concerns
<b>Market structure</b>	Monopoly	Monopolistic (infrastructure) and market (services) segments	Monopolistic (infrastructure) and market (services) segments
<b>Market opening</b>	Closed with limited international traffic	Ad hoc opening of domestic markets	Freight open Mandated opening of passenger market
<b>Ownership</b>	Public ownership <sup>15</sup>	Mostly state-owned	State-owned (infrastructure) Some private rail companies
<b>Regulatory arrangements</b>	None (Ministry)	None (Ministry)	Independent railway authority
<b>Scale</b>	Regional and national	National to international	Increasingly international

Source: Authors

<sup>13</sup> Trenitalia has applied for slots to operate a high-speed train in France.

<sup>14</sup> Under the mandatory unbundling, European countries have opted for different options, e.g. Total vertical integration Competitive access Vertical separation

<sup>15</sup> Governments generally became system owners during the first half of the twentieth century.

While these changes are a welcomed step towards integration of the European railway market, the objective is far from reached. Part of the reason is that the European Union has been pushing two major but potentially contradictory objectives at the same time: the liberalization of the national markets and the creation of an interoperable network. The problem here is that the regulatory governance structure necessary to achieve these two objectives differs. In the first case, it requires regulation for economic and financial performance. In the second case, it requires regulation for technical and operational performance. In fact, as we will see with the case study of ERTMS (more below), they actually are opposed. Achieving technical interoperability comes at a huge [immediate] cost to railway operators and infrastructure managers without really bringing major returns in the short-term. It is clear now that the sequencing of standardization and harmonization of the European matters and that it would have probably more efficient to harmonized operational rules before technical rules.

#### **4. Challenges arising from the historical and political perspectives on railways**

While the initial aim/dream to see railways play a central part in the European integration process has failed to materialize so far, a new wind seems to be blowing on the European railways (increase in traffic, favorable policies driven by environmental concerns, improvements in the opening of markets, etc.). But numerous challenges remain before railways can play a leading role in EU integration, let alone before the creation of a single European railway market. Despite significant progress, a tension remains between Member States and the EU Commission when it comes to regulation and, more generally, governance of the railway sector. Recurrent delays of Member States in transposing and implementing European Directives pertaining to the rail sector attest to the reticence of countries to relinquish authority. It also shows the limits of the current institutional setting in which the EU drafts policies that remain at the “good will” of Member States.

In spite of all the integration effort, the European railway sector remains fragmented on several levels:

- **Technical;** problems of interoperability remain due to the technical complexity of the sector as well as the size of the network; in order to move the process forward interoperability is mandated on high-speed lines and along a number of corridors; conventional rail and regional traffic will be addressed at a later stage;
- **Financial;** despite a notable improvement in the economic situation of many railway operators, their financial standing is far from excellent; infrastructure manager are even in a worse situation since the charging mechanisms do not truly reflect costs – government subsidies make up for the losses; in the case of ERTMS, funding mechanisms remain divided between national countries and the EU;



- **Organizational**; the vertically integrated monopolies have been unbundled and are under competitive and performance pressure; the centrally-controlled railways are increasingly decentralized and run by markets; ownership too is being transformed from one/few actors to several actors; at times public ownership is replaced by private or public-private arrangements. Some of the barriers to further integration lie in inadequate organizational structures to handle changes in task execution, inadequate mandates and lack of willingness of national regulators to implement and enforce administrative changes as well as lack of resources and willingness of rail undertakings and infrastructure managers to adjust to changed market structures; in the case of ERTMS, unbundling has created a “catch 22” situation where infrastructure managers and railway undertakings have an incentive to invest in the new technology only if the other has done so. In addition, unbundling has modified investment cycles as well as the distribution of the burden ;
- **Administrative/legal**; in virtue of the subsidiarity principle, national railway legislations are diverse both in terms of their design and implementation; Kaeding (2007) argues that transport directives challenge the regulatory frameworks across member states with the EU facing a serious transposition problem, both in terms of delay or precocious implementation<sup>16</sup> .

The multi-level of governance (regional, national and supra-national) has created a patchwork of stakeholders whose interests are seldom aligned<sup>17</sup> . In the case of the electricity sector, DeBrujine (2006) has noted that institutional fragmentation has led to several shifts with reliability consequences<sup>18</sup> . In light of these fragmentations, many countries have adopted a purely national economic approach to regulation.

#### 4.1. The case of the European Rail Traffic Management System (ERTMS)

Issues in the development and deployment of the pan-European signalling technology (ERTMS) illustrate well such fragmentation. One central characteristic of networked systems is the need for technical interdependence or compatibility. This means that increasing the competitiveness of

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<sup>16</sup> In the case of Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification, six issues with considerable leeway for interpretation can be identified, leading to a potential for 240 different policy combinations that have to be addressed one by one. Empirical findings suggest that problems in transposition processes occur in almost 66% of all national implementing measures: 47% of national implementing measures have been notified late to the European Commission, of which 70% recorded delays of more than six months, with a maximum delay of 4.8 years. The time length of missed deadlines varies significantly between member states and between transport sub-sectors (Kaeding, 2008).

<sup>17</sup> A limited number of strong national railway companies (e.g. DB and SNCF) play a disproportionate role.

<sup>18</sup> Shifts from long-term planning to real-time management, from design to improvisation, from anticipation to resilience, from detailed analysis to operator experience and from risk-control to reliability-seeking behavior.

the European railway sector cannot rely solely on an economic approach. Measures need to be taken to guarantee an interoperable railway system across Europe<sup>19</sup>. A cornerstone in establishing such a European-wide technically interoperable railway system rests on the signalling system.

