

Integration of Infrastructure and Transport: an Assessment from Industrial Economics and Railway Perspectives

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Abstract

This paper explores the arguments, both in favour of and against vertical integration in railways, taking into account liberalisation requirements according to EU-legislation. It draws on industrial economics insight and combines it with illustrations from the German railway business. Since privatisation, next to liberalisation and restructuring, is taken as a central means of strengthening the railways in inter-modal competition, the paper also provides a connection between structural choice and the role of public versus private ownership. On this basis, general criteria for structural choice in railways are derived and policy recommendations can be drawn. It is argued for the German case, that the integration of railway infrastructure and its main operating customers warrants higher productivity, quality, safety and innovation of the rail system. By contrast, the potential disadvantages can be captured by a suitable regulatory framework. In particular, under organisational and accounting separation as well as regulation of non-discriminatory network access, competitive forces can unfold while advantages of integration are preserved to the benefit of railway undertakings, their customers and shareholders.

JEL-classifications: K23, L22, L33, L92

Key words: Railways, vertical structure, competition, privatisation

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1 Introduction

At the core of railway reforms world-wide, there is an intense debate on vertical structure of the railways, addressing the desirability of integration versus separation of infrastructure and transport in the presence of market access by new railway undertakings. In the political debate, proponents of either structural model tend to base their views on single-sided considerations, not acknowledging that there is a trade off between advantages and disadvantages of integration. This is the principal motivation of the current paper. It is embedded in the European debate, with a strong emphasis on the German discussion on privatising Deutsche Bahn AG. However, since the premises of structural choice and thus the patterns of debate are similar world-wide, the insight can be transferred and assist ongoing reform agendas elsewhere¹.

In economics, there exists a vast literature on vertical integration (for an early survey see Perry, 1978; on transaction cost literature Boerner/ Macher, 2001; and recently Whinston, 2004) hardly appreciated in the public debate on the one hand, as well as a number of railway practitioner views not utilised by economists on the other hand. Few contributions apply the existing economic concepts to railways (e.g. Rodi, 1996; Parry, 1997; Pittman 2001 and 2004; Ehrmann, 2003). Next to this qualitative work, sound empirical evidence on the effects of vertical structure is rare. Quantitative research in this context can be divided into two methodological branches. One branch sets out to measure the effectiveness of integration vs. separation in international comparisons of market and productivity data (Cantos, 2001; Friebe et al., 2003). The principal criteria to measure success of railway reforms and structural choice would be the development of inter-modal market shares, transport volumes, public finance absorbed by the railways, (downstream) transport prices, quality and safety figures, and - underlying these measures - productivity trends (IBM BCS/ Kirchner, 2004). The few papers addressing these impact measures, so far, suffer from a lack of consistent data and experiences, since the reform process in nearly all countries is a recent phenomenon and subject to ongoing modifications. Furthermore, the degree and characteristics of integration differ between countries, and it is hard to distinguish the effects of vertical structure from other policy changes. The second branch econometrically estimates the technological impact of structural choice on the basis of observed cost complementarities (Cantos, 2001; Ivaldi/ McCullough, 2001; Ivaldi/ McCullough, 2002; and for other network industries Kaserman/ Mayo, 1991; Hayashi et al., 1997). These authors find significant impacts of vertical structure on industry costs. Yet it is noted, that they focus on a subset of arguments only. To understand the merits of these papers, it is helpful to explore the full range of reasons behind either vertical structure in a railway context.

This paper surveys and explains the arguments, both for and against vertical integration, taking into account deregulation and market opening requirements along the EU-railway packages (see e.g. IBM BCS/ Kirchner, 2004; Nash, 2004). It draws on industrial economics

¹ See e.g. Pittman (2004) for China; Freebairn (1998) and Owens (2003) on the Australian debate; Mizutani/ Nakamura (2004) on the Japanese situation.

insight and combines it with experiences and illustrations from the German railway business². Since privatisation, next to liberalisation and restructuring, is generally taken as a central means of strengthening the railways in inter-modal competition, the paper also provides a connection between structural choice and the role of public versus private ownership.

On this basis, general criteria for structural choice in railways are derived and policy recommendations can be drawn. It is argued for the German case, that the integration of railway infrastructure and its main operating customers warrants higher productivity, quality, safety, and innovation of the rail system than a model with institutional separation. By contrast, the potential disadvantages of integration can be captured by a suitable regulatory framework. In particular, under organisational and accounting separation as well as regulation of non-discriminatory network access, competitive forces can unfold while at the same time the advantages of integration are preserved to the benefit of railway undertakings, their shareholders and customers.

The remainder of the paper is organised as follows. Section 2 defines the basic structural antipodes which the subsequent comparison principally refers to. Section 3 explores the potential advantages of integration, and section 4 presents the potential disadvantages arising from integration under these solutions. In section 5, criteria for structural choice in railways are identified giving rise to a policy conclusion.

2 Basic alternatives

The basic models of reference underlying the present paper are derived from EU legislation and current national considerations. The relevant EC Infrastructure Package was adopted by the Council in February 2001 and to be implemented by national legislation until March 15, 2003. It comprises three directives³: Directive 2001/12/EC on the development of the Community's railways, Directive 2001/13/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity, the levying of charges for the use of railway infrastructure and safety certification. The directives are designed to redefine the roles and functions of the active parties and to ensure a fair and non-discriminatory access to the infrastructure in the EU-Member States. The background of these measures is the wish to revitalise the - for many years - stagnating rail transport and, to the extent possible, to shift freight and passenger transport from road to rail.

The separation of the essential functions of train path allocation and pricing decisions from the influence of train operating companies (TOCs) is a core requirement of the Infrastructure Package. Furthermore, the Infrastructure Package provides for the establishment of a

² So far, the German railway reform finds little appreciation in the international literature, which is dominated by either US or UK examples.

³ For further detail and on the current status of implementation see e.g. IBM BCS/ Kirchner, 2004; Nash et al., 2004.

regulatory body in each Member State, which is to be independent from other core functions such as the train path allocation.

This framework principally allows for two types of structural reforms, which currently evolve across Europe⁴: Unbundling between infrastructure and transport within a holding company, i.e. under joint ownership, or institutional separation of infrastructure and transport. Following UK experiences with Railtrack, i.e. separation and privatisation of both, tracks and trains, which has been revised by putting the infrastructure under public authority in 2001, a separated private-private setting is not viewed as a feasible solution anymore across Europe.

Under these premises, a material privatisation of Deutsche Bahn AG, the German incumbent railway undertaking, is subject to a heated debate, which serves as the specific background of this contribution. Models of reference for the following analysis therefore are:

- integration of infrastructure and train operating companies in a private firm with organisational as well as accounting separation,
- institutional separation of infrastructure in a public firm or government body from private train operating companies.

Under both structures, it is assumed that competitive access to the railway infrastructure is principally provided.

3 Advantages of vertical integration

Reviewing the vast literature on vertical structure (as drawn from e.g. Perry, 1978; Joskow, 1991; Riordan/ Salop, 1995; Pittman, 2001; Seabright, 2003), eight arguments in favour of vertical integration can be distinguished:

1. Lower complexity of interfaces simplifies operational co-ordination and conflict settlement.
2. Comprehensive investment incentives and avoidance of hold ups strengthen capacity, quality, safety and innovation.
3. Private infrastructure provision within an integrated firm ensures higher productivity levels and market driven allocation.
4. Integration yields cost savings and synergies in shared facilities and services.
5. Co-existence of integration and competition drives technological and product innovation.
6. Embracing staff identification and responsibility increases quality and safety.
7. Partial avoidance of double marginalisation increases consumer welfare.
8. Strategic behaviour of the integrated firm can counteract excessive entry.

