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

Presentation at the  
2nd Conference on Railroad Industry Structure, Competition, and Investment  
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Deutsche Bahn AG

Contents

- Introduction
- Basic alternatives
- Advantages of vertical integration
- Disadvantages vertical integration
- Conclusion
The question of vertical structure is at the core of railway reforms world-wide

**Motivation**

- Deregulation and liberalisation of national railways around the world, beginning in the 1980's
- Core elements of the debate
  - Introduction of intramodal competition
  - Vertical restructuring
- Vast literature on vertical integration in economics, hardly applied in the political debate on railways
- Political views often based on single-sided consideration
- Few empirical/quantitative contributions, focussing on a subset of arguments only

- Full range of arguments/trade off between pros and cons needs to be assessed with a railway specific perspective

- Specific background here: Current debate on material privatisation of Deutsche Bahn AG
Presently, there are three types of structural arrangements at work across European countries:

<table>
<thead>
<tr>
<th>Type of separation</th>
<th>None</th>
<th>Accounting</th>
<th>Organisational + accounting</th>
<th>Institutional</th>
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<tbody>
<tr>
<td>Great Britain</td>
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<td>France</td>
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Source: Own presentation on the basis of IBM BCS/ Kirchner (2004)
Annotation: Colours mark the status of liberalisation, green = “on schedule”, yellow = “delayed”
The central consideration is: Separated public infrastructure vs. integrated infrastructure under a privatised Holding with third party access.

**Models of reference in the European debate**

1. **Integration:**
   - Institutional integration with private shareholders
   - Organisational separation
   - Accounting separation
   - Downstream competition
   - Regulation of non-discriminatory access

2. **Separation:**
   - Institutional/ownership separation
   - Public infrastructure
   - Downstream competition
   - Regulation of natural monopoly
   - Accompanying co-ordination bodies

3. **Alternative model:** Separation of infrastructure ownership only (RFF/SNCF)
4. **Alternative model:** Separation of track pricing/allocation only
5. **Alternative model:** Club infrastructure

**Contents**

- **Introduction**
- **Basic alternatives**
- **Advantages of vertical integration**
- **Disadvantages vertical integration**
- **Conclusion**
Integration of infrastructure and transport under a private Holding warrants higher productivity, quality, safety and innovation

**Arguments in favour of vertical integration**

1. Lower complexity of interfaces simplifies operational coordination and conflict settlement
2. Comprehensive investment incentives and avoidance of hold ups strengthen capacity, quality, safety and innovation
3. Private provision within an integrated firm ensures higher infrastructure productivity and market driven allocation
4. Integration yields synergies and economies 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

There are two more IO arguments in favour of integration, not applicable in the unbundled setting

**Arguments in favour of vertical integration cont’d**

7. Avoidance of double marginalisation increases consumer welfare
8. Strategic behaviour of the integrated firm can counteract excessive entry
Lower complexity of internal interfaces simplifies operational co-ordination and conflict settlement

1. Operational coordination

- Internal organisation instead of external contracts at the main operator
- Focus on operational instead of legal issues
- High co-ordination of processes
- Quick reaction in case of operational disturbances

Strengthening of safety, reliability, and product-quality

The Economist (17/03/01):

"At the centre of the railway industry’s problem is the division of tracks from trains ... 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 ... In its southern zone alone, Railtrack has more than 50 staff engaged in attributing blame. ..."

