CER event: Unbundling in the railway sector: does one size fit all? 
Brussels, 5 November 2012

EVES-Rail

Economic effects of Vertical Separation in the railway sector

Main results

Study carried out by:
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Frank Zschoche – civity management consultants (Hamburg)
RESEARCH GOALS:

- Quantitative
- Qualitative
Effects of vertical separation on the rail sector’s economic performance in the EU context

We consider three measures of performance:

- Efficient use of inputs to produce outputs → cost modelling
- Competitive performance against other transport modes → rail modal share
- Value-for-money for state budgets → traffic volume per Euro of state funding
Research Goals: Qualitative

- If vertical structure does influence performance, why is that?
  - Competition may work differently – this needs to be checked.
  - There could be other changes in the incentives and costs of rail sector actors (besides competition). What about misalignment of incentives?
  - Can we identify and describe potential misalignments at various points in the value chain of the rail sector?
  - And if misalignments occur, how to overcome them?
## Literature review: Findings

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Countries covered</th>
<th>Effect of vertical separation</th>
<th>Effect of competition</th>
<th>Combined effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friebel et al. (2010)</td>
<td>Europe</td>
<td>Positive if appropriately phased</td>
<td>Positive if appropriately phased</td>
<td>Positive if appropriately phased</td>
</tr>
<tr>
<td>Cantos et al. (2010)</td>
<td>Europe</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Cantos (2011)</td>
<td>Europe</td>
<td>Not significant</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Wetzel (2008)</td>
<td>Europe</td>
<td>Not significant</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Growitsch and Wetzel (2009)</td>
<td>Europe</td>
<td>Negative for most countries</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mizutani and Uranishi (2012)</td>
<td>Europe and Japan</td>
<td>Depends on train density</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- Inconsistencies in earlier findings on separation and competition
- Data issues, treatment of structural options, and of competition
Econometric assessment of cost impact

Our starting point

- Mizutani and Uranishi (2012), Journal of Regulatory Economics
  - “With high train density, vertical separation increases costs”
  - “With low train density, vertical separation decreases costs”

- Previous papers looked for a single effect, consistent between countries

- This paper ‘switched on the lights’
  - Challenging the implicit assumption of a single invariable effect of vertical separation
  - Density varies strongly between countries

Our aim: advance state of knowledge on cost effects

- Improve, complete and extend data
- Check that Mizutani and Uranishi (2012) results hold with:
  - Improved data set
  - Proper control of competition effects
  - Testing impacts of more types of vertical structure (not only VI vs VS)
  - Europe-only sample

- Extend insight:
  - Testing for other factors that may lead to a differentiated effect of VS
RESEARCH FINDINGS: 
Quantitative

- Cost regression
- Modal share regression
- Value-for-money for state budgets
Cost regression: Model

- 26 OECD countries – 1994-2010
- Cost = f (control variables, test variables)

Control variables
(cost drivers not related to policy)

- Passenger output
- Freight output
- Route length
- Technology index
- Wage rate
- Energy price
- Materials price
- Capital price

Test variables
(policy variables that may affect costs)

- Vertical separation dummy variable
- Vertical separation dummy variable * train density
- Vertical separation dummy variable * freight revenue proportion
- Holding company dummy variable
- Holding company dummy variable * train density
- Holding company dummy variable * freight revenue proportion
- Horizontal separation dummy variable
- Passenger competition measure
- Freight competition dummy variable
Cost regression: Findings

- At higher traffic densities, vertical separation increases costs
  - At mean traffic densities, vertical separation does not significantly change costs
  - Whereas a holding company model reduces them, compared with complete vertical integration (weakly significant)

- A higher share of freight in total revenues increases the costs of vertical separation
  - Freight traffic may cause more coordination problems in a separated environment than passenger traffic

- Note 1: Findings also hold for estimation on Europe-only sample
- Note 2: Findings based on national networks - not applicable to small regional or local networks
Cost regression: Policy simulation

- Simulation result of imposing vertical separation EU-wide compared to status quo
  - Cost increase projection (EU aggregate): €5.8 bn/year
    - Effect different in every country
  - Effect worsens with higher traffic densities
    - With densities 20% higher than today:
      Cost increase projection (EU aggregate): €9.6 bn/year
- Higher traffic densities are a policy goal of the European Union (2011 Transport White Paper)
Modal share regression: Findings

Data (graph):
- Rail modal share does not appear to be higher with vertical separation (VS)

Modal share regression
- 26 OECD countries – 1994-2010
- Controlling for possible confounding factors

- No evidence that one model leads to significantly higher rail modal shares than the other
  - Both for freight and passenger traffic

- No significant difference in the impact on modal share between:
  - Holding company model with competition versus
  - Vertical separation model with competition
Graph: Market share of new entrants (freight), selected countries, 2010 (RMMS, 2012)
- Growth rate 2008-2010 of all but the largest operator: statistically not different between VI/HC versus VS
Value-for-money for state budgets:

State funding
€-ct per transport unit


0 2 4 6 8 10 12

The Netherlands
France
Switzerland
Germany
United Kingdom

1) Price level 2011, normalised by purchasing power parities
Intermediate conclusions
Quantitative part