⁴ A list of present European models is given in the appendix.

The first two arguments are based on transaction cost economics with a short-run, i.e. operational, and a long-run, i.e. investment, perspective. The third argument addresses the question of private versus public ownership and is based on the disqualification of a separated private-private-setting. The fourth argument refers to technological effects of scale and scope, and argument 5 addresses the influence of firm organisation on innovative behaviour. Argument 6 stands out, in that it is not derived from industrial economics, but from behavioural and management science.

Among these arguments, however, the latter two are not applicable under the structural solution outlined above, because strict unbundling prevents cross-subsidisation and joint profit maximisation in short-run, i.e. pricing and capacity-allocating decisions. The notion of double marginalisation (going back to Spengler, 1950; see also Tirole, 1988), i.e. argument 7, depicts the phenomenon, that downstream prices under a vertical chain of independent, profit-maximising monopolists, suffer from a double price distortion. Hence, from a consumer welfare point of view they are inferior to short-run allocation under an integrated firm. Greenhut/ Otha (1976) show that this is also valid for oligopolistic downstream markets. Argument 8 is explored by Vickers (1995; see also Kühn/ Vives, 1999), who shows that under open access there may be entry in excess of the welfare maximising level, which can partly be avoided by strategic upstream pricing of an integrated firm. Both arguments, however, are based on the assumption of joint short-run profit maximisation which is ruled out under the reigning regime following vertical unbundling with organisational and accounting separation. Furthermore, in an industry that is subject to intermodal competition, the scope for monopolistic pricing and thus the relevance of abusive pricing arguments is limited. Therefore, we restrict the deepening view to arguments 1-6.

3.1 Operational co-ordination

A high degree of operative coordination and conflict resolution are key success factors in rail transport. Under vertical integration these processes are governed at lower transaction cost than between separate firms, i.e. a given level of coordination is achieved at lower effort, or a higher level of coordination is achieved at given effort. In railways, there is a particularly large number of complex interfaces requiring intensive coordination. Decisions are frequently being made with mutual involvement and in many cases under high time-pressure: Typically between the network operator's traffic control unit and a transport undertaking's traffic management units, when planning and carrying out maintenance measures, or in the management of disturbances. This is why historically, often starting from separately owned activities, large railway companies world-wide have evolved as vertically integrated entities (Williamson, 1985)⁵.

⁵ In his seminal work, Williamson denotes a full section to „the railroad organisation“ as the classical form of managing complex transactions. The underlying concept of transaction cost economics is going back to Williamson (1975), and Klein et al. (1978). On the relevant notion of cooperative flexibility see Williamson (1991).

Within Deutsche Bahn AG, the relevant interfaces are organised on the basis of a transparent, clearly defined division of functions. Consequently, internal organisation at the largest railway undertaking incurs lower transaction costs in day-to-day business for the rail system than would be the case under institutional separation. As well as simplifying process coordination, integration makes for speedier responses in disturbance management and targeted conflict resolution. The operative business can thus be geared more closely to demand.

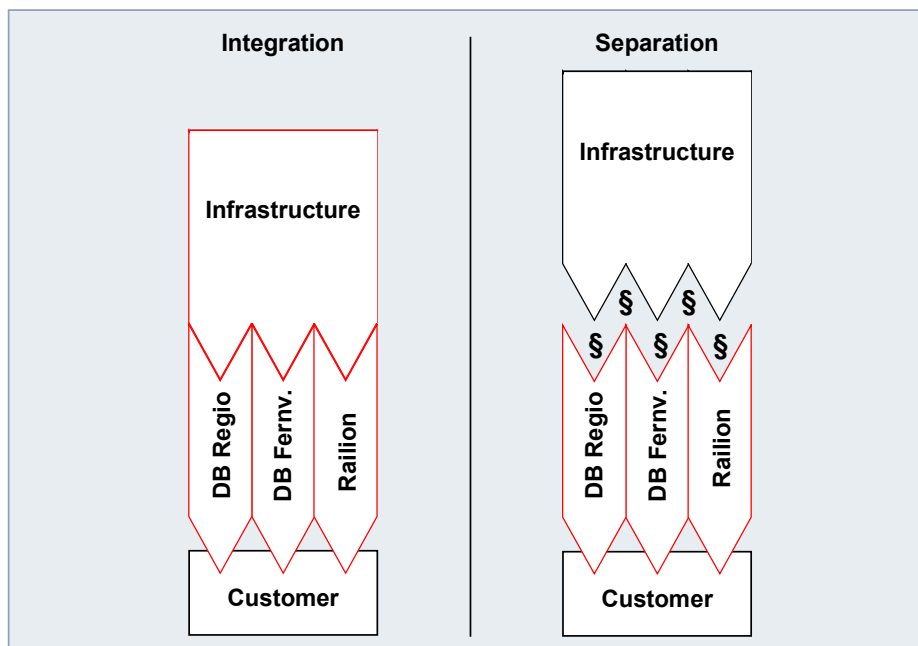


Fig. 1: Complexity of interfaces – illustrative representation

Institutional separation of DB Regio AG, DB Fernverkehr AG and Railion Deutschland AG – by far the biggest TOCs on the German rail network – from DB Netz AG, by contrast, would cause external contracts to mushroom and put internal resolution mechanisms out of order. The operating process would then be constantly accompanied by legal considerations and extensive contract monitoring, as sketched in figure 1. Coordination would be considerably more arduous and conflict resolution within the system as a whole would be more difficult. In fault scenarios in particular, rapid adoption of solutions with mutual impact would be impeded by possible legal consequences. There would be excessive research into blame-allocation with a view to apportioning causes, liability and rights to compensation rather than improving management. Accordingly, such fragmentation of the players would tie up considerable extra resources. This mechanism is also backed by experiences in Great Britain, as explained by the Economist (March 17, 2001): “At the centre of the railway industry’s problem is the division of tracks from trains which sets up an adversarial relationship between Railtrack and train operating companies. Not only does it mean that the two sides do not work naturally together on day-to-day matters of maintenance... . It also involves many man-hours as each side monitors the other’s performance, checking on whether the complex performance schedules have been met. In its southern zone alone, Railtrack has more than 50 staff engaged in attributing blame for train delays”.

The lower level of complexity of interfaces at Deutsche Bahn AG, by contrast, enhances the productivity and operational reliability of German rail services. All train operators in Germany profit from this ease of operational processes.

3. 2 Investment decisions

The embracing perspective in investment calculus derived under integration of infrastructure and its main customers ensures decisions conducive to capacity, quality, safety and innovation. Investment in the rail sector is characterised by long lead, utilisation and amortisation times. It typically exhibits a high degree of capital-intensity and is greatly geared towards a specific type of use. Much capital expenditure, e.g. on rolling stock for high-speed traffic, is only useful assuming similarly capital-intensive inputs by a distinct partner, e.g. the one responsible for designing track for high-speed workings. It is crucial, therefore, that the mutual risk of opportunistic behaviour be safeguarded against in the form of long-term, dependable ties. It is this stability that distinguishes the integration between corporate divisions at Deutsche Bahn AG, a set-up that provides the backbone for many planning processes at the corporate transport and infrastructure undertakings.