Co-ordination loss and complication of vertical separation is relevant to a large number of operational interfaces

Interfaces with high co-ordination requirements

- Planning and implementation of replacement activities
- Track allocation and train allocation
- Set up of timetables
- Management of track disposal and train disposal
- Break down management
- Traveller information
- Development and implementation of technical innovation
Avoidance of the hold up problem: Integration ensures a higher investment levels in favour of the entire rail system

2. Comprehensive innovation incentives

**Investment characteristics under integration**
- Investment costs and revenues accrue within the same firm
- Investment decisions are driven by a comprehensive view instead of individual interests
- Particularly applicable with high specificity of assets
- Integration allows for an embracing risk insurance in large projects

**Superior development of**
- Capacity
- Quality
- Safety
- Innovation
in the rail system

**Integration**
- Infrastructure
- Transport

**Separation**
- Investment is taken
- Revenue of investment
- Commercial interest/ownership
- Cost of investment

As part of a private firm, the infrastructure is subject to efficiency pressure from investors and TOCs

3. Infrastructure under entrepreneurial goals and efficiency

**Commitment of DB Netz vis a vis the capital market and DB TOCs**
- DB Infrastructure under vertical integration
  - Productivity-orientation
  - Markt-driven products
  - Efficient allocation of assets
  - Access pricing discipline

**Example: Labour productivity under competitive and privatisation pressure**
DB AG in Tsd. Ptkm per employee

- 38% of railway costs
- ~+160%
Joint production yields additional synergies and cost savings in group functions and shared services

4. Economies in joint production

- **Group functions**
  - Finance
  - Marketing
  - Lobbying
  - Real estate management
  - ...

- **Shared Services**
  - Procurement
  - Legal department
  - Training
  - R & D
  - ...

**Allocation of functions**

**Integration**
- Infra-structure
- Transport

**Separation**
- Infra-structure
- Transport

Cost savings from group functions and shared services
Cost effective duplication of functions

The co-existence of integration and competition is beneficial to innovation and development of the rail system

5. Innovation under the plural form

- **Integrated DB**
  - **Advantages**
    - Financial capacity
    - Experience
    - Comprehensive approach
    - Scale effects
  - **“Technological leader”**
    - Large R & D facilities
    - Development, implementation and standardisation of fundamental rail technology
    - Tight co-ordination of innovation in rolling stock, traction, signalling and tracks
    - Examples: Rail telematics, high speed technology, active pantograph

- **Independent TOCs**
  - **Advantages**
    - Flexibility, low complexity
    - Regional and specific customer focus
  - **“Explorer”**
    - Innovative marketing
    - Process innovation
    - Example: KVV, Connex

Optimal organisation with respect to innovation and development
Embracing staff identification and responsibility at the main operator
increase operational safety and quality

6. Embracing staff identification and responsibility

Driver

Holding perspective and identification of DB-staff

Behavioural implication

- Comprehensive awareness and responsibility for ware out and replacement
- Pragmatic operational and break down management
- Increased willingness to cooperate

Effects

- Higher operational safety
- Higher reliability/ quality
- Lower ware out and replacement requirements
- Speedy handling of unforeseen incidents

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There are four major disadvantages levelled against integration of infrastructure and transport in railways.

**Disadvantages of integration**

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 yields *lower/misguided performance incentives* in internal compared to fully external transactions.

The discriminatory potential is captured by suitable access conditions in Germany.

**1. Non-discriminatory access and competition**

<table>
<thead>
<tr>
<th>Objection</th>
<th>Solutions</th>
<th>Effects and evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discriminatory potential</strong></td>
<td></td>
<td><strong>Functioning competition in the German railway market</strong></td>
</tr>
<tr>
<td>An integrated network operator has incentives and controls means to disadvantage third parties in infrastructure access. Therefore, competition will be deterred</td>
<td>1. Access pricing and conditions are non-discriminatory and transparent</td>
<td>Entry conditions are pro-competitive</td>
</tr>
<tr>
<td></td>
<td>2. Infrastructure and transport at DB are separated in organisation and accounting</td>
<td>Track allocation is without friction</td>
</tr>
<tr>
<td></td>
<td>3. Independent regulatory authorities safeguard non-discriminatory access</td>
<td>More than 200 independent TOCs are doing business on the DB infrastructure</td>
</tr>
<tr>
<td></td>
<td>4. DB has an interest in competition: Access revenues, efficiency, innovation dynamics</td>
<td>Transport volume of third parties is rapidly increasing</td>
</tr>
<tr>
<td></td>
<td>5. The Threat of separation makes DB arrange for non-discrimination</td>
<td></td>
</tr>
</tbody>
</table>
DB Netz AG’s train path allocation to third parties works without friction