The European railway sector has spent the last 20 years developing a pan-European control and command system (ERTMS) that will, in time, enable convoys to run from Sweden to Sicily without changing the train set. In fact, ERTMS serves three purposes: improved interoperability of the trans-European rail network, the creation of a single market for procurement and the optimization of rail operations on a European-wide scale<sup>20</sup>. As such, ERTMS plays a critical role in Europe's railway market integration and liberalization.

Despite substantial efforts in standardization, there are still important cross-country variations in the implementation of interoperability requirements<sup>21</sup>. Pellegrin (2008) argues that the failure to achieve unified specifications and thus an interoperable European network is linked to the absence of an industrial project manager. Instead, each equipment manufacturer, in cooperation with its historical network, has developed a complete system of specifications. Furthermore, the European Commission, nominally in charge of the project has so far shown limited capability in managing the large number of European rail stakeholders (see appendix 1).

**Table 2: Phases of ERTMS project**

	<b>Studies and specifications 1989-1997</b>	<b>Final specifications 1998-2004</b>	<b>Roll-out 2004-2008 (till 2020)</b>
<i>Technical level</i>		Class P to Class 1 SRS	SRS 2.2.2 and 2.3.0 Work on 3.0.0
<i>Financial level</i>	National	National	National and subventions from EU
<i>Organizational level</i>	Integrated railways	Integrated railways	Unbundled railways
<i>Legal level</i>	Directive 96/48/EC	Directive 2001/16/EC	Directive 2004/50/EC Transposition delays
<i>Stakeholders</i>	EEIG, ERRI, EUROSIG	UNISIG, CENELEC, AEIF	ERA and associations
<i>Emphasis</i>	<b>Engineering</b>	<b>Politics</b>	<b>Financial</b>

Source: Adapted from UIC and Winter (2007) and personal interviews.

<sup>19</sup> Mulley & Nelson decompose interoperability into technical, corporate, judicial and cultural dimensions (1999).

<sup>20</sup> While the ultimate goal of ERTMS is to ensure the cross-border interoperability, its “side-benefits” are numerous: better and safer working conditions for train drivers, savings for railway undertakings in the long-term – different signaling systems for various networks are no longer required in the cab – and increasing the capacity utilization of the existing rail network – up to 20% through higher speeds and reduced headways.

<sup>21</sup> One should obviously differentiate the standardization of a technical component of the railway system (in this case signaling) from its regulation. The case study of ERTMS nonetheless shows that both are nonetheless linked.

The case of ERTMS offers a good example of the necessity to address the fragmentation issues – or else to run the risk of failing to achieve integration – by including the technical aspect in the regulation and governance of the European railway system. As noted the creation of an integrated and competitive railway market rests to a large extent on achieving network interoperability. ERTMS plays a central part in achieving such interoperability. But the deployment of ERTMS is taking place in a different legislative framework than from the past, one that requires better coordination<sup>22</sup>. At the same time there is a need for an overall system integration: one is looking at the railway system in different ways with 27 “closed” railway systems that need to be harmonized. One important question to be tackled is identifying all the relevant stakeholders and their respective incentives<sup>23</sup>. In addition, many of these actors do not know how to proceed in the new environment where many strategic options are available.

## 5. Defining performance in the railway sector

One important element of the reform process of the railway sector has been the drive to increase its efficiency<sup>24</sup>. A large strand of literature has looked at railway performance including some testing influence of exogenous factors like regulatory policies (Pedro Cantos & Maudos, 2001; Caves & Christensen, 1980), public policies (Oum & Yu, 1994), administrative autonomy (Gathon & Pestieau, 1995) and technical efficiency (Cowie, 1999)<sup>25</sup>. For instance, after measuring railway performance with adjustment of environmental effects, data noise and slacks Lan and Lin (2005) conclude that important policy implications and amelioration strategies for operating railways derive from broadening the scope.

Rodriguez et al. (2007) identify a number of performance measures, including commercial efficiency, technical efficiency, financial performance, capital expenditures and cost of capital. In many cases, the government and regulator seem to address all these objectives at the same time with no particular priority. This is not particularly surprising since different stakeholders, private and public, with different scope of action (e.g. competition authority or national safety authority) are in charge of a given task which influences performance. An additional difficulty comes from the fact that in the past a Ministry of Department of Transport would be in charge of optimizing all these performances. Nowadays, the remit of the Ministry has in many ways shrunk: their scope of action and authority has been reduced. New agencies have been created,

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<sup>22</sup> For instance, there has been a separate handling of the two ERTMS components (i.e. GSM-R and ETCS) – for now, there is no integration responsibility between ETCS and GSM-R

<sup>23</sup> It is important to keep in mind that many institutional players are not only linked to ERTMS.

<sup>24</sup> Measuring efficiency/performance in the railway sector is made more complex since the firms operate without private producers, either because of the particular market structure or because of non commercial objectives which are assigned to them (Perelman & Pestieau, 1988).

<sup>25</sup> See also (P. Cantos, Pastor, & Serrano, 1999) for a non-parametric approach to productivity, efficiency and technical change in the European railways.

e.g. slot allocators, independent regulatory authorities, some as a result of EU-mandated Directives, some as the result of domestic reforms. All these organizations have their own performance indicators with the risk of creating local optima at the cost of a global sub-optimum.

Many empiric studies have looked at performance under de-regulation – most of them attempting to establish link between reforms and efficiency in railways<sup>26</sup>. Among others studies looked at the impact on firms' financial condition (i.e. revenue vs. cost control), productivity and cost efficiency. Studies were also conducted to analyze the impact on customers and shippers.