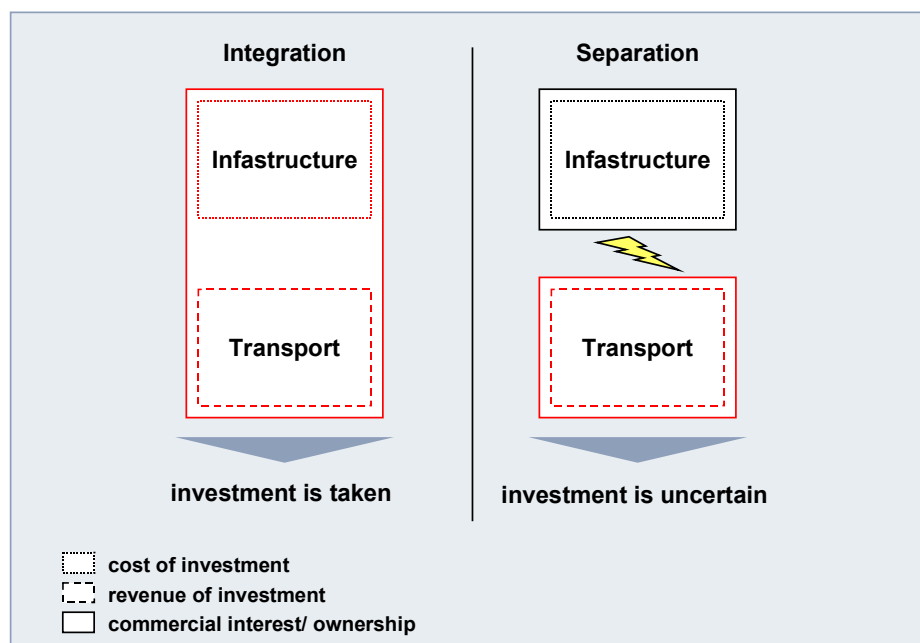


Fig. 2: Incentive structure behind a potential infrastructure investment

Investment decisions are invariably based on the ratio of expenditure to return. If the return is greater than the expenditure for a company, the economic rationale for effecting the investment is given. This is a calculation that Deutsche Bahn AG applies to the system as a whole. Benefits and disadvantages for individual corporate divisions are weighed up against one another from a single-entity perspective.

Without such balancing of interest, there is a danger of investment not being effected despite making sense overall (fig. 2). This is due to the uncertainty as to who will appropriate the return. It is a familiar, much-documented mechanism in industrial economics and is referred to as the hold-up problem (Klein et al., 1978; Riordan/ Williamson, 1985; Schmitz, 2001; recently and with reference to railways Buehler et al., 2004). The solution lies either in cumbersome, often unachievable contracts or else in integrated organisation. Inadequate investment in capacity and maintenance for the British rail network are telling evidence of the importance of this correlation in rail transport.

In Germany, the planning of measures for new-build and upgrade infrastructure ventures is factored into the Federal Transport Plan process (Bundesverkehrswegeplan) in a demand-driven manner⁶. Here, too, the cohesion of interests at the principal users is particularly conducive. Much investment in the rail sector would be inconceivable without integration.

3. 3 Infrastructure productivity

As part of an integrated, private-enterprise set-up, rail infrastructure is subject to direct pressure from both the capital market and transport undertakings following material privatisation. The constraints this gives rise to lead to operating processes becoming strictly cost and product-driven, to market-responsive products, to efficient use of resources and to discipline in train-path pricing, benefits that are not assured under a lastingly state-run infrastructure.

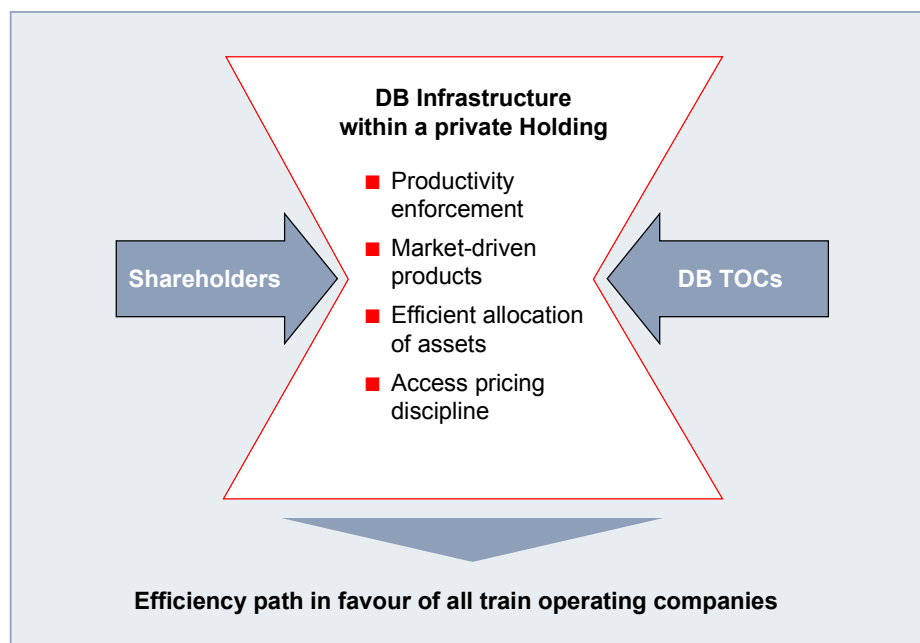


Fig. 3: Infrastructure commitment within a private holding

⁶ Subject of this process is a prioritisation of relevant projects derived from input of the German Länder. Main decision criteria are the results of a cost-benefit-analysis and a capacity assessment of the infrastructure manager, i.e. DB Netz AG for rail.

Rendering railway operations in their entirety commercially accountable is a core element of the German railway reform of 1994. Railways' poor record in both economic and transport terms prior to the reform was identified as being due to its bureaucratic structures and inadequate focus on the market and on operating results. The railway reform is designed to bring about the requisite market and productivity focus by means of a strictly private-enterprise approach. Public authorities take account of transport, regional and other policy objectives by contributing to investment in infrastructure and paying for regional passenger services. This is the financial framework for Deutsche Bahn AG to make its commercial decisions.

Market-productivity trends for the Group as a whole are indicative of successful rationalisation under competitive and privatisation pressure. To ensure the further pursuit of this path, the German Federal government is aiming at the material privatisation of Deutsche Bahn AG.