**Train path allocation to non-DB TOCs**

Train path offers of DB Netz and acceptance by non-DB TOCs

<table>
<thead>
<tr>
<th>Train path offer submitted and accepted</th>
<th>Train path offer submitted and not accepted</th>
<th>No train path offer submitted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timetable 2003</td>
<td>91</td>
<td>44</td>
<td>6.403</td>
</tr>
<tr>
<td>Timetable 2004</td>
<td>57</td>
<td>92</td>
<td>7.643</td>
</tr>
<tr>
<td>Number of tracks</td>
<td></td>
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<tr>
<td>Train path offer submitted and accepted</td>
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<td>Train path offer submitted and not accepted</td>
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<tr>
<td>No train path offer submitted</td>
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<td>Total</td>
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</tbody>
</table>


Third party TOCs rank customer orientation of DB Netz higher than DB TOCs

**Customer Satisfaction Index DB Netz AG 2003**

- good
- satisfactory
- sufficient

- total
- Non-DB customers
- DB customers

Quelle: LINK Institut und DB Netz AG
TOCs not belonging to DB are already providing services on more than 50% of DB Netz's network

Geographical abundance of third party activities

The operating performance of competitors on the DB network is strongly increasing

Development of third parties on DB infrastructure

- 419% growth between 1998 and 2002 with newcomers
- Nearly no change at DB group’s TOCs

* Estimation; Source: DB Netz AG
Non-DB TOCs of DB already serve a considerable share of the German rail market

**Turnover of DB Netz AG by customer groups**

**Passenger traffic**
- **External costumers:** 6%
- **Internal Costumers:** 92%

**Freight Traffic**
- **External costumers:** 12%
- **Internal Costumers:** 88%

Source: DB Netz AG

The German railway market exhibits favourable entry conditions in a European comparison

**Rail Liberalisation Index 2004**

- **On schedule**
- **Delayed**
- **Pending departure**

- Progress on rail liberalisation is at widely differing stages across Europe
- Germany is a front-runner alongside Great Britain and the UK
- A high degree of market openness can be achieved under both, integration and separation

Source: IBM Business Consulting Services and Christian Kirchner, 2004
The additional regulatory challenges are limited by several factors

2. Aggravation of the regulatory task

<table>
<thead>
<tr>
<th>Objection</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced scope of regulation under vertical integration</td>
<td>- Ease of traditional focus</td>
</tr>
<tr>
<td>- Traditionals focus of regulator: Avoid the abuse of monopoly power upstream, mainly via pricing tools</td>
<td>- uniform, linear access pricing system</td>
</tr>
<tr>
<td>- Additional task: Safeguard non-discrimination</td>
<td>- internal pressure disciplines pricing level</td>
</tr>
<tr>
<td>- Further complication: Transactions within the integrated firm are harder to observe than external market transactions</td>
<td>- Organisational and accounting separation creates incentive to sell to most efficient TOCs</td>
</tr>
<tr>
<td></td>
<td>- Integration saves extra coordination authorities (eg. Strategic Rail Authority)</td>
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<tr>
<td></td>
<td>- Threat of separation evokes non-discriminatory behaviour</td>
</tr>
</tbody>
</table>

With reliable service and finance contracts infrastructure policy gains from private provision