There seems to be relatively little consensus about the effect of reforms on efficiency. Friebel, Ivaldi and Vibes (2003) find that full separation of infrastructure from operations is not a necessary condition for improving railroad efficiency. In a later paper (2008) they find efficiency increases when reforms such as third-party network access, introduction of an independent regulator and vertical separation are implemented<sup>27</sup>. At the same time, reforms have been found to positively impacted railroad's technical efficiency – higher reform intensity does not necessarily increase technical efficiency; rather it depends on sequencing of reforms. In fact, railroad is sensitive to changes in the regulatory framework and one-size-fits-all may not be a fruitful way to enhance efficiency.

Regulation can be applied to operational performance – often defined as the capacity, average speed and punctuality, safety and the optimized usage of resources – e.g. via measures to incentivize operators to improve punctuality (Gibson, 2005; Vromans, Dekker, & Kroon, 2006). In many countries punctuality is the main performance indicator<sup>28</sup>. It can also be aimed at social performance (Héritier & Schmidt, 2000). In fact, railways tend to be under constant surveillance from its stakeholders (Gelders, et al., 2008). Finally, one can regulate for technical performance (Janic, 2008; Yu, 2008). While regulation can be geared towards improving all these performances, most of it seems to aim for economic efficiency<sup>29</sup>. This emphasis on economic regulation can be attributed to the history of financial distress that plagued the railway sector during the past decades as well as on the broader trend of liberalization and “retreat of the State” that emerged in the 1980s.

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<sup>26</sup> An increasing number of *econometric studies* are looking at railway efficiency and performance (Growitsch & Wetzel, 2009; Jupe & Crompton, 2006; Smith, 2005; Yu, 2008).

<sup>27</sup> While reforms seem to impact positively technical efficiency, higher reform intensity does not necessarily increase technical efficiency which depends more on the sequencing of reforms. This last finding is similar to what Wallsten (2002) finds in the telecommunication sector.

<sup>28</sup> Other important measures are information supply in trains and stations and cleanliness of trains and stations (Gelders, Galetzka, Verckens, & Seydel, 2008).

<sup>29</sup> Regulation is defined here as a specific form of governance, a set of authoritative rules, often accompanied by some administrative agency, for monitoring and enforcing compliance (Jordana & Levi-Faur, 2004).

While there is abundant literature on “individual” performance (e.g. technical efficiency or economic efficiency), few authors have addressed the issue of multiple regulatory objectives. For instance, Campos & Cantos (2000) identify a number of regulatory scenarios based on different modes of unbundling and match them with multiple performance objectives – fiscal, internal efficiency, dynamic efficiency, risk minimizing, capacity allocation and equity. Not surprisingly, the resulting matrix shows that no single scenario is able to fulfill all objectives at the national level, let alone at the EU level. For the OECD (2006) “the general objective of governments with respect to the rail sector is to force the end-user prices to be at an efficient level (taking into account the price of substitute services) with an optimal level of service quality and variety, a high level of productive efficiency (and therefore a minimum level of subsidy), and an on-going efficient level of investment and innovation in the rail sector”.

The last section asks whether the current regulatory framework answers the challenges posed by the historical and political evolution of the sector and how these objectives can be combined to meet the demands of the various railway stakeholders. Based on the case study of ERTMS, it argues for the need to develop a regulatory governance specific to the European railway sector with explicit inclusion of performance objectives (economic, social, technical and operational).

## **6. Governance of the European railway system**

While regulation of the railway sector goes back to the end of the 19<sup>th</sup> century<sup>30</sup>, it has received renewed attention with the wave liberalization that started in the mid 1980’s. Early on Puffert (1995) had noted that 1) the new distributive functions in rail transport infrastructure planning and non-discriminatory track allocation control would require the creation of a new regulatory mechanism at the European level and that 2) the separation of infrastructure and operation would lead to important changes in the logic of international interest representation.

As seen above, regulation and control of railways was relatively homogeneous across Europe until the 1990s. The economic characteristics of the railways sector (e.g. idea of natural monopoly) meant that a national monopolistic operator was under price and service regulation to protect the general interest. In practice, demand was often to be met at any cost and for an accessible price. Limited competition was held at bay since “the preservation of the national character of the industry was considered the key factor governing the overall regulation”.

Over time governments have increasingly become consumers rather than builders of large-scale systems (such as telecommunications or electricity networks). They nonetheless retain a number

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<sup>30</sup> Many regulatory questions (pricing, competition, safety, etc.) had to be addressed in the United States. They led to the creation of a state railroad commissions in the middle of the 18<sup>th</sup> century. In 1886, the US Supreme Court ruled that commerce originating or ending outside the boundaries of a state could not be regulated by that state, even though the federal government provided no alternative means of regulation (McCraw, 1984).

of prerogatives such as setting policy objectives such as efficiency, coherence, flexibility or fairness (Abbate, 1999)<sup>31</sup> .

Governance of the railway sector has been addressed at the national level but much less at the European level. In fact, railway has notably lagged behind other network industries (e.g. electricity or telecommunication) when it comes to legislation at the EU level – the Commission disposed of only limited legal and institutional powers in order to overcome the resistance of the Member States<sup>32</sup> . This mostly comes from the fact that for most of its history, railways were conceived and managed almost exclusively at the national level. Given the limited cross-border traffic, there was no real need to coordinate otherwise than through bilateral relations<sup>33</sup> .

There is a vast literature on regulatory governance, including one that deals explicitly with network industries like railways (Coen & Windhoff-Héritier, 2005; Correa, 2006) or with multi-level settings like Europe (Doern & Johnson, 2006; Majone, 1996; Rodrigo, Allio, & Andres-Amo, 2009)<sup>34</sup> . A number of authors have proposed typologies for the regulatory governance in network industries (Finger & Varone, 2006; Thatcher & Coen, 2008). Finger, Groenewegen et al. (2005) argue that for ensuring satisfactory functioning of any infrastructure requires coherence between the technical and institutional governance. Stern and Holder (1999) make a clear distinction between the objectives of infrastructure regulation (i.e. its purposes and functions) and the specific institutional framework for regulation in any given country. Merkert (2007) notes that it may be efficient to have different governance structures for different rail tasks as well as for different types of train operation and infrastructure provision.