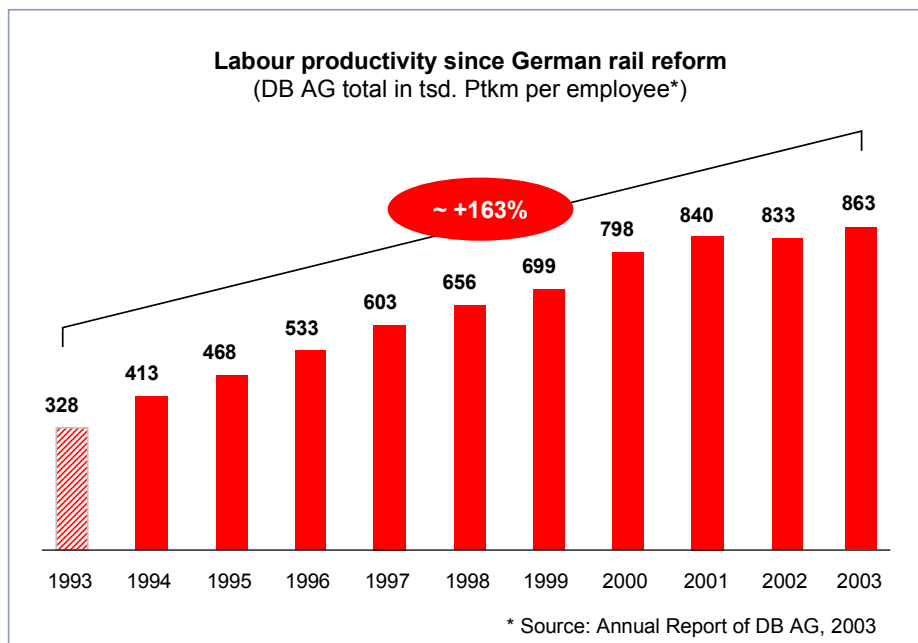


Fig. 4: Productivity increase under competitive and commercial pressure

The positive effect of privatisation on productivity and market responsiveness is demonstrated in cross-sectoral empirical studies on privatisation (D'Souza et al., 2000; Megginson/ Netter, 2001). In their comprehensive survey Megginson/ Netter (2001) find proof for efficiency enhancements ranging between 10 and 25%. They consolidate these findings to a mean improvement of around 20% which can be attributed to extra pressure in consequence of an IPO process⁷.

⁷ Theoretical explanations behind this positive impact are given in Boycko et al. (1996) with a policy-oriented approach, and in Schmidt (1996) with an emphasis on contracts and incentives. For an overview of this debate see e.g. Shleifer (1998). Empirical evidence of the direction of productivity change in transport markets is also provided by Ng/ Seabright (2001).

If infrastructure activity, presently amounting to a cost share of 38% in the total German rail system⁸, were to be exempt from this pressure, past and future restructuring successes would be jeopardised. As a continuously state-run facility, it would suffer from slack incentives under moving budget constraints. By turn, the network would pass on losses of productivity to all users in the form of higher train-path charges and/ or to the tax payer in the form of higher public finance requirements. Including infrastructure in a privatised Deutsche Bahn AG, by contrast, creates the prerequisites for positively developing efficiency to the benefit of all train operating companies (TOCs) and their users.

3. 4 Economies in joint production

Typical reasons for pooling different activities within one enterprise are the cost savings and synergies achievable through joint production (Coase, 1937). These concern the coordination benefits already mentioned, as well as static and dynamic economies of scope. Such technological advantages of vertical integration are found to be significant for railways by Ivaldi and McCullough (2002)⁹. Further savings are achieved by, for one thing, sharing fixed costs between divisions and, for another, through the reciprocal acquisition of experience. Valuable skills are learnt during joint execution of functions belonging to various stages in the value-added chain. Wider-system benefits of this sort are of particular relevance between network operators and transport undertakings in the railway sector.

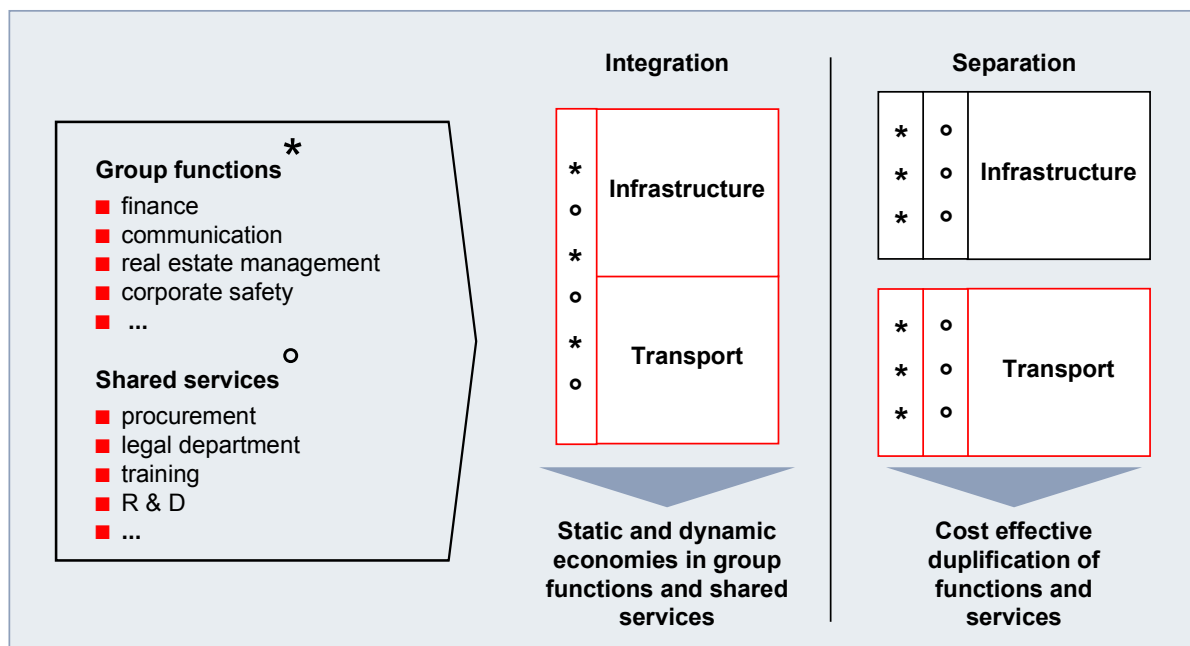


Fig. 5: Economies in group functions and shared services

⁸ Source: Internal data at DB AG. For this value, infrastructure includes the core activities of tracks, stations and rail energy supply only.

⁹ In an updated version of their paper, they find cost savings of around 25% due to vertical integration and even stronger effects of horizontal integration for US railways.

At Deutsche Bahn AG such economies primarily arise in what are referred to as group and service functions, i.e. facilities shared by the corporate divisions. If these were to be provided on an individual basis, higher costs would be incurred overall. In addition, the establishment of system-wide expertise in the likes of training, corporate safety/security and environmental protection would be necessary.

Dynamic economies between market stages would be lost in case of vertical separation of corporate divisions. Furthermore, there would be costly duplication of the functions mentioned (for other illustrations see e.g. Rodi, 1996). Intra-Group and external rail undertakings alike benefit in intermodal competition terms from the cost savings accruing from integration for DB Netz AG and DB Station & Service AG, as wide-ranging know-how as well as of lower train-path and station price levels are attained.

3. 5 Innovation under plural form

In order to become lastingly economical, even more demand-responsive and environmentally compatible, rail transport – as most other businesses - needs frequent modernisation. As regards their performance in terms of innovation, Deutsche Bahn AG and outside railway undertakings boast a variety of properties that mutually complement each other. The recent theory of innovation and organisational learning confirms the juxtaposition of several types of competing players as being the ideal pattern for a market's capacity to develop (March, 1991; Affuso, 2002; see also Ehrmann, 2003, and the literature quoted therein). It shows that this plural form is in the interests of both, integrated and non-Group enterprises. Further development of the rail system is driven by the coexistence of these two types of railway undertakings. If the integrated firm was politically forced to split, the functions would partly be lost. Requiring separate firms participating in a joint research arrangement instead imposes an unnecessary technology transfer burden (see also Teece, 1986; Jorde/ Teece, 1990).