3. Public infrastructure obligations

<table>
<thead>
<tr>
<th>Substance</th>
<th>Implication: no need for public provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to German Constitution (GG), government is responsible &quot;that account shall be taken of the public weal, and in particular of transport requirements, in the development and upkeep of the rail network [...]&quot;</td>
<td>- Regulation of infrastructure (see above)</td>
</tr>
<tr>
<td>Possible economic rationale</td>
<td>- Reliable contracts with private provider</td>
</tr>
<tr>
<td>- Market failure in railways: Infrastructure is natural monopoly</td>
<td>- Public infrastructure obligations are fulfilled via service and financing contracts with DB</td>
</tr>
<tr>
<td>- Market failure elsewhere: Public financing of road network, external effects of transport Railways market share is below politically desired levels</td>
<td>- This constitutes a hard budget constraint to infrastructure provider and reduces risks to public finance</td>
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<tr>
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<td>- DB carries commercially viable investment</td>
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<td></td>
<td>- Private provision promises efficiency gains and market driven allocation and thus generally reduces the need for public aid</td>
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</tbody>
</table>
The additional regulatory challenges are limited by several factors

### 4. Performance incentives

#### Objection

- Result and reward of activity are less closely related
- Selling to an internal TOC has a less direct effect on the manager’s measurable success
- Agreed service levels are not enforceable by court
- Manager’s effort is distracted by other goals

#### Countereffects

- Accounting separation creates individual profit centers
- Internal transactions are accounted for
- Commercial success determines infrastructure managers' pay
- Administrarive control complements pecuniary drivers
- Incomplete legal accountability eases operative coordination (see above)

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Structural choice should be based on a careful weighing in each specific national case.

**Trade off**

1. Operational co-ordination
2. Investment decisions
3. Infrastructure productivity
4. Economies in shared facilities
5. Innovation under the plural form
6. Embracing staff identification

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From the above analysis, general criteria for structural choice can be identified.

**General criteria**

Integration is 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 for intra-modal competition there exists, due to
  - network and scale advantages and high entry-costs
  - low profit-margins in the initial situation
- the stronger the pressure from intermodal competition
- 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
International diversity is (also) a reflection of differences in the above factors.

<table>
<thead>
<tr>
<th>Country</th>
<th>Characteristics</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>Low traffic complexity, low pressure from intermodal competition (for major goods), low degree of user-financing</td>
<td>separation</td>
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<tr>
<td>Japan</td>
<td>Extremely high frequency/traffic density and thus coordination requirements</td>
<td>integration</td>
</tr>
<tr>
<td>USA</td>
<td>High asset-specificity, full user financing</td>
<td>integration</td>
</tr>
<tr>
<td>Germany</td>
<td>High traffic complexity (multipolar population, mixed traffic), strong intermodal competition, high degree of user-financing Germany</td>
<td>integration</td>
</tr>
</tbody>
</table>

Final note

Gerald Corbett, former CEO of Railtrack (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.”
The position in favour of vertical integration in railways is based on a careful consideration of all relevant arguments.

### Key messages

1. Integration of infrastructure and transport at DB is subject to an ongoing political debate, which will be reinforced in the face of a possible IPO. The structural choice needs a careful analysis and weighing of all relevant arguments.

2. Under a suitable regulatory framework the disadvantages of integration can be strongly relieved. The German experience shows integration to be well consistent with functioning open access competition.

3. The advantages of integration are vital to a stable railway system. Disintegration brings about severe economic and operational problems.

4. Under the German framework the trade off between advantages and disadvantages of integration clearly solves in favour of integration. Advantages prevail from consumers’, firms’, transport policy, and public finance perspective.

5. The capital market appreciates vertical integration by sustainably higher ratings of railway undertakings.
Vertical structure in railways needs to satisfy different claims from various angles

**Perspectives and claims**

- Transport policy
- Competition policy
- Strengthening of the railways
- Integration of infrastructure and transport
- Attractive and reliable products
- Consumers
- Consistency with competition
- Low public burden
- Attractive and reliable products
- High profitability and rating
- Stability and competitiveness
- Enterprise
- Capital market

The literature identifies several potential disadvantages and advantages of vertical integration

**Inventory of arguments**

- **Simplified operational co-ordination** due to lower complexity of interfaces (transaction costs 1)
- **Comprehensive investment incentives** in favour of capacity quality and safety innovation (transaction costs 2)
- Efficiency effects of **private commitment in infrastructure provision**
- Synergies and **cost savings in joint production**
- Enhanced **innovation** under co-existence of integration and competition
- Embracing **responsibility and identification of staff** in favour of quality
- Partial avoidance of double marginalisation
- Counteraction of excessive entry

- **Potential discrimination and anti-competitive effects**
- **Conflict between public infrastructure policy and private provision**
- **Aggravation of regulatory task**
- **Lower/ misguided performance incentives**
- Economic situation of **infrastructure** division as a burden to DB TOCs and IPO
The advantages of integration bring about a positive appraisal from all relevant perspectives.