One question therefore is what kind of regulatory framework to put in place at the EU level to ensure that the European railway sector remains manageable from a regulatory perspective and that the objective of a single European market for rail is achieved. The governance of railway networks is made ever more difficult by the addition of a supra-national authority (EC) which passes Directives that need to be transposed and implemented into national legislation. The real difficulty lies in the fact that Member-States are often reluctant to give up control of their domestic railway sector.

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<sup>31</sup> Abbate identifies a number of network characteristics which pose particular governance problems, including the interconnection of independent systems and geographic spread.

<sup>32</sup> The resistance to Brussel's intervention into domestic railway policies is diminishing but still strong.

<sup>33</sup> Such a bilateral approach is still used in cross-acceptance of rolling stock, although there are signs that coordination is done at the corridor-level and even at the multinational level – in part because of the work from ERA.

<sup>34</sup> The heterogeneous technical nature of the current European railway network makes the comparison with other network industries/large-scale systems very hard/irrelevant. The aviation sector has a history of more than 50 years of international/global cooperation to standardize operations. In the telecommunication sector, which has a long history of standardization at the international level (e.g. via ITU), the hopes to create a pan-European regulator have been dashed.

As noted by Steenhuisen & van Eeten (2008) “realizing multiple public values in a large scale technological system (such as railways) requires a myriad of trade-offs because realizing one value can directly affect, postpone or thwart the realization of other values”. Governance should address questions of ownership, organizational form, methods of regulator or market design but also take into consideration the technical aspect of railways<sup>35</sup>. At the same time, it is important to recognize that no framework will be able to satisfy the governance needs of an evolving sector. It is also important to keep in mind that incremental policies at the national level may be more effective than grand designs.

Geradin and Petit (2004) identify and call for some key principles of good governance for sound regulation of network industries – independence, accountability, judicial accountability, financial accountability, political accountability and performance’ accountability. The key question is at what level these principles should be enforced, i.e. at the EU level, at the Member State level or a mix between the two with guidelines established at the EU level and enforced by Member States. As noted, the liberty given to Member States to organize the regulation of their national railway sector has led to great heterogeneity. For instance Belgium created two separate bodies – one allocation body and one regulatory body. The creation of National Safety Authorities (in charge of certifying different processes such as locomotives homologation) only reinforces heterogeneity.

The establishment of agencies at the European level is one of the most notable recent developments in EU regulatory policy (Keleman, 2002). Their governance has recently received a wide coverage in the academic literature (Dehousse, 2008; Thatcher & Coen, 2008; Trondal & Jeppesen, 2008)<sup>36</sup>. While acknowledging the importance of agencies in implementing European legislation, Groenleer et al. (2008) point out that it can only happen in cooperation with Member States, the Commission and international bodies. Dehousse (2008) actually questions the emergence of a strong regulator given the existence of multiple principals (Parliament, Commission and Member-States).

In the railway sector, the creation of agencies at the Member State has usually lagged behind other network industries since rail came rather late in the liberalization process (or had to face major opposition)<sup>37</sup>. Coen and Thatcher (2007) argue that the EC and national regulators maintain controls over European regulatory networks (ERNs).

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<sup>35</sup> Bauer & Schneider (2008) make a distinction between the social and the technical subsystem and include 4 layers of design issues: embeddedness, institutional environment, governance and resource allocation.

<sup>36</sup> Thatcher and Coen propose a typology for implementing European regulations based on 8 types of coordination – EU-supervised national implementation, forum governance, informal networks of IRAs, European networks of regulators, European regulatory agencies, federal European regulatory agencies, single European regulator and direct regulation by the Commission.

<sup>37</sup> Most formal governance structures and safeguards were exogenously drafted by political decision makers.

The study of ERTMS leads to a similar conclusion: while ERA is not a regulatory agency *per se*, it plays, together with the other railway stakeholders (industry associations and their members), a strong regulatory role but only to a certain point. It therefore finds itself in a weak position with a limited set of powers and strong oversight. That said, in the aftermath of the train accident of Viareggio, the EU Transport Commissioner Antonio Tajani announced that he wishes to set up a «European control system» for rail transport and the transport of hazardous goods. With the liberalization of rail freight transport, «we must move from national control systems to a European system». The question of performance is inextricably linked to the one of governance.

## **7. Conclusion**

While started in the 1950s and despite a lot of good will, the efforts of European countries to create a unified railway network have encountered many obstacles. Problems of achieving single European rail market stem, among others, from the legacy of heterogeneous networks built over more than a century with a predominant national focus, from the lack of alignment between the EU-driven liberalization of the railway market and domestic reforms (as witnessed by transposition issues). The disappointing progress can also be attributed to the insufficient institutional response to the rail transport policy (bridging policy with a governance framework at the EU level).

The current lack of coordination between national railways is addressed by the centralization of a certain number of activities, e.g., directives on harmonization, cross-acceptance as well as the creation of ERA. While a step in the right direction, the limited powers granted to ERA (typical of the EU “agencification” trend) shows the difficulty in creating an institutional framework – in part caused by the reluctance of Member-States to give up authority on their national networks. Today, Member-States, their Notifying Bodies (NBs) and National Safety Authorities (NSAs) are not fully in charge anymore but the EU has not been able to fill the gap. Moreover, it makes little doubt that the piecing together of railway policies conceived at the national level will fail to create a European optima.

