Study of Competition in the Railroad Industry and Analysis of Proposals that Might Enhance Competition

Final Report
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Kellogg School of Management
Northwestern University
Outline

- Project background
- Railroad economics
- Trends in rates and market power
- Railroad productivity and costs
- Railroad revenue sufficiency
- Shipper captivity
- Capacity and service quality
- Economic analysis of policy proposals
- Future directions
Project Background

- The Christensen Associates team was selected by the STB to perform an independent study of competitive issues in the U.S. freight railroad industry, including
  - Competition and captivity
  - Capacity and service quality issues
  - Economic analysis of policy proposals

- Two research phases
  - Gather stakeholder input to assist in formulating research plan
  - Quantitative research
Railroad Economics

- Economies of density and fixed costs require pricing above marginal cost to cover total costs
  - Economies of density – costs fall as traffic over network increases

- By definition, price above marginal cost is the exercise of market power, but exercise does not imply abuse

- Railroads use differential pricing to recover their total costs
  - Different commodity groups face different markups of rates over marginal costs
Railroad Market Power – Margin Between RPTM and MC
Trends in Railroad Rates and Market Power

- Recent years’ rate increases due to declining productivity growth and increasing costs, not increased exercise of market power

- Market power index relatively flat in recent years
  \[ \text{LMI} = \frac{\text{RPTM-MC}}{\text{RPTM}} \]

- Market power increased most when both MC and RPTM falling
Railroad Market Power – Lerner Index
Railroad Productivity and Costs

- Recent declines in productivity growth and increases in input price growth
  - Less ability for railroads to absorb cost increases
  - Reflected in upturn in RCAF-A

- Increases in average and marginal costs in recent years
  - “Spike” in fixed costs
  - Increases in marginal and variable costs
  - Differences in marginal costs by commodity and over time
Productivity-Adjusted Input Prices – RCAF-A

(1Q89=1.000)
Recent Trends in Commodity Rates

- Rates and markups over marginal cost vary by commodity groups and within groups
  - Relatively larger markups for agricultural commodities

- Some ability by shippers to adjust to counteract increases
  - e.g., length of haul, car loadings
  - But what are adjustment costs?
  - However, not all shippers can adjust

- Data problems with intermodal
  - Most lumped into STCC 46, Misc. Mixed Shipments
## Estimated Marginal Costs and Markups by Commodity

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Farm Products (Aggregate)</td>
<td>0.61</td>
<td>0.61</td>
<td>0.9</td>
<td>0.9</td>
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<tr>
<td>Barley</td>
<td>0.68</td>
<td>0.75</td>
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<td>Corn</td>
<td>0.71</td>
<td>0.73</td>
<td>0.7</td>
<td>0.6</td>
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<tr>
<td>Wheat</td>
<td>0.67</td>
<td>0.71</td>
<td>0.8</td>
<td>0.7</td>
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<td>Soybeans</td>
<td>0.63</td>
<td>0.58</td>
<td>0.9</td>
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<td>Metallic Ores</td>
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<td>0.51</td>
<td>2.1</td>
<td>2.3</td>
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<tr>
<td>Coal</td>
<td>0.41</td>
<td>0.41</td>
<td>1.1</td>
<td>1.1</td>
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<tr>
<td>Non-metallic Minerals</td>
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<td>0.39</td>
<td>1.8</td>
<td>2.2</td>
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<td>Food Products</td>
<td>0.59</td>
<td>0.60</td>
<td>1.2</td>
<td>1.2</td>
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<tr>
<td>Lumber &amp; Wood Products</td>
<td>0.64</td>
<td>0.63</td>
<td>1.4</td>
<td>1.4</td>
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<tr>
<td>Chemicals</td>
<td>0.63</td>
<td>0.59</td>
<td>1.6</td>
<td>1.6</td>
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<tr>
<td>Petroleum &amp; Coal Products</td>
<td>0.64</td>
<td>0.60</td>
<td>1.6</td>
<td>1.5</td>
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<tr>
<td>Clay, Concrete, Glass, &amp; Stone</td>
<td>0.60</td>
<td>0.60</td>
<td>1.7</td>
<td>1.8</td>
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<tr>
<td>Primary Metal Products</td>
<td>0.59</td>
<td>0.59</td>
<td>1.8</td>
<td>2.1</td>
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<tr>
<td>Transportation Equipment</td>
<td>0.55</td>
<td>0.51</td>
<td>5.1</td>
<td>5.4</td>
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<tr>
<td>Intermodal (COFC/TOFC)</td>
<td>-0.36</td>
<td>-0.35</td>
<td>4.3</td>
<td>4.5</td>
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</table>
Railroad Revenue Sufficiency

- Revenue sufficiency measure = RPTM/ATC

- For most years of study (1987-2006) Class I’s do not appear to be earning above normal profit
  - Results vary by railroad
  - Does 2006 indicate start of new trend?