The principal characteristics of an integrated railway undertaking are its overarching approach to technological development as well as its financial strength for projects of a long-term nature. The overarching approach is of particular importance since requirements for rolling stock are indivisibly bound up with the technical design of the permanent way. Direct interfaces exist between wheel and rail, catenary and pantograph and in the transmission of traffic management information. Only in a synchronised way is it possible to develop and introduce technological innovations.

The properties referred to add up to produce a technological leader role. Deutsche Bahn AG

- engages in rail-specific innovation management that would not be feasible for smaller railways;
- is intent on closely coordinating progress between track and train wherever this is required;
- is involved in developing and introducing customer-responsive standards in alliance with the railway supply industry;

- is forging ahead with, and setting forth the German stance on measures to raise interoperability in Europe.

The recent development of a new type of pantographs may serve as an example in this respect: In the summer of 2003, Deutsche Bahn AG for the first time tested the capability of actively regulated pantographs. In contrast to traditional types, they adapt their contact pressure to suit the overhead line. This enables faster speeds even on tracks that have not been specially upgraded. The potential savings and benefits are high, both for infrastructure and transport undertakings: enhanced output capacity of the track without construction works, lower wear and ten decibels less noise coupled with high speeds. Development and implementation are rooted in DB's overarching approach. DB Systemtechnik has been researching the issue for several years in conjunction with Bombardier.

The specific advantages of existing non-DB train operators and newcomers, by contrast, take the form of lower levels of operating complexity and a strong focus on specified regions, sectors and/ or products. Various examples are abundant in German regional and freight transport (e.g. Deutsche Bahn AG, 2004). The flexible environment elicits fresh ideas that are speedily put to effect.

To sum up, Deutsche Bahn AG and its competitors complement one another when it comes to further developing the rail system. Non-Group Railways use railway technology jointly developed by the railway supply industry and Deutsche Bahn AG. Deutsche Bahn AG profits from stimuli provided by non-Group Railways. The innovative force of competition fully unfolds in this plurality, a quality that has likewise established and proven itself in other market sectors.

3. 6 Embracing staff identification and responsibility

The integration of track and train operations strengthens employees' sense of identifying with the total rail system. The overarching perspective carries through into staff's day-to-day activities and supplements the cost-related benefits of integration. This argument stands out, in that it is not derived from industrial economics. Yet it is frequently reported to be significant by railway staff. Explanation can be drawn from human resource management and firm culture approaches (e.g. Gratton, 1999).

The system-wide perspective of railworkers has a positive impact at several levels: it strengthens holistic traffic management, cooperation and teamwork between functions, in-depth knowledge of all aspects of railway operations, coherent safety and quality monitoring and an overarching awareness of attrition and maintenance. This gives rise to greater safety, reliability and quality in operations as well as to lower costs in respect of wear and maintenance. Where vision is limited to individual functions, by contrast, a large part of these strengths is lost. In this respect, too, all DB Netz AG customers benefit from integration with the largest train operating companies.

4 Disadvantages of vertical integration

Four objections levelled at vertical integration are found in the political and scientific debate (an overview is included in e.g. Riordan/ Salop, 1985; Rodi, 1996; the typical pattern of the German debate is represented in the Transport Committee's Hearing on German Rail Reform of March 29, 2004):

1. Integration involves the risk of discriminatory behaviour by the infrastructure provider against downstream competition.
2. Integration complicates regulation of the infrastructure monopoly.
3. There is a conflict between public infrastructure obligations and private infrastructure management.
4. Integration may go along with lower and/ or misguided performance incentives in internal compared to fully external transactions.

4.1 Non-discriminatory access and competition

The objection most frequently levelled at vertical integration cites the potential for discrimination, arguing that an integrated corporation has an incentive and the means to disadvantage competitors over the in-house transport undertakings where network access is concerned. As the principal instrument of discrimination access pricing is most thoroughly analysed, yet it may also come into effect via track allocation procedures or information concealment. As a result, unconstrained competition is expected to be incompatible with an integrated set-up (e.g. Rodi, 1996), and the market equilibrium to be characterised by discriminatory behaviour of the incumbent likely to amount to vertical foreclosure (most prominently Salop/ Scheffmann, 1985, and Ordovery et al., 1990).

This conclusion, however, is refuted by actual access conditions and the competitive momentum in the German rail market. The integration of track and train running at Deutsche Bahn AG is not inimical to competition. Dynamic market trends in Germany derive from effective regulatory factors put in place:

- The train-path pricing and award systems are non-discriminatory and transparent in design. DB Netz AG guarantees all licensed TOCs access to its approximately 36,000 km of line. Since April 2001, a linear train-path pricing system (TPS 2001) has been in existence that applies to all train operators at equal terms. All transport undertakings have access to the rules governing TPS 2001, which are exhaustively documented under www.db-netz.de. DB Netz AG supports the process with a Customer Manual setting out all the steps required to access the network.
- Infrastructure and transport undertakings under the umbrella of Deutsche Bahn AG are separated in organisational and accounting terms. They contribute to corporate earnings

as companies accountable for their individual results. DB Netz AG conducts independent, professional and effective train-path marketing in respect of all transport undertakings.

- The Federal Railway Office (EBA) and the Federal Cartel Office ensure independent network access supervision ex post. The EBA monitors compliance with railway law, the Federal Cartel Office compliance with competition law. In line with recommendations made by the “Future of Rail” Task Force, a train-path agency is being installed at the EBA that, within the framework of open network access, will be supervising equal treatment of all train operating companies where the award and pricing of paths is concerned on an ex officio and ex ante basis.

Train-path allocation at DB Netz AG rests on unitary and transparent timetabling priorities. Following these rules, access conflicts with non-DB customers present only a diminishing fraction of their total access (fig. 6). They do not indicate acts of discrimination but are capacity conflicts that arise both with internal and external customers and within the Group.

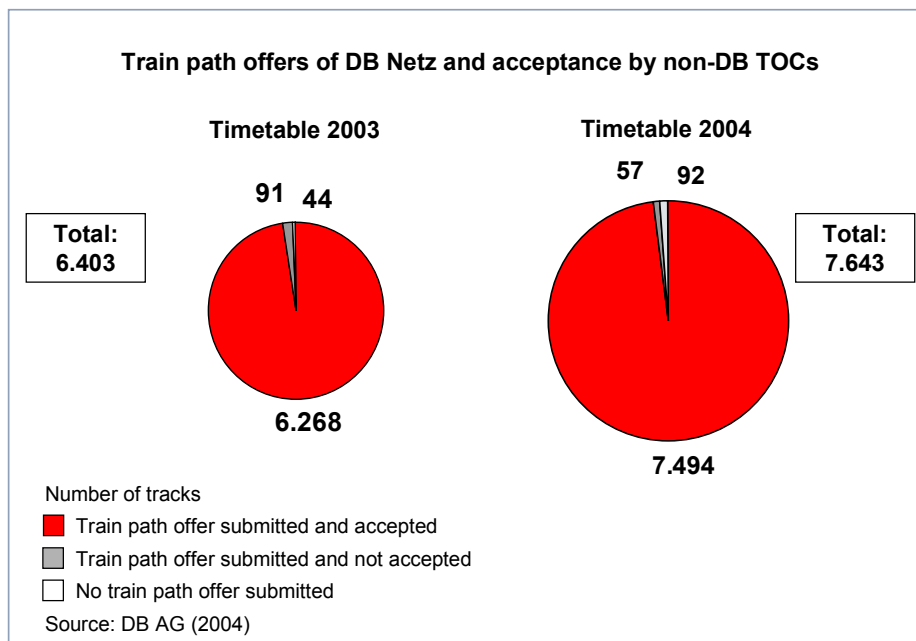


Fig. 6: Rare train path allocation conflicts

Regardless of the external regulatory framework, Deutsche Bahn AG has a vested interest in on-rail competition. It gives dynamic impetus to the rail industry and generates additional train-path income for DB Netz AG. This is straightforward for cases, where the downstream competitors are more efficient than corporate TOCs (this intuition is backed by e.g. Weisman/ Kang, 2001) or engage in product differentiation and thereby evoke extra traffic. In addition, general acceptance of the German model and hence of retaining the benefits of integration for the rail system result from non-discrimination being strictly observed. To fulfil and support the regulatory requirements, Deutsche Bahn AG installs precautionary measures in-house - over and above the statutory provisions - to ensure a rapid adoption from incumbent structures to competitively unobjectionable behaviour. Accordingly, DB Netz AG has steadily improved its customer-satisfaction in recent years (fig. 7). The Satisfaction