The failure to create a supra-national regulatory body for the telecommunication sector does not bode well for the creation of a similar agency for rail. One of the key questions is whether the regulatory tasks of ERA, currently limited to safety, interoperability and ERTMS, will be extended to further regulatory activities. The difficulties in developing and deploying ERTMS can be seen more as a symptom – rather than the cause – of governance weakness in the EU railway system. The current governance weakness poses not only a risk of regulatory divergence but also of “real” risk (e.g. Viareggio incident). The question of performance is not restricted to the railways sector. Other network industries, like the electricity sector, under similar transformations and face similar issues.



Through the study of ERTMS, the paper has tried to show that the creation of a single railway market requires a different approach to governance of the European railway network. For instance, before thinking of regulatory agencies or regulatory mechanism, one should consider deciding on what performance one wants to achieve. Too often, the overriding goal of regulating for economic performance clouds a broader set of issues that need to be regulated (environmental, social, operational) as well.

In the future, the European railway sector will have to deal with managing traffic increase, achieving objectives of energetic and environmental efficiency, ensuring continuous interoperability and further market opening<sup>38</sup>. Hence, governance and, by extension regulation, will need to reflect/integrate the dynamic aspect of the industry and of the reforms.

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<sup>38</sup> The notion that interoperability is “not a one-off, absolute state, rather it is a dynamic set of circumstances which will change through time in ways which alter the effectiveness with which different systems are able to work together”. This is particularly important when thinking about the governance and regulation of the European railway system: as one cannot expect the 27+ national railway systems to achieve interoperability at the same time on the different dimensions, one cannot expect interoperability to remain static.

## References

- Abbate, J. (1999). From control to coordination: New governance models for information networks and other large technical systems. In O. Coutard (Ed.), *The governance of large technical systems* (pp. xvi, 303 p.). London ; New York: Routledge.
- Alexandersson, G., & Hultén, S. (2008). The Swedish Railway Deregulation Path. *Review of Network Economics*, 7(1), 18-36.
- Bauer, J. M., & Schneider, V. (2008). *Lessons from complexity theory for the governance of LTS*. Paper presented at the Complexity and large technical systems, May 30-31.
- Campos, J., & Cantos, P. (2000). Rail Transport Regulation. In G. de Rus & A. Estache (Eds.), *Privatization and Regulation of Transport Infrastructure: Guidelines for Policymakers and Regulators* (pp. 67). Washington, D.C.: World Bank Institute Development Studies.
- Cantos, P., & Maudos, J. (2001). Regulation and efficiency: the case of European railways. *Transportation Research Part A: Policy and Practice*, 35(5), 459-472.
- Cantos, P., Pastor, J. M., & Serrano, L. (1999). Productivity, efficiency and technical change in the European railways: A non-parametric approach. *Transportation*, 26, 337-357.
- Caves, D. W., & Christensen, L. R. (1980). The Relative Efficiency of Public and Private Firms in a Competitive Environment: The Case of Canadian Railroads. *The Journal of Political Economy*, 88(5), 958-976.
- Coen, D., Héritier, A., & Böllhoff, D. (2002). *Regulating the Utilities: UK and Germany Compared*. London: Anglo-German Foundation for the Study of Industrial Society.
- Coen, D., & Thatcher, M. (2007). Network Governance and Multi-level Delegation: European Networks of Regulatory Agencies (Vol. 28, pp. 49-71): Cambridge Journals Online.
- Coen, D., & Windhoff-Héritier, A. (2005). *Refining regulatory regimes : utilities in Europe*. Cheltenham, UK ; Northampton, MA: E. Elgar.
- Correa, P. (2006). *Regulatory governance in infrastructure industries : assessment and measurement of Brazilian regulators*. Washington, DC: World Bank.
- Cowie, J. (1999). The Technical Efficiency of Public and Private Ownership in the Rail Industry: The Case of Swiss Private Railways. *Journal of Transport Economics and Policy*, 33(3), 241-251.
- De Bruijne, M. (2006). *Networked reliability. Institutional fragmentation and the reliability of service provision in critical infrastructures*. Delft.
- Dehousse, R. (2008). Delegation of powers in the European union: The need for a multi-principals model. *West European Politics*, 31(4), 789 - 805.
- Doern, G. B., & Johnson, R. (2006). *Rules, rules, rules, rules : multilevel regulatory governance*. Toronto, ON: University of Toronto Press.
- European Commission. (2001). *White Paper submitted by the Commission on 12 September 2001: "European transport policy for 2010: time to decide"*.
- European Commission. (2005). *Communication from the Commission to the EU Parliament and the Council on the deployment of the European rail signalling system ERTMS/ETCS*.
- Farsi, M., Filippini, M., & Greene, W. (2005). Efficiency Measurement in Network Industries: Application to the Swiss Railway Companies. *Journal of Regulatory Economics*, 28(1), 69-90.