- Consistent with financial market assessment
  - e.g., P/E ratios, EPS
  - Financial performance similar to electric utilities
Railroad Revenue Sufficiency: RPTM/ATC
Railroad Revenue Sufficiency and Market Power

- No increase in exercise of market power in recent years as revenue sufficiency improved

- Greatest increases in market power occurred in late 1980s and early 1990s when industry mostly below and trying to achieve revenue sufficiency levels
Railroad Revenue Sufficiency and Market Power

The chart shows the trends in Railroad Revenue Sufficiency and Market Power from 1987 to 2006. The blue line represents the RPTM/ATC Lerner Index, which remains relatively stable over the period. The green triangles depict the Lerner Index, showing a consistent upward trend, indicating increasing market power over the years.
Shipper Captivity

- Within commodity groups, shippers with no or limited transportation options pay more than shippers with same shipment characteristics and better transportation alternatives

- R/VC is weakly correlated with market structure factors that affect shipper captivity
  - Not a reliable indicator of market dominance
  - Instances of “relative captivity” when R/VC < 180
  - Percent of R/VC below 100 often greater than percent above 300
### Percent Tons and Ton-Miles by R/VC Category

#### Percent of Tons by R/VC Category

<table>
<thead>
<tr>
<th>Period</th>
<th>R/VC &lt; 100 Percent</th>
<th>R/VC between 100 and 180 Percent</th>
<th>R/VC between 180 and 300 Percent</th>
<th>R/VC &gt; 300 Percent</th>
<th>Subtotal R/VC &gt; 180 Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2001</td>
<td>14%</td>
<td>44%</td>
<td>31%</td>
<td>12%</td>
<td>43%</td>
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<tr>
<td>2005-2006</td>
<td>14%</td>
<td>42%</td>
<td>27%</td>
<td>17%</td>
<td>44%</td>
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#### Percent of Ton-Miles by R/VC Category

<table>
<thead>
<tr>
<th>Period</th>
<th>R/VC &lt; 100 Percent</th>
<th>R/VC between 100 and 180 Percent</th>
<th>R/VC between 180 and 300 Percent</th>
<th>R/VC &gt; 300 Percent</th>
<th>Subtotal R/VC &gt; 180 Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2001</td>
<td>19%</td>
<td>51%</td>
<td>25%</td>
<td>5%</td>
<td>30%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>20%</td>
<td>51%</td>
<td>21%</td>
<td>9%</td>
<td>29%</td>
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</table>
Correlation of R/VC with Market Factors

<table>
<thead>
<tr>
<th>Commodity Group</th>
<th>Correlation Coefficient with R/VC Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RPTM</td>
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<tr>
<td>Chemicals</td>
<td>0.18</td>
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<tr>
<td>Coal</td>
<td>0.61</td>
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<tr>
<td>Corn</td>
<td>0.23</td>
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<tr>
<td>Intermodal</td>
<td>0.12</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.16</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Market Structure and Rates - Wheat
Capacity Constraints

- Capacity “tightness” due to localized congestion and constraints
  - Similar to performance of other network industries
  - Econometric and engineering studies say overall networks not constrained

- No evidence of connection between capacity and increased exercise of market power
  - No overall changes in railroad markups during periods of “tightness,” but some redistribution

- Capacity lumpiness – hard to achieve optimality

- Future projections must be viewed cautiously
Capacity Investment

- Investment has increased in both nominal and real terms in recent years

- Investment is relatively constant percent of industry revenues
  - Still high relative to other industries, but down somewhat from 1990s – period of high “capex”
  - Similar to electric utilities
Service Quality

- RPM Train speed data used as proxy
  - These data are a rough, aggregate proxy

- Service performance declines in 2003-2005 period linked to terminal congestion

- Speed and variability by commodity
  - Variability typically greatest for coal and grains, lowest for intermodal

- Better data needed
Economic Analysis of Policy Proposals

- Circumstances (as of 2006) imply providing relief to certain groups will likely result in increases for other shippers or threaten railroad viability
  - Caveat – does 2006 represent a new trend?

- Incremental policies have greater likelihood of resolving shipper issues with lower risk of adverse consequences. For example,
  - Reciprocal switching, terminal agreements
  - Improvements in STB procedures
  - Possibility of encouraging competitive response and expanding “size of pie”

- Some shippers will not benefit from greater competition – continued oversight necessary
# Economic Impact of Open Access Proposals

<table>
<thead>
<tr>
<th></th>
<th>Reciprocal Switching</th>
<th>Bottleneck Rates</th>
<th>Terminal Agreements</th>
<th>Trackage Rights</th>
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<tbody>
<tr>
<td>Economies of Density</td>
<td>Potential gains</td>
<td>Gains unlikely</td>
<td>Potential gains</td>
<td>Potential gains</td>
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<tr>
<td>Length-of-Haul Economies</td>
<td>Small loss</td>
<td>Potentially large loss</td>
<td>No gain to small gain</td>
<td>No gain to small gain</td>
</tr>
<tr>
<td>Vertical Economies</td>
<td>Small loss</td>
<td>Potentially large loss</td>
<td>Small loss</td>
<td>Potentially large loss</td>
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<tr>
<td>Investment Incentives</td>
<td>Small effect</td>
<td>Potentially large effect</td>
<td>Small effect</td>
<td>Potentially large effect</td>
</tr>
<tr>
<td>Railroad Profitability</td>
<td>Small effect</td>
<td>Potentially large effect</td>
<td>Small effect</td>
<td>Potentially large effect</td>
</tr>
<tr>
<td>Coordination Costs</td>
<td>Small to moderate</td>
<td>Small to moderate</td>
<td>Small to moderate</td>
<td>Potentially large</td>
</tr>
<tr>
<td>Competitive Response</td>
<td>Most likely</td>
<td>Least likely</td>
<td>Most likely</td>
<td>Somewhat likely</td>
</tr>
<tr>
<td>Shipper Gains</td>
<td>Most likely</td>
<td>Least likely</td>
<td>Most likely</td>
<td>Somewhat likely</td>
</tr>
</tbody>
</table>
Length-of Haul Economies – Stylized Facts

Reciprocal Switching

Elasticity = -0.5
Elasticity = -0.6
Future Directions

- Captivity and effective competition
- Disaggregate analysis of service quality
- Disaggregate analysis of capacity issues
- Cost shifting
- Fuel surcharges
- Class II and III issues
- Critical evaluation of demand growth projections
- Access to railroads