Index kept since 1999 shows further that non-DB and in-house TOCs ascribe similar levels of customer-responsiveness to DB Netz AG, even with slightly better scores by the former.

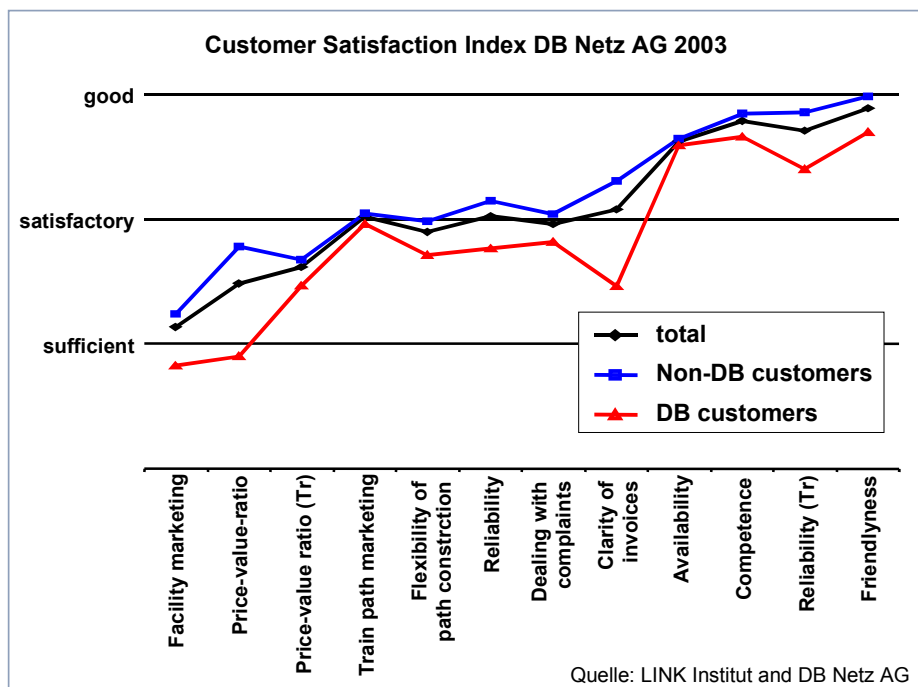


Fig. 7: Customer satisfaction at DB Netz AG

Starting from 40 licensed railway undertakings in 1994, there are now more than 280 non-Group railway undertakings operating on the Deutsche Bahn AG network (fig. 8), more independent companies than in any other country in Europe. Dynamic growth of non-DB railway activity is particularly pronounced in the freight and regional passenger sectors.

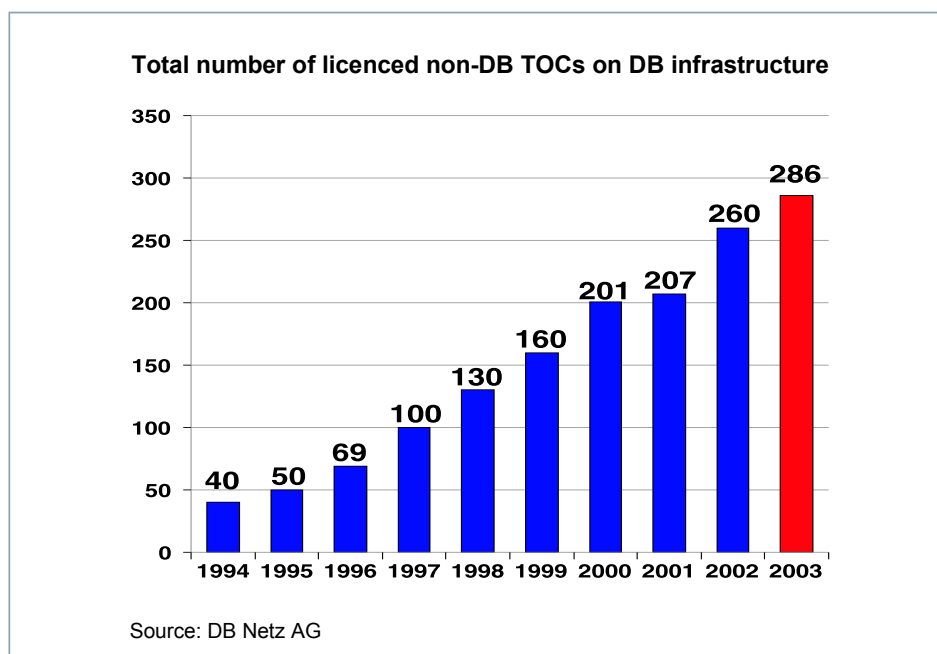


Fig. 8: Increasing number of licenced players on DB infrastructure

The traffic performance accruing at non-Group TOCs in Germany is growing steadily. From 1998 to 2003 competitors of Deutsche Bahn AG raised their operating performance by an average of approx. 40 per cent per year. In 2003, 8.5 per cent of all trains in Germany were run by competitors of Deutsche Bahn AG. This trend is set to continue in the years to come.

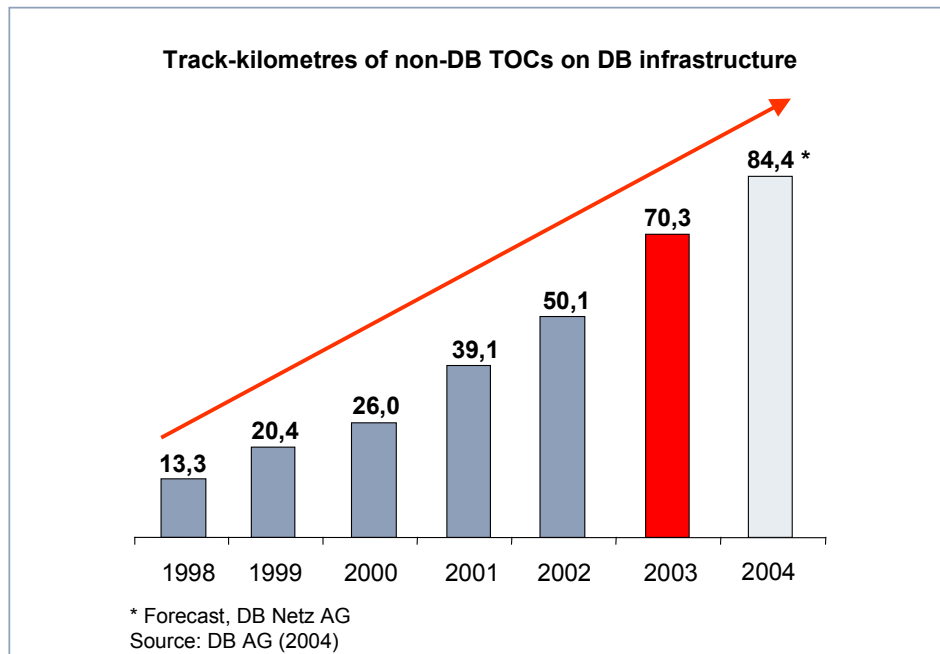


Fig. 9: Growing traffic volume of non-DB TOCs

Yet, owing to the different business models in place and to the market mechanism under product differentiation (e.g. de Villemeur et al., 2003), expectations to find an atomistic type of equilibrium structure are likely to be frustrated and should not serve as a policy guideline. Particularly the US experiences following rail liberalisation since the 1980s illustrate that market consolidation and the existence of large players does not contradict successful deregulation of the railways (e.g. Wilson, 1994; Schmidt, 2001).