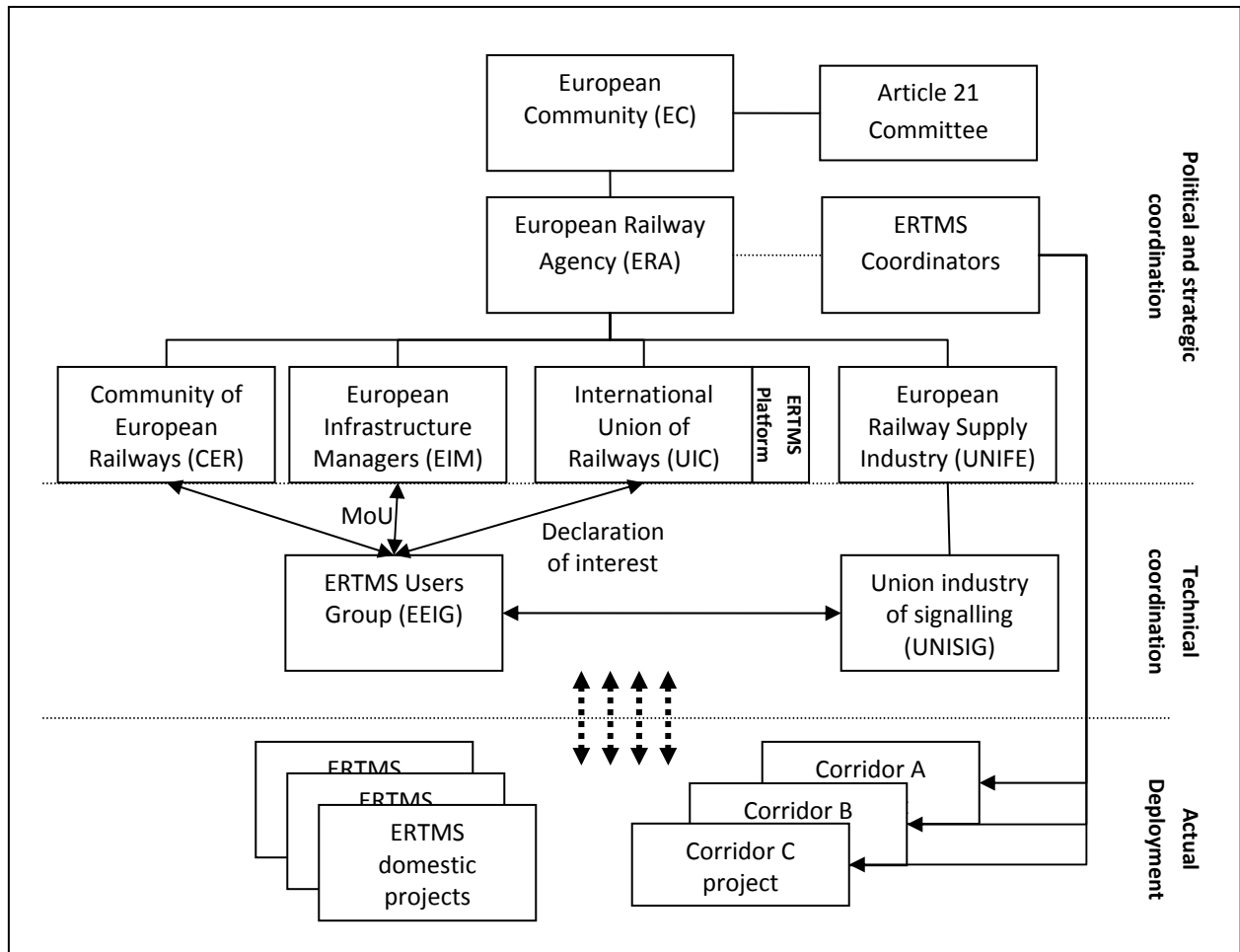
- Finger, M., Groenewegen, J., & Künneke, R. (2005). The Quest for Coherence Between Institutions and Technologies in Infrastructures. *Competition and Regulation in Network Industries*, 6(4), 227-259.
- Finger, M., & Varone, F. (2006). Governance of network industries: towards European regulators, differentiated regulations, or self-regulation? (Vol. MIR-REPORT-2006-008). Lausanne: EPFL.
- Friebel, G., Ivaldi, M., & Vibes, C. (2003). *Railway (de) regulation: a European efficiency comparison*: IDEI report no 3 on passenger rail transport, University of Toulouse.
- Friebel, G., Ivaldi, M., & Vibes, C. (2008). Railway (De)Regulation: A European Efficiency Comparison. *Economica*, 9999(9999).
- Gathon, H. J., & Pestieau, P. (1995). Decomposing efficiency into its managerial and its regulatory components: The case of European railways. *European Journal of Operational Research*, 80(3), 500-507.
- Gelders, D., Galetzka, M., Verckens, J. P., & Seydel, E. (2008). Showing results? An analysis of the perceptions of internal and external stakeholders of the public performance communication by the Belgian and Dutch Railways. [doi: DOI: 10.1016/j.giq.2007.01.003]. *Government Information Quarterly*, 25(2), 221-238.
- Geradin, D., & Petit, N. (2004). The Development of Agencies at EU and National Levels: Conceptual Analysis and Proposals for Reform (Vol. Jean Monnet Working Paper 01/04, pp. 64). New York: NYU School of Law.
- Gibson, S. (2005). Incentivising operational performance on the UK rail infrastructure since 1996. *Utilities Policy*, 13(3), 222-229.
- Groenleer, M., Versluis, E., & Kaeding, M. (2008). *Regulatory governance through EU agencies? The implementation of transport directives*. Paper presented at the ECPR Standing Group on Regulatory Governance Conference.
- Growitsch, C., & Wetzel, H. (2009). Testing for Economies of Scope in European Railways: An Efficiency Analysis. *Journal of Transport Economics and Policy*, 43, 1-24.
- IBM. (2007). *Rail Liberalisation Index 2007*: IBM Global Business Services.
- Janic, M. (2008). An assessment of the performance of the European long intermodal freight trains (LIFTS). *Transportation Research Part A: Policy and Practice*, 42(10), 1326-1339.
- Jordana, J., & Levi-Faur, D. (2004). The Politics of Regulation in the Age of Governance. In J. Jordana & D. Levi-Faur (Eds.), *The Politics of Regulation: Examining Regulatory Institutions and Instruments in the Governance Age*. Cheltenham: Edward Elgar.
- Jupe, R., & Crompton, G. (2006). "A deficient performance": The regulation of the train operating companies in Britain's privatised railway system. *Critical Perspectives on Accounting*, 17(8), 1035-1065.
- Kaeding, M. (2008). Lost in Translation or Full Steam Ahead: The Transposition of EU Transport Directives across Member States. *European Union Politics*, 9(1), 115-143.
- Keleman, D. R. (2002). The Politics of 'Eurocratic' Structure and the New European Agencies. *West European Politics*, 25(4), 93 - 118.
- Künneke, R., & Finger, M. (2009). *The governance of infrastructures as common pool resources*. Paper presented at the Paper presented on the fourth Workshop on the Workshop (WOW4), June 2–7, 2009.
- Lan, L. W., & Lin, E. T. J. (2005). Measuring railway performance with adjustment of environmental effects, data noise and slacks. *Transportmetrica*, 1(2), 161-189.