**Summary in favour of integration**

- **Arguments pro integration**
  1. **Lower complexity of interfaces** simplifies coordination and conflict settlement.
  2. **Comprehensive investment incentives** strengthen capacity, quality, safety and innovation.
  3. **Private infrastructure provision** ensures x-efficiency and market driven allocation.
  4. **Integration yields cost savings and synergies in production**.
  5. **Co-existence of integration and competition** drives technological and product innovation.
  6. **Embracing staff identification and responsibility** increase quality and security.

**Perspectives and appraisal**

- **Transport policy**
  - ...strengthens the railways
  - ...is consistent with railway competition
  - ...yields profitability and superior rating

- **Competition policy**
  - ...is consistent with competition
  - ...yields attractive and reliable products
  - ...ensures stabilisation and competitiveness

- **Consumers**
  - ...generates attractive and reliable products
  - ...ensures competitiveness and stability

- **Public finance**
  - ...yields profitability and higher rating

- **Integration of infrastructure and transport**
  - ...relieves the tax payer
  - ...yields competitiveness and stability

- **Enterprise**
  - ...ensures x-efficiency and market driven allocation

- **Capital market**
  - ...requires efficient and market driven allocation

The advantages of integration allow for a positive appraisal from all relevant perspectives.

**Perspectives and appraisal**

- **Transport policy**
  - ...strengthens the railways

- **Competition policy**
  - ...is consistent with competition

- **Consumers**
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- **Public finance**
  - ...yields profitability and superior rating

- **Integration of infrastructure and transport**
  - ...relieves the tax payer

- **Enterprise**
  - ...ensures competitiveness and stability

- **Capital market**
  - ...requires efficient and market driven allocation
DB Netz AG - Train Path Pricing System
Part of EICIS

DB Netz’s Train Path Pricing System is Part of the European Infrastructure Charging Information System (EICIS).

The single-stage Train Path Pricing System contains three modular pricing determinants:

1. Line category and utilisation → Base price
2. Train path products → Product factor
3. Supplements and deductions → Special factors
The Modular Train Path Pricing System TPS 2001 - Overview 2004

<table>
<thead>
<tr>
<th>LINE CATEGORIES</th>
<th>PRODUCTS</th>
<th>SUPPLEMENTS/ DEDUCTIONS</th>
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<tbody>
<tr>
<td>Long-Distant Lines</td>
<td>Express Path</td>
<td>• Steam engine</td>
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<td>F1 High Speed</td>
<td>• Out-of-gauge</td>
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<td>F2 Rapid</td>
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<td>F3 High Performance</td>
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<td>F4 Priority fast</td>
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<td></td>
<td>F5 Priority slow</td>
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<tr>
<td></td>
<td>F6 Local fast</td>
<td></td>
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<tr>
<td>Feeder lines</td>
<td>Express Freight Path</td>
<td>Regional Factor</td>
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<td></td>
<td>Standard Freight Path</td>
<td>(local passenger trains only)</td>
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<td>Urban lines</td>
<td>Lokomotive train Path</td>
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<td>Passenger trains</td>
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<td>Freight</td>
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<td>Tilting</td>
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<td>Axle Load &gt;22.5 t</td>
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<td></td>
<td>Regional Factor</td>
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<td></td>
<td>on busy sections</td>
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</table>

Utilisation factor (1, 2) on busy sections

TRAIN PATH PRICE