The relative performance of market-access conditions in German rail transport is illustrated by an international comparison. The Rail Liberalisation Index produced by IBM Business Consulting Services and Kirchner (IBM BCS/ Kirchner, 2003 and 2004) sheds light on levels of market liberalisation in Europe (fig. 10). Its four principal findings:

- Progress on liberalising rail traffic in Europe is at widely differing stages.
- Germany is a front-runner alongside Great Britain and Sweden. The markets in these countries have established sustainable intramodal competition.
- The situation in Germany is cited as being exemplary notably as regards actual market-access conditions.
- A high degree of market openness can be achieved with both, integration and institutional separation of infrastructure and transport.

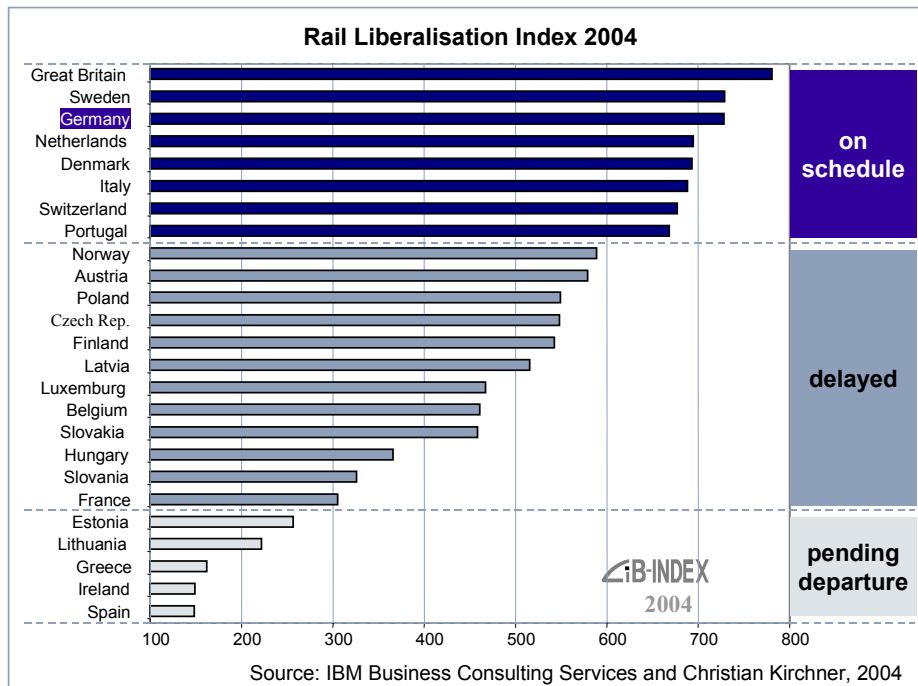


Fig. 10: Status and comparison of rail liberalisation in Europe

Experience thus demonstrates that intramodal competition and corporate integration are not mutually exclusive if placed under a well-designed regulatory framework. In addition, European railways are subject to strong competitive pressure from other modes of transport, which is in many segments overlays the potential extra effects of competition on rail.

4. 2 Aggravation of the regulatory task

Railway infrastructure exhibit typical characteristics of natural monopolies and are thus most efficiently provided by a single firm in each region/ country. Since access to this monopolistic bottleneck is vital for downstream firms, access conditions and pricing require regulatory oversight¹⁰, regardless of the specific vertical arrangement (e.g. Freebairn, 1998). The Principal subject of regulation is to avoid the abuse of monopoly power by the upstream firm¹¹.

Under vertical integration, however, the regulatory task is expanded and more complicated. Firstly, to safeguard non-discrimination, i.e. equal treatment of all train operators by the infrastructure provider, becomes a central issue of regulation - in addition to the traditional focus on general access conditions and especially pricing. Although an institutionally separated firm may also be motivated to discriminate amongst downstream customers for several reasons (Baake et al., 2004), the incentive to discriminate is inherent to the joint ownership structure. Secondly, the information asymmetry between regulator and regulated

¹⁰ Regulation and competition policy are taken as synonyms for our purpose subsequently.

¹¹ This is also true, if the network provider is a public firm with commercial goals, i.e. if it is provided with the incentive to maximise profits/ revenue or to minimise public funding requirements. In the latter case rent extraction would serve fiscal reasons.

firm is aggravated by the fact that transactions within the integrated firm are harder to observe than market transactions between infrastructure and independent transport undertakings which are governed by external contracts (Laffont/ Tirole, 1994). These two aspects imply that in the presence of an integrated infrastructure regulation requires extra resources and is more likely to be incomplete.

However, there are some counter-effects that limit this problem. Firstly, if discrimination is observable and greatly suppressed by a uniform pricing system, the traditional challenge of regulation is simplified. This is because downstream interests within the integrated firm discipline the pricing behaviour of the network operator below monopoly levels. Secondly, under strict unbundling and separate short-run profit maximisation, the network provider has an incentive to treat all TOCs equally, i.e. to sell its track capacity to the most efficient train operators, irrespective of their institutional belonging. Thirdly, as is evidenced by the UK experience, the potentially smaller regulatory resources under institutional separation are compensated by extra coordination authorities such as the Strategic Rail Authority and the Office of the Rail Regulator (House of Commons Transport Committee, 2004). Fourthly, the mere political threat of vertical separation should evoke non-discriminatory behaviour and thus ease regulatory requirements.

4. 3 Public infrastructure obligations

According to widely spread conviction, privatisation and integration are incompatible because infrastructure provision is a genuinely public task. In Germany, for instance, the latter is enshrined in Constitutional Law (GG), Article 87e (4) where the German Federation guarantees “that account shall be taken of the public weal, and in particular of transport requirements, in the development and upkeep of the rail network [...]”. From an economic point of view the need for public involvement only holds, if there is market failure and/ or if the politically desired level of provision is above that arising without public involvement. In transport infrastructure both arguments appear to be at least partly applicable. The first aspect refers to the natural monopoly character of the physical infrastructure of tracks and stations. This, however, implies no need for public provision but rather, as set out above, for regulatory oversight. The second aspect is common especially in the context of national and joint transport policy in Europe (e.g. Nash, 2004), as for a given level of publicly financed road infrastructure the desired modal share to allow for a sustainable transport system deviates from an otherwise *laissez-faire* situation with lower railway shares (OECD, 2002). Accepting the derived necessity for public activity, again, this does not require public provision. Rather, the desired level of infrastructure (as well as service) quality and extent can most efficiently be achieved under contracts between a private agent and the public principal/ initiator.