- Lochman, L. (2009). Background for ERTMS. In UIC & P. Winter (Eds.), *Compendium on ERTMS - European Rail Traffic Management System* (pp. 31-50). Hamburg: DW Media.
- Majone, G. (1996). *Regulating Europe*. London ; New York: Routledge.
- McCraw, T. K. (1984). *Prophets of regulation : Charles Francis Adams, Louis D. Brandeis, James M. Landis, Alfred E. Kahn*. Cambridge, Mass.: Belknap Press of Harvard University Press.
- Merkert, R. (2007). *A transaction cost perspective on the organization of European railways*. Paper presented at the 11th World Conference on Transport Research (WCTR).
- Mulley, C., & Nelson, J. D. (1999). Interoperability and transport policy: the impediments to interoperability in the organisation of trans-European transport systems. [doi: DOI: 10.1016/S0966-6923(98)00046-5]. *Journal of Transport Geography*, 7(2), 93-104.
- Nash, C. (2007). Reform of European Passenger Railways – where do we stand? In R. Marcario, J. Viegas & D. Hensher (Eds.), *Competition and Ownership in Land Passenger Transport* (pp. 95-114). Oxford: Elsevier Science.
- Nash, C. (2008). Passenger railway reform in the last 20 years - European experience reconsidered. *Research in Transportation Economics*, 22(1), 61-70.
- Nash, C., & Rivera-Trujillo, C. (2004). *Railway reform in Europe - Principles and Practice*. Paper presented at the Conference on Competition in the rail industry.
- OECD. (1999). Competition and Railroads. *OECD Journal of Competition Law and Policy*, 1, 143-224.
- OECD. (2005). *Railway Reform and Charges for the Use of Infrastructure*. Paris: OECD.
- OECD Competition Committee. (2006). Structural Reform in the Rail Industry. *OECD Journal of Competition Law & Policy*, 8(2), 67-79.
- Oum, T., & Yu, C. (1994). Economic efficiency of railways and implications for public policy: a comparative study of the OECD countries' railways. *Journal of Transportation Economics and Policy*, 37, 121-138.
- Pellegrin, J. (2008). ERTMS (European Rail Traffic Management System) : une gouvernance européenne déplorable. *Transports*, 448(Mars-Avril), 106-114.
- Perelman, S., & Pestieau, P. (1988). Technical performance in public enterprises : A comparative study of railways and postal services. *European Economic Review*, 32(2-3), 432-441.
- Puffert, D. (1995). L'Intégration Technique du Réseau Ferroviaire Européen. In M. Merger, A. Carreras & A. Giuntini (Eds.), *Les Réseaux Européens Transnationaux XIXe-XXe Siècles - Quels Enjeux?* (pp. 303-318). Nantes Ouest Editions.
- Rodrigo, D., Allio, L., & Andres-Amo, P. (2009). Multi-Level Regulatory Governance: Policies, Institutions and Tools for Regulatory Quality and Policy Coherence (Vol. Working Papers on Public Governance, No. 13). Paris: OECD.
- Rodriguez Pardina, M., & Schlirf Rapti, R. (2007). *Regulatory Requirements Under Different Forms of Utility Service Delivery* Washington, D.C.: World Bank.
- Schot, J. (2007). Introduction: Building Europe on transnational infrastructures. *The Journal of Transport History*, 28(2), 167-171.
- Smith, A. S. J. (2005). The role of efficiency estimates in UK regulatory price reviews: The case of rail. *Utilities Policy*, 13(4), 294-301.
- Steenhuisen, B., & van Eeten, M. (2008). Invisible Trade-Offs of Public Values: Inside Dutch Railways. *Public Money & Management*, 28(3), 147-152.

- Stehmann, O., & Zellhofer, G. (2004). Dominant Rail Undertakings under European Competition Policy. *European Law Journal*, 10(3), 327-353.
- Stern, J., & Holder, S. (1999). Regulatory governance: criteria for assessing the performance of regulatory systems: An application to infrastructure industries in the developing countries of Asia. *Utilities Policy*, 8(1), 33-50.
- Thatcher, M., & Coen, D. (2008). Reshaping european regulatory space: An evolutionary analysis. *West European Politics*, 31(4), 806 - 836.
- Trondal, J., & Jeppesen, L. (2008). Images of Agency Governance in the European Union. *West European Politics*, 31(3), 417 - 441.
- UIC, & Winter, P. (2007). *Global Perspectives for ERTMS*. Paris: Union Internationale des Chemins de Fer.
- van der Vleuten, E., Anastasiadou, I., Lagendijk, V., & Schipper, F. (2007). Europe's System Builders: The Contested Shaping of Transnational Road, Electricity and Rail Networks. *Contemporary European History*, 16(03), 321-347.
- Vromans, M. J. C. M., Dekker, R., & Kroon, L. G. (2006). Reliability and heterogeneity of railway services. *European Journal of Operational Research*, 172(2), 647-665.
- Wallsten, S. J. (2002). Does Sequencing Matter? Regulation and Privatization in Telecommunications Reforms (Vol. Working Paper No. 2817). Washington, D.C.: World Bank.
- Waters II, W. G. (2007). Evolution of Railroad Economics. *Research in Transportation Economics*, 20, 11-67.
- Yu, M.-M. (2008). Assessing the technical efficiency, service effectiveness, and technical effectiveness of the world's railways through NDEA analysis. *Transportation Research Part A: Policy and Practice*, 42(10), 1283-1294.