- Costs improve / worsen in case of vertical separation with
  - Lower / higher traffic density and
  - Lower / higher share of freight in revenue

- Competition itself seems to have very weak effects on performance
- Competition does not appear to work better or worse under vertical separation

- So something happens to costs when there is vertical separation – something that is not explained by competition
  → Qualitative part
RESEARCH FINDINGS:
Qualitative

- Rail sector value chain
- Incentive misalignment analysis
- Realignment mechanisms
Rail sector value chain

- Initiative
- Sales
- Station
- Track
- Train
- Transport Service for the customer

Build → Own → Maintain → Operate
Investment coordination

Production planning coordination

Timetable planning coordination

Production (real-time) coordination

Overall consistency and feed-back loops from realisation to planning

Coordination needs between system elements at various time horizons

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Incentive misalignment: Concept – actors – economic effects

- VS leads to the existence of a fully separated IM alongside RUs
  - Each subject to a set of incentives given by the market and/or by the regulatory context
  - Each actor makes choices that optimise its economic position
  - These choices may well be optimal for each individual actor... but not necessarily for the rail sector as a whole
- Misalignment of incentives is when economic losses occur due to choices that are sub-optimal compared to what would occur in a more cooperative set-up (better aligned)

- Types of economic losses that may arise due to misalignment:
  - Additional capacity investment needs
  - Additional operational costs
  - Lost opportunities for revenue-making
## Incentive misalignment: Misalignment & realignment examples

<table>
<thead>
<tr>
<th>Investment coordination</th>
<th>Production planning coordination</th>
<th>Timetable planning coordination</th>
<th>Production (real-time) coordination</th>
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</thead>
<tbody>
<tr>
<td>• Extension / decommissioning</td>
<td>• Quality of resources and reliability</td>
<td>• Maintenance/renewal versus operations</td>
<td>• Disruption handling</td>
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<tr>
<td>• Upgrading / downgrading</td>
<td>• Small/medium scale investments</td>
<td>• Timetable robustness</td>
<td>• Feed-back loops</td>
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<tr>
<td>• Rail2000 (CH)</td>
<td>• Coordination of small scale / high impact investments (JP)</td>
<td>• Timetabling and path allocation (CH, GB, FR, NL)</td>
<td>• Traffic control centres colocation (GB, NL, FR)</td>
</tr>
<tr>
<td>• High frequency rail (NL)</td>
<td>• IM/RU cooperation/misalignment (NL, FR, GB)</td>
<td>• Track possessions and commercial consequences (FR, PL)</td>
<td>• Passenger information (NL)</td>
</tr>
<tr>
<td>• RUS/IIP (GB)</td>
<td>• Trade-offs track maintenance / total system costs</td>
<td></td>
<td>• Feed-back loops (JP, NL)</td>
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<tr>
<td>• Prioritisation (FR)</td>
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<tr>
<td>• Rolling stock and power supply (GB)</td>
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<tr>
<td>• ERTMS/ETCS</td>
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<tr>
<td>• Synergy real estate – rail</td>
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</table>
Incentive misalignment: Findings: size

- Literature review:
  - Induced costs from misalignment (up to +20%)
  - Vertical separation also leads to additional transaction costs, but these are limited (+1%)
- Misalignment issues increase in importance
  - In non steady-state railways (demand increase, investments, reconfigurations)
  - In systems with higher train densities
Incentive misalignment: Findings: realignment options

- How to solve misalignment issues?
  - Track access charges and performance regimes are important but cannot solve all misalignment issues
  - Regulators cannot either solve all misalignment issues (compared to holding or vertical integration steering)
  - Various hybrid arrangements have started to appear
    - Joint ventures, sharing of surplus/loss from joint actions
    - Non-financial cooperation, joint facilities
    - Remark: Easier to reach where a single operator carries a large part of the traffic
- Can re-alignment mechanisms solve all problems?
- How do re-alignment mechanisms perform compared to alternative arrangements?
Overview of findings on the effects of vertical separation

- **System cost effects**
  - Depend on train density and share of freight
  - Negative aggregate effect for the EU if all switch to VS (costs increase)

- **Rail modal share effects**
  - No significant difference between VS and holding company model, also when looking at impact with competition

- **Value for money for state budgets**
  - No pattern to suggest an advantage from VS
  - (Analysis limited to 5 countries)

- **Market entry**
  - Can be significant and growing both with and without VS

- **Alignment of incentives**
  - Effects are important and require much more attention
  - New trend towards re-alignment (e.g. GB, NL)
Policy recommendations

- **Free choice of structural model**
  - Subject to providing non-discriminatory access
  - Allows for competition between structural models
  - Allow switching from a holding model to vertical separation
  - Allow switching from vertical separation to a holding model

- **Where vertical separation is adopted**
  - Efficient setting of track access charges and performance regimes is necessary but not enough
  - Enable (re)alignment of incentives between IM and RUs

- **For any structure**
  - Need for coordination mechanisms must be recognised