In Germany, the Federal State provides financial resources for this purpose. Deutsche Bahn AG is owner of the infrastructure and runs it as a business enterprise. There is no conflict in this division. On the contrary, the rigorously entrepreneurial alignment of the railways is a core element of the reform to strengthen the rail system. It is vital for the efficient fulfilment of

the infrastructure mandate that transparent, mutually binding contractual relations exist between the Federal government and Deutsche Bahn AG.

It is already the case today that central and regional government exert influence by means not of any shareholder function but of financial relations. Upgrade and new-build measures are adopted by parliament within the framework of the Federal Transport Plan. Measures that are not in DB Netz AG's commercial interests are put to effect on the basis of long-term financing agreements between the Federation and DB Netz AG. DB Netz AG runs the infrastructure and in the process consistently honours long-term quality and performance pledges.

A financial arrangement of this kind, combined with penalisation clauses, is beneficial from a transport as well as budgetary policy perspective. Network management on a private-economy basis yields rationalisation effects and a market-driven deployment of resources. It provides a stable planning framework for the government and for Deutsche Bahn AG. At the same time, it warrants the trust of investors in the rail sector. From a legal perspective, privatising Deutsche Bahn AG by up to 49.9 per cent – including the infrastructure constituents – is wholly reconcilable with Article 87e (3) GG.

4. 4 Performance incentives in internal transactions

A traditional argument against vertical integration relates to performance incentives in internal vs. market transactions (e.g. Williamson, 1991; Rodi, 1996). In comparison, market transactions are attributed to yield higher incentives to perform properly. The rationale is that result and reward of the economic activity and corresponding transaction are more closely connected than in internal relations. Selling infrastructure capacity to an external partner has a direct effect on the infrastructure manager's profits and measurable success. In case of discontent on the side of the train operator, the agreed level of service is enforceable by court. By contrast, a corporate customer under integration has to rely on internal settlement which could be subject to softer criteria. Furthermore, if the infrastructure is part of an integrated firm, the managers efforts vis-a-vis its downstream customers may be diluted or distracted by other goals, such as career and internal status concerns.

Again, looking at experiences within Deutsche Bahn AG this argument comes along with some ambiguity. Firstly, following accounting separation the transport as well as infrastructure divisions can be viewed as individual profit centres. Their economic scores are measured separately and build the divisional management's major motivator, as laid down in their respective work contracts. Secondly, profit-related incentives are complemented by non-pecuniary drivers. Thus, softer contract enforcement in case of bad performance is at least partly compensated by administrative control and disciplinary measures within the firm, as also acknowledged by Williamson (1991). Thirdly, the incomplete legal accountability in internal relations can rather be viewed as a strong advantage in operative coordination as explored and argument 1 above. Thus the aspect of higher incentive intensity under

separation, though valid in itself, has to be assessed against several counterweights in the present setting.

5 Conclusion

The structural choice from a political/ regulatory point of view needs to consider both, the pros and cons of vertical integration and should be based on a weighing of these arguments in the specific circumstance. Reviewing the scientific debate, there is no methodologically sound way to find a one-size-fits-all structural solution. In each specific national case the substance of these arguments needs to be carefully considered.

Recalling the above aspects, however, it is possible to generally identify general criteria for (dis-) integration. Specifically, vertical integration in railways can be expected to be more favourable

- the higher the co-ordination requirements are, i.e.
 - the more complex the line- and infrastructure-network,
 - the higher the density/ frequency in rail traffic,
 - the more mixed traffic there is,
 - the higher the asset specificity in investment;
- the less economic scope there exists for intra-modal competition, due to
 - network and scale advantages and high entry-costs,
 - low profit-margins in the initial situation;
- the stronger the pressure from intermodal competition, i.e. the less scope for extra pressure from competition on rail can be expected;
- the more reliable the institutional setting with respect to regulation of non-discriminatory access is;
- the less public funds there are available for infrastructure financing/ the higher the share of user-financing is.

These criteria imply, that the international diversity of structural arrangements is only partly owing to a lack of commercial or political understanding. It is also reflection of the above factors showing country-specific values. For instance, in Sweden, with a comparatively low traffic complexity, low pressure - for major goods - from intermodal competition, and a low degree of user-financing, an institutional separation may well be technically and economically adequate (on the current situation see e.g. Banverket, 2003). Whereas,

- for the US freight railways, with full user-financing and high specificity of rolling stock and track infrastructure,

- for Japan, with extremely high traffic density and thus coordination requirements (Mizutani/ Nakamura, 2004), as well as
- for Germany with comparatively high network complexity, strong intermodal competition, a reliable regulatory framework and a high degree of user financing,

to pertain integrated ownership can be recommended. Since the UK also falls into this second group of country characteristics, full separation there is perceived as contributing to the sustained discontent with the British railway reform (Stagecoach, 2001; House of Commons Transport Committee, 2004).

Compared to other network industries like telecommunications and electricity, the railway as a production system is characterised by even stronger interdependencies between infrastructure and downstream operations. The quality and productivity of trains and hence the competitiveness of rail services against other modes is determined to a large degree by infrastructure performance. Its contribution to value-added and its role in controlling operations are significantly more pronounced in rail traffic than in other network industries. This is why the commercial control and incorporation of infrastructure play such a prominent part here.

For the reasons set out above, the integration of track and train operations at Deutsche Bahn AG impacts positively on productivity, quality, safety and innovation in the rail system. It is possible at the same time to widely refute objections to integration within the German regulatory framework and on the grounds of current experience. These objections, therefore, do not justify destabilising and weakening the rail system by means of institutional separation and other trial-and-error reform initiatives.

This is why Deutsche Bahn AG regards the present framework – non-discriminatory network access coupled with organisational and legal separation plus functional independence under the corporate umbrella – as the best solution for the future of rail transport in Germany. Deutsche Bahn AG's interest in keeping tracks and train operations integrated relates to retaining benefits for the rail system and its users as well as to the conviction that these benefits are also reflected in the railways' capital market perception.

Gerald Corbett, former CEO of Railtrack, sums up his experiences thus (Sunday Times, August 19, 2001): "There is a reason why most railways in the world are integrated: it is that they are easier to manage thanks to teamwork on the ground. Splitting into all these different bits and particularly splitting the wheel from the rail has made it a managerial nightmare. ... I don't think the big investment will be delivered in the current structure, because it is too complex. There are too many vested interests."

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Appendix

Tab. 1: Vertical models in European Railways – infrastructure and transport

Type of separation	None	Accounting	Organisational + accounting	Institutional
Country				
Great Britain				X
Sweden				X
Germany			X	
Netherland				X
Denmark				X
Italy			X	
Switzerland			X	
Portugal				X
Norway				X
Austria		X		
Poland			X	
Czech Republic		X		
Finland				X
Latvia			X	
Luxembourg		X		
Slovakia				X
Belgium		X		
Hungary		X		
Slovenia			X	
France				X*
Estonia		X		
Lithuania		X		
Greece		X		
Ireland		X		
Spain		X		

Source: Own presentation based on IBM BCS/ Kirchner (2004)

Annotation: Colours mark the status of market openness according to the Rail Liberalisation Index 2004 – green = „on schedule“, yellow = „delayed“, red = „pending departure“

* Infrastructure ownership at RFF, infrastructure management/ operations contracted to SNCF