## Appendix 1: ERTMS ETCS Ecosystem

Figure 1: ERTMS ETCS Ecosystem (without GSM-R)



Source: Adapted from Querzè (2007) and personal interviews.

## Appendix 2: The European Railway Agency (ERA)

Coming in the footsteps of the European Association for Railway Interoperability (AEIF), the European Railway Agency (ERA) was set up to help create an integrated railway area by reinforcing safety and interoperability<sup>39, 40</sup>. Its main task is to develop economically viable common technical standards and approaches to safety, working closely with railway sector stakeholders, national authorities and other concerned parties, as well as with the European institutions.

The Commission has mandated ERA to perform certain activities under Directives 96/48/EC and 2001/16/EC. This includes: 1) preparing the review and updating of TSIs and making any recommendations to take account of developments in technology or social requirements (e.g. those who indicate the exact format of the messages which have to be exchanged between the track and the train); 2) contributing to the development and implementation of rail interoperability – ensure that the TSIs are adapted to technical progress and market trends and to the social requirements; 3) monitoring progress with the interoperability of the railway systems; 4) examining from the point of view of interoperability, any railway infrastructure project. It is expected that these measures will gradually create an open market for rail products and systems, create true operational rail interoperability at a European level, and reduce the high costs and burdens currently being experienced from the perpetuation of specific national technical solutions and systems.

In practice, the Agency also acts as the system authority for ERTMS<sup>41</sup>. The two main axes of ERA as system authority are: 1) configuration and quality control which includes repository of all specifications, quality review, cross check, consistency and gap identification and 2) system evolution and change management which includes baseline planning, system version management and backward compatibility. The EC will also be able to ask the agency for assistance in the evaluation, as far as interoperability is concerned, of projects eligible for Community financial support. As such, ERA plays a central role in the current and future technical development of ERTMS<sup>42</sup>. In fact, one can argue that the creation of the agency and its important “technical” work is partly addressing the inclusion of technical regulation.

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<sup>39</sup> In September 2006, the European Association for Railway Interoperability (AEIF) officially transferred all its documentation to the European Railway Agency. AEIF was the joint representative body mandated by the EU Commission to lay down the Technical Specifications for Interoperability (TSIs).

<sup>40</sup> The regulation 881/2004 of the European Parliament and the Council dated 29 April 2004 established the European Railway Agency, and defined its responsibilities and working methods (Lochman, 2009).

<sup>41</sup> ERA is also in charge of establishing transparent processes to manage the ERTMS system changes.

<sup>42</sup> In the framework of the standard’s evolution process, which is under ERA’s responsibility, there has been an attempt by ERA (led by the ERTMS unit manager) to take the lead in the next standard release via the creation of a working group. The attempt failed due to a general blockage of the stakeholders.

However, the fact that ERA is considered as the system authority does not reduce potential conflicts of interests within the ERTMS ecosystem. The agency's scope/depth of action is also under question. The appointment of European coordinators to facilitate the coordinated deployment of ERTMS in corridors can be interpreted as an attempt to bridge the gap between ERA's technical and political work, and the actual deployment<sup>43</sup>. At the same time it shows the limitation of the institutional framework which struggles to manage the transition of an innovation from development to deployment.

Moreover, the double-headed approach is contradictory: the coordinators' mandate is more geared towards short-term success (deployment via corridors) than towards long-term sustainability (standards). In practice, ERA finds itself in a situation where it plays both a technical and as political role, which places additional pressure on the agency both from the EC and the ERTMS coordinators.

While the technical competence of ERA is not in question, this cannot be said of the current institutional arrangement which leaves ERA devoid of legislative or regulatory powers – it only submits opinions and recommendations to the European Commission<sup>44</sup>. Second, the gap between technical coordination and actual deployment is hardly filled by ERA. The “reality of corridors” never reaches ERA –to minimize transaction costs, ERA doesn't work with individual suppliers but representative organizations, e.g. UNIFE, UNISIG. Third, the standardization process itself poses a problem – going back and forth between ERA and Member States. Last, investment decisions are still made at the local and national level which distorts incentives. There is therefore a risk of ending up with very good interoperability inside one country/along one corridor<sup>45</sup> but not across countries.

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<sup>43</sup> The coordinators' role consists in facilitating the preparation of coherent and economically viable deployment plans (through corridors) and pinpointing any problems in the implementation of these plans (European Commission, 2005). A number of measures are envisaged, including technical harmonization, efficient and reliable path allocation rules and processes, traffic management, transparency on infrastructure, consistence in performance schemes for quality of service, cooperation between national regulatory bodies and governance. But even the corridor-based approach runs the risk of creating inter-corridor interoperability issues, limiting the “liquidity” of rolling-stock and postponing the ideal of a single (unified) railway market.

<sup>44</sup> It may also send technical opinions to the European Commission or Member States' Committees. ERA is also working with representatives (suppliers) to write down a legislation imposing them what to develop, a sign that the agency is establishing its power

<sup>45</sup> The Commission adopted an action plan to develop a rail network giving priority to freight by applying the corridor-based strategy and presenting ideas to be developed concerning aspects of corridor governance, management and operation.